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Medical and Sport Sciences

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ICONST MSS 2026

International Conferences on Science and Technology
Medical and Sport Sciences
July 1-3, 2026 in Budapest - HUNGARY

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Dear Readers;

The 10th of ICONST organizations was held in Budapest-HUNGARY between July 1-3, 2026 with the theme of ‘science for sustainable technology' again. In recent years, weather changes due to climate change have reached a perceptible level for everyone and have become a major concern. For this reason, scientific studies that transform technological progress into a sustainable one is seen as the only solution for humanity's salvation. Here we ask ourselves "which branch of science is responsible for sustainability?". Sustainability science is an interdisciplinary field of study that covers all basic sciences with social, economic, ecological dimensions. If we consider technology as the practical application of scientific knowledge, the task of scientists under these conditions is to design products that consume less energy, require less raw materials, and last longer.

ICONST organizations organize congresses on sustainability issues of four main fields of study at the same time in order to present different perspectives to scientists. This year, more 250 papers from 24 different countries presented by scientists in ICONST Organizations.

97 papers from **9 countries (Albania, Bosnia and Herzegovina, Germany, India, Kazakhstan, Kosovo, Romania, United Kingdom and Türkiye)** presented in our International Conference on Medical and Sport Sciences organized under ICONST organizations. **Albania is the country with the highest participation with 47%, followed by Türkiye with 39%, Kazakhstan with %5, Kosovo with %3, Bosnia and Herzegovina, Germany, and India with %2. Outside of Türkiye participant rate is totally 61%.**

As ICONST organizations, we will continue to organize organizations with the value you deserve in order to exchange ideas against the greatest threat facing humanity, to inspire each other and to contribute to science. See you at your future events.

ICONST Organizing Committee

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Importance Of Physical Exercise In An Ageing Society

HAFIZ T.A. KHAN[1]

Abstract: Population ageing is one of the most significant demographic transformations of the 21st century, driven by declining fertility, increased life expectancy, and changing migration patterns. As the proportion of older adults continues to rise worldwide, societies face growing challenges related to chronic diseases, disability, dementia, multimorbidity, and increasing healthcare and long-term care demands. This presentation examines the global ageing phenomenon and its implications for public health. It highlights the critical role of regular physical exercise in promoting healthy ageing by improving physical function, mental well-being, independence, and longevity. Endurance, strength, flexibility, and balance exercises are emphasized as effective strategies for reducing disease burden and enhancing quality of life among older adults. The presentation concludes that promoting physical activity is a cost-effective and essential public health intervention for supporting healthy and active ageing in increasingly older societies.
Keywords: Physical Exercise1, Ageing2, Society3.

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"Keep Your Eye on The Ball": A Corpus-Based Study of Sports Idioms

OANA MARIA PĂSTAE

Abstract: Sports have historically served as a rich source of idiomatic expressions in English. From the boxing ring to the football pitch, idiomatic expressions enclose competitiveness, resilience, and strategy in ways that fill everyday communication. This study focuses on sports idioms and their transition from being specific to sports field to being used in everyday language**.** The data were collected from the **Corpus of Contemporary American English (COCA)**, one of the largest balanced corpora of American English, containing more than 1 billion words from spoken, fiction, magazines, newspapers, and academic texts. First, I compiled a list of 20 idiomatic expressions derived from sports domains such as baseball, football, boxing, athletics, racing, I, then, manually filtered this list to keep those idioms that were clearly derived from sports or ball games, were attested (in at least some examples) in corpora and had nontrivial metaphorical, extended use beyond literal sports domains. After that, I explored their frequencies, registers, context and metaphorical function. The analysis demonstrated that sports idioms function beyond sports discourse, permeating domains such as politics, business, movie, parenting, and everyday conversation. The results show that certain sports idioms (e.g. kick off, level playing field, step up to the plate, down to the wire) occur with much greater frequency and others with less frequency (throw a curveball, take the ball and run with it) in everyday conversation.

Keywords: sports idioms; corpus linguistics; idiomatic variation; frequency; figurative language.

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Awareness and Promotion of Aquatic Exercise Through Digital Media and Wearable Technology

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Swimming and aquatic exercise are accessible, year-round recreational activities with well-documented health benefits, and the rapid expansion of digital media and wearable technology has profoundly changed the way people discover, plan, practice and monitor their free-time physical activity. **Aim of the study:** This paper aims to examine how digital media and wearable technology can raise awareness and promote aquatic exercise as an accessible, safe and health-oriented free-time activity. **Methodology:** A descriptive and analytical approach was adopted, based on specialist literature in swimming, sports medicine and physical therapy. The study compares traditional and digitally enhanced practice, reviews five forms of aquatic exercise (competitive, open water, lifesaving, therapeutic and utilitarian-applied) together with their associated digital tools, and analyses practice possibilities, recreational characteristics, target groups, physiological benefits, contraindications and safety. **Main findings:** Aquatic exercise can be practiced year-round, individually or in groups, at low equipment cost and without age restrictions, provided that medical clearance is obtained where necessary. Immersion is associated with increased central blood volume and cardiac output, greater respiratory effort, and improved muscular blood flow, joint mobility, strength, flexibility, proprioception and mental recovery. Digital media, including video tutorials, specialized websites, review platforms and online booking, improves access to information, venue discovery and planning, whereas smartwatches and monitoring applications enable the tracking of laps, strokes, heart rate and recovery, thereby supporting motivation and consistent participation. **Conclusions:** Sustained awareness and promotion, supported by digital media and wearable technology, can extend the reach of aquatic exercise across the lifespan and contribute to physical, mental and social well-being. Practiced with appropriate medical guidance, aquatic exercise is a safe and versatile form of recreation, and its integration into leisure planning and the expansion of aquatic facilities should be encouraged for all age groups.

Keywords: aquatic exercise; digital media; wearable technology; health promotion

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The Importance Of Early Diagnosis And Treatment Of Types Of Malocclusions In Children: Collaboration Between General Dentist, Pedodontist And Orthodontist, A Literature Review

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Abstract: According to WHO, malocclusion is one of the three main oral diseases in the world. It affects the growth, development, function and aesthetics of the child's face. It also affects functions such as chewing, swallowing, speech and TMJ. Young patients may present with class III and class II malocclusions, open bite, cross bite, problems in the number, size and shape of teeth; sleep problems, apnea, attention deficit hyperactivity disorder (ADHD), neurocognitive disorders, etc. All of these require careful diagnosis and multidisciplinary treatment, which aims not only to solve the problem presented by the child but also to ensure the timely effectiveness of the treatment provided. The purpose of our study includes: 1. Underlining the importance of diagnosis and intervention as early as possible to solve the patient's problem. 2. Determining the connection between pedodontics and orthodontics (interceptive orthodontics) 3. Educating children and parents about oral hygiene and regular dental check-ups. Our study includes a literature review of studies and articles published in PubMed, Google Scholar, and Scopus. We studied 100 articles from 2010-2024. We included articles that studied children aged 6-12 years. The articles we studied are systematic literature reviews, case-control studies, longitudinal studies, cross-sectional studies and case-control studies. We excluded from our work articles that studied children under 6 years of age and adolescents, articles that only expressed the opinion of various experts and those studies that did not present a precise methodology. From the analysis of the articles that we took into the study, we concluded that: 1. In the treatment of malocclusions in children, early examination and the determination of an effective and long-term treatment plan are important, because the child is constantly undergoing the growth process. 2. Orthodontic treatments are not indicated for milk teeth because they cannot withstand the large forces that are exerted on the teeth in this case. 3. Children with poor oral hygiene and the presence of caries are not selected patients for orthodontic treatments. 4. Oral habits should be eliminated and then orthodontic therapy should be started. 1. In solving orthodontic problems in children, accurate diagnosis and the existence of a clear treatment plan are of great importance. 2. Treatment should be comprehensive and possible complications should be prevented. 3. Having cooperative patients and parents is an advantage in achieving treatment success. 4. Cooperation between the general dentist, pedodontist and orthodontist is of great importance.

Keywords: Malocclusion, Pedodontist, Deciduous Teeth, Orthodontist, Comprehensive Treatment, Oral Habits.

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Short-Term Changes In Gingival And Plaque Indices Following Periodontal Intervention In Adults With Diabetes: A 3-Month Secondary Analysis

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Abstract: Diabetes is associated with increased gingival inflammation and plaque accumulation. This analysis evaluated short-term changes in Gingival Index (GI) and Plaque Index (PI) at 3 months in a clinical trial of adults with type 2 diabetes mellitus and periodontitis. Participants were assigned to an intervention periodontal-management approach or a control condition and assessed at baseline and 3 months. Outcomes were GI and PI (0–3 scale). Primary endpoints were within-person change from baseline to 3 months and the between-group difference in mean change (Welch t-test). A baseline-adjusted 3-month comparison (ANCOVA) and an exploratory responder analysis (≥0.5-unit improvement) were performed. Sensitivity analyses excluded participants reporting antibiotics since the last visit or periodontal treatment outside the study by 3 months. Baseline n=89 (45 control, 44 intervention). At 3 months, GI/PI were available for all controls (45/45) and 42/44 intervention participants. Mean GI decreased from 2.08 to 1.97 in controls and from 2.04 to 1.55 in the intervention arm. Mean PI decreased from 2.09 to 1.89 and from 1.92 to 1.42, respectively. Mean GI change was −0.10 (control, n=45) vs −0.48 (intervention, n=42), with a between-group difference in change of −0.38 (95% CI −0.46 to −0.30; $p<0.001$). Mean PI change was −0.21 vs −0.49, difference −0.28 (95% CI −0.39 to −0.18; $p<0.001$). Baseline-adjusted group effects at 3 months were −0.38 for GI and −0.30 for PI (both $p<0.001$). Responder rates (≥0.5 improvement) were 2.2% vs 54.8% for GI and 8.9% vs 47.6% for PI (control vs intervention). Sensitivity analyses yielded similar estimates. By 3 months, the intervention achieved clinically meaningful, statistically robust improvements in GI and PI compared with control, indicating early improvements in plaque control and gingival inflammation in adults with diabetes and periodontitis.

Keywords: Diabetes mellitus, Periodontitis, Gingival Index, Plaque Index.

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Mammography Dose Optimization: Analysis Of Technical Parameters And Mean Glandular Dose

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Abstract: Optimizing radiation dose while ensuring diagnostic image quality is essential in mammography. The mean glandular dose (MGD) reflects the absorbed radiation in the glandular tissue of the breast and is influenced by breast thickness, tube voltage (kV), and tube current-time product (mAs). Assessment of dose variability and predictors of MGD supports quality assurance and radiation protection. To assess dose consistency between bilateral craniocaudal (CC) projections, identify predictors of MGD, and analyze the variability of technical parameters in mammography. A retrospective study analyzed 206 CC projections from 103 women aged 40 to 65 years, obtained in 2024 at the Institute for Women's Health, Canton Sarajevo, using the MAMMOMAT Fusion system (Siemens Healthineers, Erlangen, Germany). MGD per projection was calculated to be 0.0136 ± 0.0036 dGy, with compression thickness showing a positive correlation with MGD. No significant differences were observed between the right and left CC projections, indicating bilateral dose consistency. Regression analysis identified mAs as the dominant predictor of MGD, followed by compression thickness, while kV had a minimal impact on the outcome. The limited values reflected actual anatomical and technical variability. The mammography system demonstrated a stable and symmetric dose distribution, operating below established reference levels. Exposure optimization emerged as a key factor influencing MGD, with mAs identified as the primary determinant. Standardized protocols and operator training remain essential for minimizing dose variability without compromising image quality. These findings support evidence-based radiation protection strategies and ongoing protocol optimization in routine clinical mammography.

Keywords: mammography, dose optimization, technical parameters, radiation protection

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Static And Dynamic Posture Analysis In Sedentary Individuals

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Abstract: The aim of this study is to evaluate the static and dynamic posture characteristics of sedentary individuals aged 18–35 years and to determine postural deviations that may be observed in the ankle, knee, hip, shoulder, and spine regions. The research was conducted as a descriptive study based on pre-test–post-test measurements. The study population consisted of individuals registered in sports centers located in Sarıyer district of Istanbul. The sample consisted of a total of 167 sedentary individuals aged 18–35 years who were in these centers, did not exercise regularly, and voluntarily participated in the study. 75 of the participants were women (44.9%) and 92 were men (55.1%). The age, height, body weight, and body mass index of the participants were recorded. Static posture analysis was evaluated from the front, side, and back in the anatomical position, while dynamic posture analysis was performed during walking and basic movements. All measurements were applied as pre-test and post-test. Data analysis was performed using IBM SPSS Statistics 26.0 program, employing descriptive statistics and comparative analyses. It was determined that sedentary individuals may exhibit more prominent features such as shoulder drooping, spinal curvature, and lower extremity misalignment changes. Furthermore, more postural deviations were observed in dynamic assessments compared to static posture. These findings are important for the early identification of postural disorders in sedentary individuals and the planning of appropriate exercise programs.

Keywords: Sedentary individuals, posture analysis, static and dynamic posture, musculoskeletal system, postural deviation.

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Clinical Predictors For Early Mri After Acute Ankle Sprain

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Abstract: Ankle sprain is a common injury among the people and normally is recovered in few weeks depend on the grade of injury. The incidence of talar OLT lesions following an ankle distortion has been reported to be up to 6.5%. Clinical examination and the plain x ray are the gold standards for the first line of examination. MRI is examination of choice for persistent pain after 4-6 weeks and chronic instability. To evaluate predicted factors of osteochondral lesion of talus for ordering an early MRI. A prospective cohort study including 180 patients with acute lateral ankle sprain. Clinical examination, functional tests, and MRI were performed within 7 days after injury. Patient with ankle fracture, previous ankle surgery and systemic ligament disease were excluded from the study. Patients were followed for 12 months. Chronic ankle instability was assessed using the Cumberland Ankle Instability Tool. MRI-confirmed osteochondral lesion of talus (OLT) in 22 % which is correlated with ATFL 84% and CFL injuries 52% , Moderate–severe sprains, VAS >6, Syndesmosis injury with positive squeeze test 47%, inability to bear weight for 4 steps 28%, positive anterior drawer test 43% VAS pain ≥6–7, persistent weight-bearing pain after at a week, severe swelling or hemarthrosis, positive anterior drawer test, pain above the ankle joint with positive squeeze test are predictor of osteochondral lesion of talus and should be the criteria for an early MRI.

Keywords: ankle sprain; bone contusion; osteochondral lesion; syndesmosis.

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Adolecsent's Approach To Reproductive Health

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Abstract: Adolescence represents a critical period for establishing healthy sexual behaviors. Limited knowledge regarding sexually transmitted infections (STIs) and reproductive health increases vulnerability to adverse health outcomes. This study aimed to evaluate the level of knowledge, information sources, and communication patterns related to sexual and reproductive health among adolescents aged 15–20 years in Durrës, Albania. A cross-sectional study was conducted including 1,000 adolescents (750 females, 250 males) with a mean age of 17.8 years. Participants completed a structured questionnaire assessing knowledge of STIs, transmission routes, preventive measures, and sources of information. Descriptive statistical analysis was performed. Overall findings revealed insufficient knowledge levels in this age group. Although 63.3% reported having received information about sexual and reproductive health, understanding was largely limited to basic hygiene concepts (75%). The internet was the primary information source (46%), followed by physicians (31%) and school materials (15%), suggesting a shift from traditional educational channels.HIV was the most recognized STI (82.5%), while knowledge of syphilis (47.4%), chlamydia (45.6%), and gonorrhea (38.6%) was considerably lower. Notably, 10.5% incorrectly classified candidiasis as an STI. One-third (33.3%) were unable to identify any transmission route, and 50% did not recognize clinical symptoms of STIs. Preventive knowledge was limited, with only 40% identifying condom use as a protective measure. Despite knowledge gaps, 83% acknowledged the importance of sexual health education, and 68.3% reported willingness to consult a physician in case of infection.

Keywords: Sexual and reproductive health; Adolescents; Sexually transmitted infections (STIs); Health knowledge; Health education; HPV awareness; Preventive behaviors; Albania; Public health; Youth health literacy

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Design And Application Of A Three-Dimensional Printed Anthropomorphic Breast Phantom In Mammography - A Review Article

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Abstract: Mammography is a key diagnostic tool for the early detection of breast cancer, but due to the use of ionizing radiation, it is necessary to reduce the dose while preserving image quality. Advances in three-dimensional (3D) printing have enabled the development of anthropomorphic breast phantoms that accurately simulate different tissues, with the potential to optimize mammography protocols. The review aims to analyze the literature on the design, production, and application of 3D-printed anthropomorphic breast phantoms, with an emphasis on reproducing anatomical structures, physical tissue properties, and radiological characteristics. During the fall of 2025, a search of the PubMed and Scopus databases was conducted for studies in English published between 2015 and June 2025, focused on 3D printed breast phantoms for mammography, applying predefined criteria for inclusion and exclusion from the study. Eight studies met the criteria, demonstrating different approaches to the design and fabrication of 3D printed breast phantoms. The phantoms successfully reproduced anatomical structures, tissue attenuation properties, and radiographic texture. The modular design allowed for the insertion of lesions, microcalcifications, and iodine objects, improving the assessment of lesion detectability and system performance. Integration with observer models enabled objective assessment of image quality and prediction of human observer performance. 3D printed anthropomorphic breast phantoms provide a reliable, reproducible, and flexible platform for technical evaluation of mammography systems and radiation dose optimization. Continuous improvement of materials and modeling techniques will further improve tissue realism and diagnostic relevance.

Keywords: mammography, 3D printing, anthropomorphic phantom.

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Aesthetic–Performance Conflict: A Qualitative Study On Muscle Dysmorphic Tendencies In Elite Athletes

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Abstract: The aim of this study is to examine the relationship between aesthetic expectations and performance-oriented demands in elite fitness athletes and to explore how this relationship contributes to muscle dysmorphic tendencies. In contemporary sport sciences, performance is not solely determined by physical capacity but is also shaped by psychological factors and body image perceptions. In this context, the conflict between achieving an ideal aesthetic appearance and maintaining optimal performance may lead to psychological pressure and body dissatisfaction among athletes. The study was conducted using a qualitative research design based on a phenomenological approach. The participants consisted of elite-level fitness athletes aged between 18 and 35, with at least three years of competitive experience. Participants were selected through purposive sampling, specifically criterion sampling. Data were collected through semi-structured in-depth interviews conducted both face-to-face and online, and audio recordings were transcribed for analysis. The data were analyzed using phenomenological analysis, including coding, categorization, and theme development processes. The findings reveal that elite athletes experience a significant interaction between body image, aesthetic concerns, and performance pressure. In particular, athletes in fitness-related disciplines are more likely to develop muscle dysmorphic tendencies due to heightened aesthetic expectations. From a sport sciences perspective, the results highlight the importance of addressing psychological well-being alongside physical performance. Accordingly, training programs and athlete support systems should integrate psychological components to promote both performance optimization and healthy body perception.

Keywords: body image, muscle dysmorphia, elite athletes, sport psychology, performance, aesthetics.

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Brain And Sports Performance: A Prefrontal Cortex-Based Neurocognitive Model

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Abstract: Sports performance is not only related to physical capacity but also directly linked to higher-order cognitive processes such as attention, working memory, executive functions, and decision-making. This review examines the central role of the prefrontal cortex (PFC) in sports performance within a neurocognitive framework. Based on a systematic literature review, this work comprehensively investigates the anatomy and functional organization of the PFC, the relationship between executive functions and sport, transient hypofrontality theory, neurocognitive mechanisms of the flow state, the connection between working memory and sports performance, and neurocognitive network structures. The effects of combined physical and cognitive training on PFC activation and sport-specific neurocognitive profiles are also discussed. Current findings reveal that the PFC is both a constraining and enabling structure in sport, forming part of a dynamic neural system shaped by training. The proposed model aims to provide an integrative framework at the intersection of sport psychology, neuroscience, and training science.

Keywords: prefrontal cortex, sports performance, executive functions, neurocognitive model.

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Children's Right To Participate In Sports And Their Protection

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Abstract: This study aims to examine the approaches in the international literature regarding the protection of children's rights in general, and children's rights in sports in particular, and to determine the duties and responsibilities of relevant individuals, institutions, and organizations, and to develop various recommendations. In addition to the fundamental children's rights stemming from national and international legal regulations, protecting the rights of children in the process of participating in sports activities is of great importance. In this process, all stakeholders, primarily parents, but also educators, administrators, sports clubs, federations, educational institutions, sports organizations, coaches, and sports managers, have important duties and responsibilities. The ability of children to continue their development in healthier, safer, and more supportive environments is directly related to the protection of their physical, mental, and social well-being. In this context, guaranteeing the fundamental rights that children possess from birth in sports environments is not only a legal obligation but also a fundamental responsibility that should be addressed within the framework of universal ethical principles and social values.

Keywords: Sport, child, children's rights, sports policies

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Trends In Mortality Rates Attributable To Occupational Risks In Albania During The Period 1990-2023

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Abstract: Occupational risks remain an important determinant of population health, and examining their long-term mortality trends in Albania offers valuable insights into workplace safety, regulatory progress, and the effectiveness of public health interventions. Hence, our aim was to describe the trends in mortality rates attributable to occupational risks in Albania during the period 1990-2023. This analysis was based on the estimates from the Global Burden of Disease (GBD) Study available from the Institute for Health Metrics and Evaluation (IHME). Crude and age-standardized mortality rates attributable to the occupational risks for the Albanian population were extracted for the period 1990-2023. In both 1990 and 2023, crude mortality rate attributable to occupational risks in Albania was estimated at about 9 (95%CI=7-11) deaths per 100,000 population. The total percentage crude change during the period 1990-2023 was only 8% which was not statistically significant (95%CI: from -18% to 38%). Conversely, the age-standardized mortality rate decreased from around 10 (95%CI=8-13) deaths per 100,000 population in 1990 to 5 (95%CI=4-7) deaths per 100,000 population in 2023. The total standardized percentage change during the period 1990-2023 was 47%, which was highly statistically significant (95%CI=32%-59%). The stability of crude mortality rates attributable to occupational risks in Albania contrasts with the significant decline in age-standardized rates, reflecting both demographic influences and improvements in workplace safety and health interventions over the past three decades. These findings emphasize the importance of sustaining and strengthening occupational health policies in Albania, particularly in light of an aging workforce.

Keywords: Albania, Global Burden of Disease (GBD), Institute for Health Metrics and Evaluation (IHME), mortality rate, occupational risks.

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Burden Of Disease Attributable To Occupational Risks In Albania, 1990-2023

QAMIL DIKA[1], MARSIDA DULI[1]

Abstract: Occupational risks contribute substantially to the global burden of disease, making their assessment essential for guiding workplace safety strategies. Our aim was to describe trends in the burden of disease attributable to occupational risks in Albania for the period 1990-2023. Data for this analysis were extracted from the Global Burden of Disease (GBD) Study, which are reported by the Institute for Health Metrics and Evaluation (IHME). Crude and age-standardized burden of disease rates [measured in Disability-Adjusted Life Years (DALYs)] attributable to occupational risks for the Albanian population were extracted for the period 1990-2023. From 1990 to 2023, crude disease burden in Albania attributable to occupational risks decreased slightly from around 919 (95%CI=524-1445) to 898 (95%CI=301-1529) DALYs per 100,000. The total percentage crude change during the period 1990-2023 was only -2% which was not statistically significant (95%CI: from -45% to 19%). In contrast, the age-standardized CKD burden decreased significantly from about 1042 (95%CI=585-1639) DALYs per 100,000 in 1990 to 690 (95%CI=211-1196) DALYs per 100,000 in 2023. The total standardized percentage change during the period 1990-2023 was -34% (95%CI: from -65% to -18%). The slight but non-significant reduction in crude disease burden attributable to occupational risks contrasts with the marked decline in age-standardized rates, suggesting that demographic changes have masked important progress in workplace safety and health interventions in Albania over the past three decades. These findings highlight the need to sustain and expand occupational health policies in Albania, as the workforce continues to age and diversify.

Keywords: Albania, burden of disease, Disability-Adjusted Life Years (DALYs), Global Burden of Disease (GBD), Institute for Health Metrics and Evaluation (IHME), occupational risks.

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Trends In Chronic Kidney Disease Mortality In Albania During The Period 1990-2023

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Abstract: Chronic kidney disease (CKD) represents a growing public health challenge worldwide, and understanding its long-term mortality trends in Albania provides critical insights for health system planning and policy development. Therefore, our aim was to describe the trends in CKD mortality in Albania during the period 1990-2023. This analysis was based on the estimates from the Global Burden of Disease (GBD) Study reported by the Institute for Health Metrics and Evaluation (IHME). Crude and age-standardized mortality rates of CKD for the Albanian population were extracted for the period 1990-2023. From 1990 to 2023, crude mortality rate of CKD in Albania increased from about 9 (95%CI=6-13) to 17 (95%CI=13-23) deaths per 100,000 population. The total percentage crude change during the period 1990-2023 was 86% (95%CI=49%-164%). Conversely, the age-standardized CKD mortality rate decreased from around 14 (95%CI=10-22) deaths per 100,000 population in 1990 to 10 (95%CI=7-13) deaths per 100,000 population in 2023. The total standardized percentage change during the period 1990-2023 was -33% (95%CI: from -46% to -3%). While the crude mortality rate of CKD in Albania has nearly doubled over the past three decades, the decline in age-standardized mortality highlights the impact of demographic shifts and possible improvements in CKD prevention, diagnosis, and management. These contrasting trends emphasize the importance of continued investment in health system strengthening, with particular attention to aging populations and equity in access to care. Sustained monitoring and targeted interventions will be essential to mitigate the growing burden of CKD in the Albanian population.

Keywords: Albania, chronic kidney disease, Global Burden of Disease (GBD), Institute for Health Metrics and Evaluation (IHME), mortality rate.

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Burden Of Chronic Kidney Disease In Albania, 1990-2023

MARSIDA DULI[1], QAMIL DIKA[1]

Abstract: Chronic kidney disease (CKD) is a major contributor to global morbidity and mortality, with its burden shaped by demographic transitions, lifestyle factors, and health system capacity. Our objective was to assess the trends in CKD burden in the population of Albania during the period 1990-2023. This analysis utilized estimates from the Global Burden of Disease (GBD) Study, as reported by the Institute for Health Metrics and Evaluation (IHME). Crude and age-standardized CKD burden rates (expressed in Disability-Adjusted Life Years [DALYs]) in the Albanian population were obtained for the period 1990-2023. From 1990 to 2023, crude CKD burden in Albania increased from around 292 (95%CI=221-375) to 425 (95%CI=343-534) DALYs per 100,000. The total percentage crude change during the period 1990-2023 was 46% (95%CI=22%-84%). In contrast, the age-standardized CKD burden decreased from approximately 393 (95%CI=293-522) DALYs per 100,000 in 1990 to 268 (95%CI=220-330) DALYs per 100,000 in 2023. The total standardized percentage change during the period 1990-2023 was -32% (95%CI: from -42% to -11%). The observed increase in crude CKD burden alongside the decline in age-standardized rates reflects the dual impact of demographic aging and potential improvements in disease management in Albania over the past three decades. While the rising crude burden highlights the growing absolute demand on health services, the reduction in standardized rates suggests progress in prevention and treatment strategies. These findings highlight the need for sustained investment in CKD care, with particular emphasis on addressing the challenges posed by an aging population in Albania.

Keywords: Albania, burden of disease, chronic kidney disease, Disability-Adjusted Life Years (DALYs), Global Burden of Disease (GBD), Institute for Health Metrics and Evaluation (IHME).

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The Effects Of Stress On Mental Health And Well-Beıng

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Abstract: The main objective of this study is to examine the relationship between individuals' perceived stress levels and their mental well-being. The research was conducted using a correlational survey model, a quantitative research method. The study population consisted of university students, and the sample comprised volunteer participants selected using a convenient sampling method. The Perceived Stress Scale was used to determine participants' stress levels, and the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) was used to measure their mental well-being. The data were analyzed using the IBM SPSS Statistics software package; descriptive statistics, normality tests (skewness and kurtosis values), Pearson correlation analysis, and regression analysis were applied in the analyses. The research findings showed a negative and statistically significant relationship between perceived stress and mental well-being. It was determined that individuals with high stress levels had lower levels of mental well-being, and that stress negatively affects individuals' psychological, emotional, and cognitive functions. In conclusion, it was revealed that stress is a significant determinant of individuals' mental health and overall well-being. Accordingly, it has been assessed that the development and implementation of intervention programs aimed at stress management will play a critical role in improving the quality of life of individuals.

Keywords: Stress, Perceived Stress, Mental Well-being, Psychological Health.

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Examining The Relationship Between Green Exercise Behaviors And Leadership Styles In Sports Managers

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Abstract: The aim of this research is to examine the relationship between green exercise behaviors and leadership styles among sports managers. The research was conducted using a correlational survey model, a quantitative research method. The population of the study consists of sports managers working in sports clubs and institutions affiliated with the Ministry of Youth and Sports in Istanbul. The sample consists of a total of 256 sports managers, 124 of whom are women (48.4%) and 132 are men (51.6%), selected using simple random sampling. Data were collected using the Green Exercise Scale and the Leadership Styles Scale. Descriptive statistics, Pearson correlation analysis, and multiple regression analysis were applied to the obtained data using the IBM SPSS package program. The research findings show that there are positive and significant relationships between green exercise behaviors of sports managers and especially transformational leadership and democratic leadership styles ($p < .05$). The regression analysis results revealed that green exercise behaviors significantly predict leadership styles. In conclusion, it is assessed that participation in nature-based physical activities can positively influence the leadership behaviors of sports managers. Accordingly, it is recommended to encourage sustainability and nature-based activities for sports managers.

Keywords: Green exercise, leadership styles, sports managers, sustainability, sports management.

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Analysis Of The Relationship Between Mental And Physical Fatigue In Football Players

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Abstract: The aim of this study is to examine the relationship between mental and physical fatigue in football players and to determine whether this relationship differs according to gender. The population of the study consists of athletes in amateur and professional football clubs operating in Istanbul. The sample of the study consists of a total of 357 football players who participated in the study on a voluntary basis, 178 of whom are female and 179 are male athletes. Data were collected using relevant measurement tools to determine the mental and physical fatigue levels of the football players. IBM SPSS 25.0 software package was used for the analysis of the obtained data. In the analysis process, descriptive statistics (mean, standard deviation) were calculated, and Pearson correlation analysis was applied to examine the relationships between the variables. In addition, an independent samples t-test was performed to determine whether the mental and physical fatigue levels differed according to gender, and simple linear regression analysis was performed to examine the predictive effect of mental fatigue on physical fatigue. The research findings show that there is a positive and significant relationship between mental and physical fatigue in football players ($p < .05$). Comparisons based on gender revealed that female football players had higher levels of mental fatigue than male players, while physical fatigue levels showed a significant but less pronounced difference. According to regression analysis results, mental fatigue is a significant predictor of physical fatigue, and the explanatory power of the model is statistically significant. In conclusion, it can be said that mental fatigue increases physical fatigue in football players, and this relationship may differ according to gender. These findings indicate that adopting gender-sensitive approaches in training planning and controlling mental load are critical for performance.

Keywords: Mental fatigue, physical fatigue, football players, gender, performance, sports psychology

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Integrative Bioinformatic Analysis Of Molecular Links Between Connective Tissue Disorders And Neurodevelopmental Processes

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Abstract: Connective tissue disorders are a group of genetically and clinically diverse diseases resulting from disturbances in the structural and functional components of the extracellular matrix (ECM). The extracellular matrix is critical for structural support and for regulating cell adhesion and signal transduction. Therefore, alterations in the ECM may affect not only tissue integrity but also cellular communication and organization. In this context, Ehlers-Danlos syndrome (hEDS), Hypermobility Spectrum Disorder (HSD), and Marfan syndrome-classified as connective tissue disorders primarily associated with structural abnormalities-have also been suggested to exhibit potential links with neurodevelopmental conditions such as Attention Deficit and Hyperactivity Disorder (ADHD), autism, and depression. Despite this, the molecular relationships between connective tissue disorders and neurodevelopmental disorders have not been comprehensively addressed at the protein level using integrated bioinformatic approaches. This study aims to investigate the potential molecular interactions between these disease groups at the protein level. For this purpose, ECM-related genes (COL1A1, COL3A1, COL5A1, FBN1) and genes involved in neurodevelopmental processes (RELN, HSPG2) were selected. Protein sequences corresponding to these genes were retrieved from UniProt and PDB databases; multiple sequence alignment, domain organization, and three-dimensional structural analyses were performed to evaluate functional similarities among the proteins. The findings suggest that connective tissue disorders are not limited to mechanical support functions but may also be associated with critical neurological pathways, including signal transduction, cell adhesion, and neuronal organization. These results highlight the importance of addressing connective tissue disorders within a broader biological framework, integrating systemic and neurodevelopmental perspectives.

Keywords: Ehlers-Danlos syndrome, hypermobility spectrum disorder, Marfan syndrome, extracellular matrix, neurodevelopmental disorders, bioinformatics.

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Examining The Relationship Between Sleep Quality, Attention And Decision-Making In University Students

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Abstract: The aim of this study is to examine the relationship between sleep quality, attention, and decision-making skills among university students. The study was conducted using a correlational survey model, which is a quantitative research method. The sample of the study consists of 100 university students aged between 18-25 selected through simple random sampling. Data were collected using the Pittsburgh Sleep Quality Index, the Melbourne Decision Making Questionnaire, and an attention scale used to assess attention levels. The collected data were analyzed using IBM SPSS software. Descriptive statistics, Pearson correlation analysis, and regression analysis were applied. The findings indicate that as sleep quality decreases, attention levels also decrease, and individuals tend to show higher indecisiveness and greater risk-taking in decision-making processes ($p < .05$). In conclusion, sleep quality has a significant effect on both attention and decision-making processes. These findings highlight the importance of maintaining healthy sleep habits for students' academic and daily performance.

Keywords: Sleep quality, attention, decision-making, university students.

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A Review Of The Craniocervical-Mandibular System As A Functional Unit

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Abstract: Alterations in craniocervical posture have often been cited as the reason for changes in the position of the mandible. Numerous studies in global literature have elucidated this cause-effect relationship via the biomechanical link between the craniocervical system and the mandible. It is an analysis of comparable articles released in PubMed, Research Gate, Google Scholar concerning the biomechanical relationships of the craniocervical mandibular system. This evaluation encompassed clinical investigations of craniocervical alignment and jaw positioning. The craniocervical mandibular system is not viewed anymore as being made up only of the temporomandibular joints, chewing muscles, and ligaments that link the temporomandibular joint to the cervical area. There is increasing discussion suggesting that this system ought to be referred to as the tongue, mandible, and hyoid bone system. The pharyngeal constrictor and genioglossus muscles directly link the mandible and tongue. The geniohyoid and mylohyoid muscles link the mandible and hyoid bone. The hyoid bone and tongue are linked by two longitudinal muscles. The scalene, trapezius, and sternocleidomastoid muscles, upon contraction, can exert force on the jaw muscles. The biomechanical links of the craniocervical mandibular system are established via the muscles that link the mandible and tongue, the mandible and hyoid bone, the tongue and hyoid bone, along with the muscles that attach the jaw to the cervical area. Consequently, alterations in cervical posture will manifest as changes in the position of the mandible.

Keywords: craniocervical-mandibular system, temporomandibular joint, biomechanics

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Correlation Between Me-Msr Measured In P-A Cephalogram And C2-C7 Sva Spine Parameter

JOANA HANKOLLARI[1], NIKOLLAQ LEKA[2]

Abstract: A postero-anterior cephalogram is used to analyze the Menton-Mid-Sagittal Reference (Me-MSR). To determine skeletal facial asymmetry, the horizontal deviation of the menton from the mid-sagittal reference plane is a factor to consider. The purpose of this study is to determine whether there is a correlation between these two parameters. This study included 37 patients aged between 25 and 65 years. Congenital facial asymmetry or asymmetry caused by trauma, tumors, uncorrected loss of permanent teeth, or autoimmune pathologies were not included. Cervical spine trauma, pregnant women, and breastfeeding women were also excluded. P-A cephalogram is the method used to measure Me-MSR, and L-L cervical radiography is used to measure C2-C7 SVA. The standard C2-C7 SVA is defined as being less than 4 cm. A Me-MSR that is normal is characterized by a measurement of 0-3 mm. Females made up 62.16% of the cases. Normal Me-MSR was found in approximately 56.76% of cases, while normal C2-C7 SVA was found in approximately 64,86 % of cases. The correlation between these two parameters was statistically significant ($p<0.001$). Abnormal values of Me-MSR and C2-C7 SVA increase with age. To conclude, we found that Me-MSR and C2-C7 SVA spine parameters have a statistically significant correlation in our study.

Keywords: Me-MSR parameter, C2-C7 SVA parameter, P-A cephalogram, spine parameter.

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Nursing Workload And Service-Level Care Quality Indicators In An Albanian Specialized Hospital: A Retrospective Analysis Of Staffing Ratios And Admission Volumes (2023–2025)

DANIELA BIMI

Abstract: Nursing workload is a critical determinant of care quality, particularly in resource-constrained health systems. In Albania, systematic data on nursing workload at the service level are lacking, limiting the evidence base for care quality improvement. This study examines service-level nursing workload indicators and their relationship with hospitalization trends across 50 departments of a specialized Albanian hospital. A retrospective analysis of administrative hospital data (2023–2025) was conducted. Service-level nursing workload was quantified as annual hospitalizations per nurse (2025). Nurse-to-bed ratios (NBR), hospitalization volumes, and three-year growth rates were computed for 50 departments. Departments were stratified by workload intensity (low: <20; moderate: 20–35; high: >35 admissions/nurse). Spearman correlations and Kruskal-Wallis tests were applied. The mean nursing workload was 29.7 admissions per nurse in 2025 (SD=12.2; range: 6.4–59.3). Ten departments (20%) were classified as high workload (>35 admissions/nurse), concentrated in endocrinology, emergency specialties, gastrohepatology, gynecology, and chemotherapy. Total hospitalizations increased 13.9% over three years (15,421 in 2023 to 17,570 in 2025). A significant inverse relationship between NBR and workload per nurse was not confirmed ($r_s=-0.205$, $p=0.153$), but Kruskal-Wallis analysis showed significant workload differences across specialty categories ($H=18.73$, $p=0.005$). High nursing workload is concentrated in specific departments, signaling elevated risk for care quality compromise. Service-level workload monitoring should be institutionalized as a standard nursing quality indicator in Albanian hospitals. Targeted staffing interventions, workload-based nurse allocation, and enhanced monitoring in high-workload services are recommended.

Keywords: nursing workload; care quality; hospitalizations per nurse; nurse staffing; specialized hospital; Albania; patient safety; nursing indicators

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Coach Burnout In Elite Football: Examining The Statements Of Pep Guardiola And Jürgen Klopp From Mental Health And Social Psychology Perspectives

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Abstract: The purpose of this review study is to examine the public statements and turnover decisions of elite football managers, such as Pep Guardiola and Jürgen Klopp, within the framework of mental health, organizational behavior, and social psychology theories, thereby providing a theoretical perspective on the contextual gap in the literature. In the study, the chronic stress and emotional processes endured by elite coaches were analyzed within a qualitative/theoretical framework by integrating Lee and Chelladurai's Emotional Labor Model, Lazarus's Cognitive-Motivational-Relational Theory (CMRT), Schmidt and Stein's Commitment Model, and Self-Determination Theory (SDT). The analyses revealed that the dysfunctional "Surface Acting" strategy, frequently utilized by elite coaches under pressure, increases burnout over time and forces leaders into the "Genuine Expression" stage, accelerating their turnover intentions. Situational properties such as lack of information (ambiguity), time pressure (imminence), and novelty were found to shift coaches' primary appraisals from a "challenge" to a "threat and loss" perception. When the total volume of stressors reaches its peak, problem-solving and escape mechanisms become ineffective, and individuals face the paradox of being involved in sport not because they "want to be" but because they "have to be". Moving from Olusoga's (2019) criticism that only 15.6% of the coach burnout literature focuses on high-performance coaches, this study fills a crucial gap regarding chronic stress and insufficient recovery at the summit level, guiding sports managers and practitioners in building systemic support mechanisms and psychological safety zones to protect the mental health of head coaches.

Keywords: Elite Football, Coach Burnout, Emotional Labor, Cognitive Appraisal, Stress Processes.

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The Sense Of Emptiness In The Modern World: The Effect Of Leisure Boredom On Meaning In Life And New Age Belief Systems

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Abstract: The aim of this study is to examine the effect of individuals' leisure boredom on meaning in life and new age beliefs. The study was conducted in accordance with the quantitative research method. The sample of the study consisted of 330 individuals living in Yalova province. A demographic information form, the Leisure Boredom Scale, the Meaning in Life Questionnaire and The Scale of New Age Beliefs were used as data collection instruments. Independent samples t-test, Pearson correlation analysis and simple linear regression analysis were employed in the analysis of the data. According to the findings of the study, a negative and significant relationship was found between leisure boredom and meaning in life, while a positive and significant relationship was identified between leisure boredom and new age beliefs. In addition, positive relationships were determined between weekly screen time and both leisure boredom and new age beliefs. In terms of gender, female participants were found to have higher new age belief scores compared to male participants. Similarly, individuals who reported an interest in spiritual practices were found to have significantly higher levels of new age beliefs. Regression analysis results indicated that meaning in life negatively predicted leisure boredom, whereas new age beliefs positively predicted leisure boredom. As a result, it can be suggested that the leisure boredom experienced by modern individuals is not merely a temporary sense of boredom or a recreational inadequacy, but also a psychological process associated with the search for meaning in life and alternative spiritual orientations. In particular, a decrease in meaning in life appears to increase leisure boredom, while new age beliefs and spiritual tendencies are associated with this sense of emptiness. In this context, the study is expected to contribute to the literature on leisure psychology, modern spirituality and the search for meaning.

Keywords: Leisure boredom, meaning in life, new age beliefs.

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Investigation of Athletic Mental Energy Levels of Sports Science Faculty Students

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Abstract: The aim of this study is to examine the recreation activity participation of students studying at the faculty of sports sciences in terms of different variables. The working group consists of a total of 200 participants, 99 women, 101 men studying at the Faculty of Sports Sciences of Muş Alparslan University in the 2025/2026 academic year. He used the personal information form created by the researcher and the Recreational activity participation scale developed by Kılıçaslan (2024) as a data collection tool. In the evaluation of the data, T-test was used to compare quantitative continuous data between two independent groups, and one-way Anova test was used to compare quantitative continuous data between more than two independent groups. As a result, there was no significant difference in the total score and lower dimension scores of the recreation experience scale according to gender, department and class sports ($P>0.05$).

Keywords: Recreational, Activity, Recreational activity

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Climate Change And Infectious Diseases: Emerging Threats For Albania And The Mediterranean Region — Epidemiological Projections And Adaptation Imperatives

GENTİAN STRONİ

Abstract: Climate change represents one of the most consequential determinants of infectious disease emergence and redistribution in the twenty-first century. The Mediterranean basin—experiencing warming rates 20% faster than the global average—is recognized as a climate change hotspot, yet systematic assessment of climate-sensitive health threats for Albania and the broader region remains critically limited. This presentation aims to: (1) synthesize current evidence on climate–infection linkages relevant to the Mediterranean context; (2) examine Albania's specific vulnerabilities to climate-sensitive infectious diseases; (3) analyze recent epidemiological signals from Southern Europe demonstrating emerging transmission patterns; and (4) propose evidence-based adaptation strategies for the infectious disease community. Comprehensive narrative review integrating IPCC climate projections, ECDC epidemiological surveillance data, WHO health-climate frameworks, and peer-reviewed literature on vector ecology, waterborne pathogens, and zoonotic disease dynamics in Mediterranean settings. Environmental transformations are reshaping infectious disease epidemiology across three interconnected domains: vector-borne diseases (dengue, chikungunya, West Nile virus, leishmaniasis) expanding as competent vectors establish in previously unsuitable territories; waterborne and foodborne pathogens (Vibrio species, Salmonella, harmful algal blooms) proliferating under warming conditions; and zoonotic disease dynamics shifting with climate-driven habitat alterations. Albania's specific vulnerabilities include extensive coastlines susceptible to Vibrio emergence, established Aedes albopictus populations, endemic leishmaniasis with expansion potential, and water infrastructure challenges. Recent autochthonous transmission events across Southern Europe underscore threat immediacy. Addressing climate-sensitive infectious diseases requires coordinated action spanning enhanced surveillance, integrated vector management, climate-informed early warning systems, One Health infrastructure strengthening, and healthcare workforce preparedness. The Mediterranean infectious disease community must transition from reactive response to proactive adaptation—a professional imperative demanding immediate attention.

Keywords: climate change; infectious diseases; vector-borne diseases; Albania; Mediterranean; One Health; adaptation

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Bioterrorism In The Era Of Democratized Biotechnology: Recognition, Response, And The Evolving Role Of The Infectious Disease Specialist

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Abstract: Bioterrorism—the deliberate release of pathogenic agents to cause harm—remains a persistent yet underappreciated threat intersecting infectious disease, public health, and national security. The convergence of increasingly accessible biotechnologies, geopolitical instabilities, and pandemic-exposed preparedness gaps demands renewed vigilance from the infectious disease community. The 2001 anthrax attacks demonstrated that initial case detection occurs in clinical settings, positioning infectious disease specialists as critical sentinels in biodefense architecture. This presentation aims to: (1) synthesize current evidence on biological threat agents and their clinical manifestations; (2) establish recognition frameworks enabling rapid identification of deliberate biological events; (3) delineate response protocols from clinical suspicion through public health coordination; and (4) examine emerging biosecurity challenges posed by synthetic biology, gene editing technologies, and dual-use research. Comprehensive narrative review integrating CDC/WHO bioterrorism guidelines, published outbreak investigations, Laboratory Response Network protocols, and contemporary biosecurity literature. Case-based illustrations drawn from historical bioterrorism events and tabletop exercise scenarios. Category A agents (anthrax, smallpox, plague, botulism, tularemia, viral hemorrhagic fevers) are examined through clinical, epidemiological, and response dimensions. Recognition algorithms emphasizing "red flags" distinguishing deliberate release from natural outbreaks are presented. Contemporary concerns including CRISPR accessibility, de novo pathogen synthesis, and dual-use research governance are critically analyzed. Bioterrorism preparedness is not institutional paranoia but professional responsibility. The infectious disease specialist serves uniquely as sentinel, diagnostician, and coordinator linking clinical medicine with public health response. In an era of democratized biotechnology, maintaining recognition competencies and response readiness constitutes essential professional practice.

Keywords: bioterrorism; biological weapons; biosecurity; anthrax; smallpox; plague; dual-use research; public health preparedness.

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The Role Of The Dentist In The Early Diagnosis Of Orofacial Problems And Dental That Affect The Appearance Of Language Delays In Children

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Abstract: Speech is one of the oldest means of communication and is an important indicator of the psychosocial health of a human being. Speaking is a process that takes place inside the oral cavity, and any problem or abnormality in it can affect the processing and development of speech. The dentist plays an important role in the early diagnosis of orofacial, dental problems and developmental abnormalities that can affect the speech process. The purpose of our study is: determining the main orofacial problems that can affect the speaking process. Underlining the importance of the dentist in the early diagnosis of problems that appear in the oral cavity. Understanding the speech process in children. Our study is a systematic review on orofacial problems and anomalies that can affect the development of the speech process in children. We took into the study a considerable number of articles from Pub Med, Google Scholar, Research Gate and other prestigious dental journals . We sorted the information we received and determined who the problems and dental anomalies were that affect the communication process. In our study we noticed that: Communication and the formation of words is a complex process that depends on anatomical and psychosocial factors. Anatomical problems and the development of the dental apparatus play an important role in the formation of words and sentences. The main dental problems that affect the language development process of the child are; oro-palatine clefts, ankyloglossia, oral breathing, tongue dimensions, early childhood caries, orofacial muscle problems Further studies are needed to determine the relationship between orofacial problems and the production of sounds and words in children.

Keywords: dentist, communication, orofacial problems, dental anomalies, psychosocial development, anatomical factors.

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Evaluation Of Lactic Acid Bacteria As Natural Biopreservatives In A Chia Seed-Based Coating Matrix Against Foodborne Pathogens

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Abstract: The primary objective of this study was to evaluate the *in vitro* antibacterial activity of selected lactic acid bacteria (LAB) against potential foodborne pathogens. The experimental panel comprised 14 indicator strains, including six antibiotic-resistant coliform isolates. The antagonistic activity of LAB strains and their bioactive metabolites was assessed using the spot-on-the-lawn, perpendicular streak, and serial dilution methods. Following incubation, inhibition zones and minimum inhibitory concentrations (MICs) were quantified. Preliminary results revealed that several coliform isolates were multidrug-resistant (MDR) with pronounced resistance to β-lactam, tetracycline, sulfonamide, aminoglycoside, and fluoroquinolone antibiotics. Regarding the antibacterial efficacy of LAB, five strains inhibited the growth of the majority of the target bacteria. Notably, *Lactococcus lactis* subsp. *lactis* NCAIM B.01631 and *Lactiplantibacillus pentosus* NCAIM B.01727 exhibited broad-spectrum antimicrobial activity, inhibiting the growth of all 14 tested pathogens. When incorporated into a chia seed-based biopolymer matrix, these LAB strains maintained strong antibacterial activity, while their cell-free bioactive metabolites effectively suppressed pathogen growth. Overall, the selected LAB strains and their derivatives demonstrated potential as natural biopreservatives for incorporation into biopolymer-based coating materials, offering a promising strategy for controlling MDR pathogens in food systems.

Keywords: Lactic acid bacteria; multidrug-resistant pathogens; antimicrobial biopolymer coatings; food biopreservation.

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Missed Nursing Care In Hospital Clinical Practice: Influencing Factors And Management Strategies

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Abstract: Missed nursing care represents a global problem in the healthcare system, characterized by the omission or delay of nursing interventions. This phenomenon negatively affects the quality of care and patient safety by increasing the risk of complications, length of hospital stay, and mortality rates. International studies indicate that this phenomenon is highly prevalent, ranging from 6.8% to 98.1%. The aim of this study was to identify missed nursing care, assess the factors influencing nursing practice, and evaluate management methods for its reduction. A cross-sectional study was conducted, involving 85 nurses providing services in a hospital setting. Data were collected through a structured online questionnaire, which included socio-demographic characteristics, the frequency of missed nursing care, influencing factors, and perceptions regarding measures that could reduce it.The results showed that the most frequently missed nursing care activities were oral and basic hygiene care (42.4%), patient and family education (43.5%), patient mobilization (38.8%), and communication with the multidisciplinary team (37.6%). Approximately 43.5% of nurses reported that missed nursing care is not adequately reported. The influencing factors identified were nursing staff shortages (41.2%), lack of materials and equipment (38.8%), high workload (29.4%), and occupational stress (30.6%). Regarding strategies, increasing nursing staff and improving work organization were reported with the same frequency (36.5%), while appropriate professional training (35.3%) and reducing administrative documentation (14.1%) were considered important measures for reducing this phenomenon.In conclusion, missed nursing care remains a challenge in hospital clinical practice, affecting the quality of nursing care and requiring appropriate organizationalinterventions to reduce its occurrence.

Keywords: missed nursing care, risk factors, management, patient safety.

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The Effects Of Aromatherapy On Sleep Physiology: A Review Of Neurobiological Mechanisms And Clinical Evidence

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Abstract: Sleep disorders are prevalent in the general population, and the side effects and potential for dependence associated with conventional treatments have increased interest in complementary approaches. The objective of this review is to evaluate the effects of aromatherapy on sleep quality in light of neurobiological mechanisms and current clinical evidence. The PubMed, Web of Science, and Cochrane databases were searched using the keywords “aromatherapy,” “essential oils,” “sleep,” and “insomnia”; randomized controlled trials, systematic reviews, and meta-analyses were included. Lavender (*Lavandula angustifolia*), chamomile, bergamot, and *Rosa damascena* are the most frequently studied essential oils. At the mechanistic level; it has been shown that essential oils enhance GABAergic transmission by modulating the limbic system (amygdala, hypothalamus, prefrontal cortex) via the olfactory system; they reduce serum cortisol levels; suppress sympathetic activity while increasing parasympathetic tone; and decrease inflammatory cytokines (IL-1β, IL-6, TNF-α). Clinical meta-analyses report that lavender inhalation results in a significant improvement in Pittsburgh Sleep Quality Index (PSQI) scores (SMD = -0.56, 95% CI [-0.96, -0.17]), shortens sleep latency, and increases total sleep time. Similar positive effects have been observed in specific populations (the elderly, postmenopausal women, pregnant women, and women in the postpartum period), and the side effect profile is quite low. Aromatherapy, particularly with lavender, is a non-invasive, safe, and well-tolerated complementary method that improves sleep quality. However, the high heterogeneity among studies (different essential oil chemotypes, doses, and application durations) highlights the need for standardization. Future research should focus on clarifying molecular targets, establishing long-term safety data, and developing personalized aromatherapy protocols.

Keywords: Aromatherapy, essential oil, sleep, insomnia, GABA, cortisol, meta-analysis

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The Role Of Cxcr2-Mediated Neutrophil Recruitment In The Pathogenesis Of Ulcerative Colitis

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Abstract: Ulcerative colitis (UC) is a chronic inflammatory disorder characterized by dense leukocyte infiltration and mucosal tissue destruction. Within its pathogenesis, the uncontrolled recruitment and migration of neutrophils into the colonic mucosa play a fundamental role in both the triggering and perpetuation of inflammation. Current research has demonstrated that the CXCR2 receptor is significantly overexpressed in the inflamed intestinal tissues and peripheral blood neutrophils of patients with active UC. The expression levels of this receptor exhibit a strong positive correlation with clinical disease activity indices, such as the Mayo Index and the Ulcerative Colitis Endoscopic Index of Severity (UCEIS). Bioinformatic analyses have identified CXCR2 as a pivotal "hub" gene governing the progression of the disease. CXCR2 serves as a primary mediator regulating the migration, activation, and vascular adhesion of neutrophils to inflammatory sites, specifically through its interaction with ligands such as CXCL1, CXCL2, and CXCL8. Analyses conducted in animal models have confirmed that CXCR2 is the most specifically upregulated receptor during the acute phase of inflammation, showing up to a 33-fold increase compared to all other CXC receptors. The suppression of the CXCR2 signaling pathway not only impairs neutrophil migration but also significantly ameliorates mucosal inflammation by reducing the production of reactive oxygen species (ROS), myeloperoxidase (MPO) activity, and pro-inflammatory cytokines such as TNF-α, IL-1β, and IL-6. Consequently, the CXCR2-ligand axis represents a strategic and promising therapeutic target for managing neutrophil infiltration and preventing tissue damage in the treatment of UC.

Keywords: CXCR2, neutrophil recruitment, ulcerative colitis, mucosal inflammation.

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Recreational participation or health perception? A study on the determinants of social network level

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Abstract: This study examined the relative contributions of perceived health outcomes and recreational participation to individuals' social network levels. A cross-sectional survey design was employed with a sample of 219 participants. Data were collected using the Turkish versions of the Perceived Health Outcomes of Recreation Scale (PHORS; Yerlisu Lapa et al., 2020) and the Lubben Social Network Scale-Revised (LSNS-R; Kuru Alici & Kalanlar, 2020). Correlation analysis revealed a positive and statistically significant relationship between perceived health outcomes and social network level ($r = .202$, $p < .01$), whereas recreational participation was not significantly associated with social networks. Multiple regression analysis demonstrated that the overall model was significant ($F(2, 212) = 4.64$, $p < .05$, $R^2 = .042$), with perceived health outcomes emerging as the sole significant predictor of social network level ($\beta = .206$, $p = .004$). In a subsequent model controlling for demographic variables, perceived health outcomes remained a significant predictor ($\beta = .163$, $p = .008$), while income level showed a marginal contribution. Post-hoc power analysis indicated that the study achieved adequate statistical power ($1 - \beta = .786$). Overall, the findings suggest that social network levels are more strongly related to the perceived health benefits derived from recreational activities than to participation frequency itself. These results highlight the importance of designing recreation programs and policies that not only promote participation but also enhance the quality of recreational experiences capable of generating meaningful health outcomes.

Keywords: Social Network, Perceived HealthOutcomes, Recreational Participation, Leisure, Regression Analysis

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Gender Role Attitudes, Leisure Constraints, and Leisure Satisfaction among Women

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Abstract: Women's access to leisure and recreational opportunities is shaped not only by individual preferences but also by gender-related social expectations, responsibilities, and access to resources. This study examined the relationships between women's gender role attitudes, perceived leisure constraints, and leisure satisfaction, with particular attention to the mediating role of leisure constraints. A correlational survey design was employed with a sample of 277 women. Data were collected using the Gender Role Attitude Scale, the Leisure Constraints Scale, and the short form of the Leisure Satisfaction Scale. Descriptive statistics, Cronbach's alpha coefficients, independent-samples t-tests, one-way analysis of variance (ANOVA), Pearson correlation analysis, multiple linear regression, and bootstrap-based mediation analysis with 5,000 resamples were performed. The findings showed that more egalitarian gender role attitudes were significantly associated with lower perceived leisure constraints ($\beta = -.23$, $p < .001$) and higher leisure satisfaction ($\beta = .13$, $p = .007$). Gender role attitudes were negatively correlated with leisure constraints ($r = -.21$, $p < .001$) and positively correlated with leisure satisfaction ($r = .16$, $p < .01$). Contrary to the expected direction, leisure constraints were positively associated with leisure satisfaction ($r = .21$, $p < .001$). Mediation analysis further revealed a positive direct effect of egalitarian gender role attitudes on leisure satisfaction ($c' = .17$, $p < .001$) alongside a significant negative indirect effect through leisure constraints ($ab = -.04$, 95% CI [−.09, −.01]), indicating an inconsistent mediation, or suppression, pattern. Employment status and income level also significantly differentiated both perceived constraints and leisure satisfaction. These findings highlight the complex role of gender-related attitudes in women's leisure experiences. Promoting egalitarian gender norms and developing accessible, inclusive recreational opportunities that address time, economic, and social constraints may contribute to improving women's participation in leisure and their satisfaction with recreational experiences.

Keywords: gender role attitudes, leisure constraints, leisure satisfaction, recreation, women.

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The Olfactory System, Nasal Pathogen Entry, And Chronic Neuroinflammation In Alzheimer's Disease: A Review

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Abstract: Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by amyloid-β accumulation, tau pathology, synaptic dysfunction, and neuroinflammation. In recent years, the olfactory system has attracted increasing attention because it is one of the early affected structures in AD and represents an anatomical interface between the external environment and the central nervous system. This review aims to evaluate the potential role of the olfactory system in AD pathogenesis, with particular emphasis on nasal infections, chronic sinonasal inflammation, pathogen entry through olfactory and trigeminal pathways, and neuroinflammation. This study was designed as a literature review based on current experimental, clinical, and review articles investigating the relationship between the olfactory system, Alzheimer's disease, neuroinflammation, chronic rhinosinusitis, nasal pathogen entry, and *Chlamydia pneumoniae*. Olfactory dysfunction has been reported as one of the early functional alterations across the AD spectrum. Structures such as the olfactory bulb, olfactory tract, piriform cortex, amygdala, and entorhinal cortex are closely associated with both olfactory processing and memory functions, making them relevant to AD pathology. Recent studies suggest that impaired odor identification may be associated particularly with tau accumulation in olfactory-related brain circuits. Moreover, because the olfactory epithelium is directly exposed to the external environment, it has been proposed that pathogens may reach the central nervous system through olfactory and trigeminal nerves. In an experimental mouse study, intranasal inoculation with *Chlamydia pneumoniae* resulted in the detection of the bacterium in the olfactory and trigeminal nerves, olfactory bulb, and brain; amyloid-β deposits were also observed near infected regions. These findings support the hypothesis that nasal mucosal damage or chronic inflammation may facilitate pathogen entry and contribute to microglial activation, cytokine release, and chronic neuroinflammation, thereby potentially accelerating AD-related pathology. However, there is currently no conclusive clinical evidence demonstrating that nose picking, untreated nasal infections, or chronic rhinosinusitis directly cause AD in humans. The olfactory system may be considered both an early affected structure in AD and a potential route through which pathogens can access the central nervous system. Current literature suggests that nasal infections and chronic sinonasal inflammation may contribute to AD pathogenesis through neuroinflammatory mechanisms. Nevertheless, the existing evidence supports this relationship mainly as a possible risk-enhancing or disease-accelerating mechanism rather than a direct causal pathway. Further longitudinal human studies, biomarker-based clinical investigations, and mechanistic experimental research are needed to clarify this association.

Keywords: Alzheimer's disease; olfactory system; neuroinflammation; chronic rhinosinusitis; nasal infection; Chlamydia pneumoniae.

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Social Media As A Source Of Dental Health Information: Perceived Credibility, Trend Exposure, And Aesthetic Expectations — A Cross-Sectional Survey In Albania

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Abstract: The proliferation of social media has fundamentally altered how individuals seek and consume health-related information, including oral health guidance. Despite growing global concern regarding the quality and accuracy of dental content circulating online, empirical evidence from Southeastern European populations remains limited. This study aimed to evaluate the frequency and patterns of social media use as a source of dental health information, the perceived credibility of such information, exposure to potentially harmful dental trends, and the influence of social media on patients' aesthetic expectations in Albania. A cross-sectional survey using a structured 13-item questionnaire was conducted among 153 participants in Albania in May 2026. The sample included members of the general public (60.8%), dental professionals (15.0%), healthcare professionals in technical-medical fields (18.3%), and dental students (5.9%). Descriptive statistics and cross-tabulations by professional group were performed. Results showed that 96.7% of participants used social media daily or multiple times per day. Instagram was the primary platform for dental information (48.4%), followed by TikTok (20.3%) and YouTube (15.0%). Overall, 69.3% had actively searched for dental information online; however, perceived credibility was moderate (M = 2.71/5). Additionally, 64.7% reported exposure to inaccurate or potentially harmful dental content. The most commonly observed trends included home tooth whitening (54.2%), veneers without professional indication (28.1%), and charcoal toothpaste (20.9%). Furthermore, 61.4% believed that social media significantly influences patients' aesthetic expectations, while 94.1% supported a stronger professional presence of dentists on social media platforms. These findings suggest that social media represents a major yet insufficiently regulated source of oral health information in Albania. The widespread exposure to DIY dental trends, combined with only moderate perceived credibility, highlights the need for evidence-based professional engagement on digital platforms to counter misinformation and align patient expectations with clinical standards.

Keywords: social media; oral health; dental misinformation; dental trends; aesthetic expectations; Albania

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Public issues of Health Sector in Albania

ENIS URUCI, EMIRJETA KUNIQI, MIGENA PRIFTI

ABSTRACT
In respect of actual healthcare situation in Albania, mostly referring to the low level of healthcare services as well as to broad issues pertaining to the public health sector, we have obtained a specific topic not yet delivered from the Albanian researchers of the field, aiming that we can modestly help in the clarification of the situation as it has been often camouflaged in the needs of political powers. According to the researches made on this topic it seems to be the actual healthcare trend of developments in Europe and not only… Due to the latest context we believe that in order to bring a fair approach in the Albanian situation the integration of medical and economic sciences is a must. Thus, the paper considers evidences regarding the legal framework from the healthcare sector in Albania and compares them with the respective demand and legal framework in European Community aiming as a final goal the exploration of opportunities which can bring a better perspective in the country. For the previously mentioned reasons we have interviewed specialists of the field such as: well known doctors, experienced administrators in public hospitals and ordinary staff as they face every day different issues.

- ✓ On behalf of the research made the paper concludes:
- ✓ On policies and strategies needed to improve the services in the healthcare public sector;
- ✓ On the expansion of the financial resource base and increase funding for public health;

On strengthening the managerial capacity of healthcare institutions through the implementation of contemporary models .

Keywords: Albanian Health Care; hospitals; health management in Albania, health sector,private institutions.

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INTRODUCTION

We are convinced that the topic we have chosen carries a wide and very interesting problem in the field of health services in Albania. It is part of the trend of contemporary developments in Europe and beyond. We also think that in the chosen topic, medical sciences will be optimally harmonized with economic sciences, making a contribution,we hope original, in the field of health management in Albania.

SOME PROBLEMS OF FINANCING THE HEALTH SECTOR IN ALBANIA.
Another important objective of the study, which is the result of the identification of the problems of the functioning of the health sector in Albania, is the assessment of the financing situation of this sector and the provision of some modest recommendations on the expansion of the base of financial resources as well as the increase of public funds for Health.

*Strengthening the managerial capacities of health institutions through the creation of contemporary models of health management.
The good functioning of health institutions and the provision of a quality service to patients is closely related to the way these institutions are managed.
The proper selection of managers, based on their managerial skills and not on their party affiliation or technical skills in the field of medicine, is an important condition to guarantee a good performance on their part, and therefore health institutions that act in accordance with the appropriate standards and serve the population best.

METHODOLOGY OF THE WORK.

According to contemporary authors, the methods used in the field of research are quantitative, qualitative and mixed. In our study,we relied on mixed methods, which we consider as a combination of quantitative and qualitative methods. We rely on the collection and processing of quantitative data, without which it is difficult to accurately reflect the reality, in our case the state of the health market in Albania. In this case, statistical analyzes and results increase the possibility to get to know the situation better and to reach accurate conclusions.

On the other hand, the use of qualitative methods has helped us to analyze the psychological and spiritual factors that have a significant impact on the current state of the health system in the country.

We have also reflected the impact of competition in Health, public and private factors, the impact of politics on health, the economic level of the people, the high level of corruption in this sector, etc. We have also classified influencing factors into internal and external factors.

SOME PROBLEMS IN HEALTH SERVICE MANAGEMENT.

Considering the problem of health management in the country as a whole, we have tried to highlight the problems of this sector, which we will briefly present and comment on below:

- First, we can say that since the organizational structures of the hospital have not been clearly planned, the placement of health profile managers in the management of these institutions.
- Placing in the organizational structure, in the direction of the health service instead of health management specialists, would significantly inhibit the arrival of professional doctors in the direction of the work due to the fact that they have insufficient knowledge in the field of health management.
- Secondly, we must fight with a common political will so that in the direction of Albanian health, people with deep knowledge, in the field of management and not party militants, come.
- Thirdly, the design of interdepartmental programs to create all training opportunities for new health service managers from Albanian universities.
- Fourth, to grant special scholarships for elite students to be sent to Western Universities, to be scientifically trained in the field of modern management.

THE MANAGEMENT OF THE HEALTH SYSTEM IS NOT BUILT IN ACCORDANCE WITH THE NEEDS OF THE HEALTH SERVICE IN THE COUNTRY.

During the contacts with different citizens, with professional doctors and managers of hospitals, and others; from the numerous information collected in five districts of Albania, the argument prevails in many cases that the management and good administration of the health service is decisive in the quality of services to the people. In summary, we have selected some of the main causes of the condition.

- The following factors have influenced the current situation:
- The lack of real managers, prepared for the administration and management of work in the hospital service.
- Shortages in the supply of the necessary material base, and especially the supply of materials for daily needs and medicines, is still far from the required standards. From the tests carried out and media investigations, materials and medicines have been found to be expired or on the verge of expiry. In many cases, supplies are made by preferential firms, close to the current heads of institutions, with close ties to politics.
- In many cases, party militants with deficient professional and cultural training are placed in the direction of work from the wards or departments to the top of the hospital service pyramid.
- In other cases, in the management of health service affairs, professionals are appointed who, under these conditions, are left without performing their professional duties towards patients and at the same time, do not manage the management problems at a level for the simple reason that they do not are specialists in this field.

RECOMMENDATIONS REGARDING THE IMPROVEMENT OF MANAGERIAL STRUCTURES IN THE HEALTH SYSTEM.

- The profession of health manager will be created through these ways:
- Stimulation and absorption of professionals trained abroad in management positions who currently work outside the state health system .
- . Increasing the number of personnel trained abroad with binding contracts to return and serve in the country.
- Preparation of managers from the School of Public Health and Health Management, which will be created in the country.
- . The managerial capacities of primary health care doctors will be strengthened. Primary care professionals must learn the basic notions of managing people, finances and services.
- For this purpose, training courses with micro-management techniques of primary care services will be built and institutionalized, to respond to the concrete needs of these services in Albania. The training courses will be implemented, first in the region of Tirana, where the World Bank project is providing assistance in this direction. Afterwards, it will be institutionalized with the aim of offering it continuously throughout the country.
- b. The managerial capacities of health leaders at different levels will be strengthened, such as Regional health authorities, leaders at the district or county level, national health institutions, etc.
- Hospital management capacities will be strengthened through these measures:

- Elaboration of a new model of the "autonomous hospital" within the year 2005.
- This model will be elaborated and implemented first in the regional hospital of Durres, furthering the started initiative. The mechanisms of hospital autonomy will also be elaborated to be implemented in the University Hospital Center of Tirana.
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- Elaboration of a "new model of hospital management", suitable for the conditions of hospitals in Albania. This model will include:
- • Balanced organizational structure with 2 poles, medical and managerial. The medical director and his staff will solve the technical problems while the manager and his staff will manage the financial and material resources.
- • Functional decentralization within the hospital, where each service has autonomy in the management of all resources (also financial).
-
- • Establishment of simultaneous clinical and financial information systems as necessary requirements for effective management.
- • Collective decision-making by making hospital management boards functional and responsible.
- The School of Public Health and Health Management will be established, which will enable the continuous education of new staff in the fields of health services management.

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Educational Gaps in Palliative-Care Knowledge Among Albanian Health-Sciences Respondents

INDRIT BIMI[1]

Abstract:

Background: Palliative care is increasingly recognized as an essential component of person-centred health services, but educational exposure among health-sciences trainees and early-career professionals remains uneven. This short conference paper summarizes palliative-care knowledge and identifies priority learning gaps among health-sciences students and health-care workers in Albania.

Methods: A cross-sectional survey was conducted from 27 January to 1 April 2026 among 317 respondents. Knowledge was assessed using an adapted Albanian version of the Palliative Care Knowledge Questionnaire-Basic. Nineteen dichotomously scored items covered caregiver self-care, indications and timing of palliative care, pain management, prognosis communication, resuscitation and DNAR/DNR decision-making, psychosocial-spiritual care and bereavement care. Adequate knowledge was defined as at least 15 correct responses out of 19.

Results: The mean knowledge score was 11.4+/-3.5 out of 19, and 43 respondents (13.6%) reached the adequate-knowledge threshold. Internal consistency was acceptable (Cronbach alpha=0.73). Knowledge was strongest for recognizing palliative care in advanced cancer, caregiver self-care and clear prognosis communication. The weakest areas were pain management, resuscitation/DNAR decision-making and psychosocial-spiritual care. Adjusted logistic regression did not identify statistically significant independent predictors of adequate knowledge.

Conclusion: Palliative-care knowledge was incomplete, with gaps concentrated in clinically actionable domains. Structured undergraduate and early professional teaching should prioritize case-based pain management, goals-of-care communication, ethical decision-making and holistic assessment.

Keywords: palliative care; knowledge; health-sciences education; nurses; Albania

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INTRODUCTION

Palliative care aims to improve the quality of life of patients and families facing serious or life-threatening illness through early identification, assessment and treatment of pain and other physical, psychosocial and spiritual problems [1,2]. Its role is not restricted to the final days of life; contemporary models emphasize early integration alongside disease-directed care when serious health-related suffering, functional decline or complex family needs are present [1,3].

Education is a central component of palliative-care development. Undergraduate students, nurses, midwives and early-career health-care workers often represent the first point of contact for patients with uncontrolled symptoms, family distress or end-of-life uncertainty. Their knowledge influences symptom recognition, referral decisions, communication with families and the quality of basic supportive care [4,5]. International evidence shows that palliative-care teaching is often fragmented and that learners may hold misconceptions about opioid use, pain assessment, timing of palliative-care referral, resuscitation decisions and psychosocial-spiritual responsibilities [6-8].

In Albania, published data on palliative-care knowledge among health-sciences students and front-line health-care workers are limited. Local assessment is necessary to identify educational priorities and support feasible curriculum development. This short conference paper therefore summarizes the main knowledge findings from a cross-sectional survey of Albanian health-sciences respondents, with emphasis on domains that require targeted educational reinforcement.

METHODS

A cross-sectional observational survey was conducted from 27 January to 1 April 2026. The study included health-sciences students and health-care workers in Albania, including nursing students, nurses, midwives and staff working in clinical settings. The final analytic dataset contained 317 completed responses. Because formal enrolment or staff denominators were unavailable, a response rate was not calculated.

Palliative-care knowledge was assessed using an adapted Albanian version of the Palliative Care Knowledge Questionnaire-Basic, a previously developed and validated instrument for assessing basic palliative-care knowledge [9]. The questionnaire was translated into Albanian, reviewed for clarity and contextual relevance, and pilot-tested among 10 health-sciences students before the main data collection. The final version contained 19 knowledge items. Correct responses were scored as 1, while incorrect and "do not know" responses were scored as 0. Total scores ranged from 0 to 19. Adequate knowledge was defined a priori as at least 15 correct answers, corresponding to 75% or higher.

Categorical variables were summarized as frequencies and percentages using valid denominators. Continuous scores were summarized as mean+/-standard deviation and median with interquartile range. Internal consistency was assessed using Cronbach alpha for the dichotomously scored items. Bivariate and adjusted logistic regression analyses were used descriptively to explore factors associated with adequate knowledge. Statistical interpretation was conservative because of the cross-sectional design and the limited number of adequate-knowledge events.

RESULTS

The study included 317 respondents. Age was available for 304 respondents; the mean age was 24.9+/-9.6 years and the median age was 22 years. Most respondents were female. Prior palliative-care training was reported by 64 respondents (20.2%), while most respondents reported no such training. Almost half did not know whether a palliative-care physician was available at their institution, indicating a potential visibility gap in service organization and referral pathways.

The mean total knowledge score was 11.4+/-3.5 out of 19, with a median of 11. Adequate knowledge was observed in 43 respondents (13.6%). The internal consistency of the adapted knowledge items was acceptable, with Cronbach alpha=0.73. Knowledge was strongest for recognizing palliative care as relevant to advanced cancer, the importance of caregiver self-care and the need for clear prognosis communication. In contrast, lower correctness was observed for cancer pain pharmacology, placebo use, the role of non-opioid analgesics alongside morphine, automatic resuscitation in advanced metastatic cancer and DNAR/DNR shared decision-making.

Table 1. Main sample characteristics and palliative-care knowledge outcomes

Indicator	Result
Respondents, n	317
Age, mean+/-SD; median (IQR)	24.9+/-9.6; 22 (21-23)
Female sex, n (%)	279 (88.6)
Prior palliative-care training, n (%)	64 (20.2)
Total knowledge score, mean+/-SD; median (IQR)	11.4+/-3.5; 11 (9-13)
Adequate knowledge (>=15/19), n (%)	43 (13.6)
Internal consistency	Cronbach alpha=0.73
Highest-performing domains	Caregiver self-care (83.0%); bereavement care (73.8%); prognosis communication (72.7%)
Lowest-performing domains	Resuscitation/DNAR (37.1%); pain management (46.2%); psychosocial-spiritual care (57.4%)
Adjusted associations	No covariate showed a statistically significant independent association with adequate knowledge

Note: Percentages were calculated using valid denominators. DNAR/DNR=do not attempt resuscitation/do not resuscitate; IQR=interquartile range; SD=standard deviation.

In adjusted logistic regression, none of the examined covariates showed a statistically significant independent association with adequate knowledge. Master-level education showed higher adjusted odds of adequate knowledge, but the estimate was imprecise. Prior palliative-care training was not independently associated with adequate knowledge after adjustment, which

may reflect variability in the content, duration and recency of reported training activities rather than absence of educational value.

DISCUSSION

This short conference paper identifies partial but insufficient palliative-care knowledge among Albanian health-sciences respondents. The overall score suggests that many respondents understood broad concepts of palliative care, but fewer demonstrated consistent knowledge across clinical, ethical and psychosocial domains. This pattern is educationally important because it distinguishes general awareness from practical readiness.

The weakest area was pain management. Although most respondents recognized pain as clinically important, fewer answered correctly on analgesic pharmacology, placebo use and the continued role of non-opioid analgesics when morphine is used. These misconceptions are clinically relevant because inadequate pain knowledge may contribute to undertreatment, delayed symptom relief and avoidable suffering. Training should therefore include applied pain-assessment cases, opioid and non-opioid pharmacology, adjuvant therapy and patient-centred communication about fears related to opioids [3,10].

Substantial gaps were also observed in resuscitation and DNAR/DNR decision-making. End-of-life decisions require ethical reasoning, proportionality of interventions, respect for patient values and communication with families. The findings support simulation-based teaching on goals-of-care discussions, DNAR/DNR decisions and interprofessional collaboration. Psychosocial-spiritual care also requires reinforcement, because palliative care is multidimensional rather than limited to physical symptom control [1,4,5].

The practical implication is that palliative-care teaching should move beyond isolated lectures. A feasible conference-level recommendation is the introduction of a compact competency-based module that includes early integration of palliative care, case-based pain management, communication simulation, DNAR/DNR ethics and routine assessment of psychosocial, spiritual and bereavement needs.

CONCLUSION

Palliative-care knowledge among surveyed health-sciences students and health-care workers in Albania was incomplete, with the most relevant gaps in pain management, resuscitation/DNAR decision-making and psychosocial-spiritual care. Competency-based education using clinical cases and simulation is warranted to strengthen practical readiness for generalist palliative-care responsibilities.

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Quality Of Nursing Education In Kosovo: A Student Perspective On Infrastructure, Faculty, And Clinical Training

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Abstract: Improving the quality of nursing education is a priority for health workforce development in Kosovo. This study examined nursing students' perceptions of educational quality across domains including faculty availability, infrastructure, teaching and learning materials, and clinical training readiness. A comprehensive structured questionnaire was administered to 30 female BSc nursing students across Years I–III at Rezonanca University College. Findings revealed adequate faculty availability but significant deficiencies in clinical equipment, learning materials, and infrastructure, particularly internet connectivity and simulation resources. Only 50% of students reported feeling clinically confident upon hypothetical graduation. These results point to systemic gaps requiring targeted investment and policy attention.

Keywords: nursing education quality, Kosovo, clinical training, health workforce, educational infrastructure

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1. INTRODUCTION

The quality of nursing education is a critical determinant of healthcare system performance. Nurses trained in well-resourced, evidence-based programs demonstrate better patient outcomes and greater professional confidence (1). The global nursing workforce shortage—estimated at 5.9 million globally, concentrated in low- and middle-income countries—makes the quality of pre-service training ever more consequential (2).

In Kosovo, nursing education is provided through public and private institutions, yet systematic assessments of educational quality from the student perspective remain limited. With Kosovo's health system undergoing post-conflict reconstruction and European integration, addressing training quality is urgent. The present study used comprehensive student survey data to evaluate perceived quality of nursing education across faculty, infrastructure, materials, and clinical practice dimensions.

2. MATERIAL AND METHOD

A cross-sectional descriptive survey was administered in March 2026 to 30 BSc nursing students at Rezonanca University College, Kosovo. The questionnaire comprised over 180 items assessing: (1) faculty sufficiency and teaching disposition, (2) infrastructure condition across 14 facility types (rated: Good / Needs Improvement / Not Available), (3) availability and quality of 19 categories of learning materials (rated: Sufficient / Insufficient / Unknown), (4) learning and assessment approaches, (5) clinical placement quality, and (6) self-reported clinical readiness. The all-female sample was enrolled in Years I–III. Descriptive analysis used frequency distributions. Ethical approval was obtained prior to data collection.

3. RESULTS

Table 1 presents the sample's demographic profile. All 30 participants were female, enrolled predominantly in Year III (43.3%) and Year I (40.0%).

Table 1 Participant Demographic Characteristics (N = 30)

Characteristic	Category	n	%
Gender	Female	30	100.0
Program	BSc Nursing	29	96.7
	Not reported	1	3.3
Study Year	Year I	12	40.0
	Year II	4	13.3
	Year III	13	43.3
	Not reported	1	3.3

Note. All participants were enrolled in the BSc Nursing program at Rezonanca University College. The sample was entirely female.

Table 2 presents student ratings of infrastructure across ten facility types. Internet connectivity received the worst ratings, with only 10.0% rating it as in good condition and 56.7% identifying it as needing improvement. Skills laboratories (53.3%), libraries (50.0%), and lecture halls (46.7%) were similarly rated as needing improvement by approximately half of respondents. Clinical health facilities and transport to clinical sites received somewhat more favorable ratings.

Table 2 Student Ratings of School Infrastructure Condition (N = 30)

Facility Type	**Good Condition n (%)**	**Needs Improvement n (%)**	**Not Available n (%)**
Lecture halls	9 (30.0)	14 (46.7)	5 (16.7)
Skills labs / demo rooms	7 (23.3)	16 (53.3)	5 (16.7)
Libraries	8 (26.7)	15 (50.0)	4 (13.3)
Computer labs	10 (33.3)	14 (46.7)	4 (13.3)
Clinical labs	8 (26.7)	13 (43.3)	5 (16.7)
Internet connectivity	3 (10.0)	17 (56.7)	6 (20.0)
Student study/meeting rooms	6 (20.0)	11 (36.7)	9 (30.0)
Student dormitories	2 (6.7)	11 (36.7)	9 (30.0)
Transport to clinical sites	12 (40.0)	8 (26.7)	5 (16.7)
Clinical health facilities	12 (40.0)	10 (33.3)	7 (23.3)

Note. Percentages exclude 'No opinion' responses (2–8 per facility type). 'Not Available' indicates facility does not exist or is inaccessible.

Table 3 presents student assessments of learning material availability across 12 categories. Computers (63.3%) and projectors (60.0%) were the most consistently reported as sufficient. In contrast, simulators (43.3%), technical journals (46.7%), and stethoscopes (43.3%) were most frequently rated as insufficient.

Table 3 Availability of Learning Materials and Clinical Equipment (N = 30)

Learning Material / Equipment	**Sufficient n (%)**	**Insufficient n (%)**	**Don't Know n (%)**
Updated textbooks	12 (40.0)	12 (40.0)	6 (20.0)
Updated technical journals	4 (13.3)	14 (46.7)	12 (40.0)
Computers	19 (63.3)	10 (33.3)	1 (3.3)
Projectors	18 (60.0)	10 (33.3)	2 (6.7)
Skills lab materials	13 (43.3)	12 (40.0)	5 (16.7)
Anatomical models	13 (43.3)	10 (33.3)	7 (23.3)
Simulators	7 (23.3)	13 (43.3)	10 (33.3)
Diagnostic equipment	8 (26.7)	12 (40.0)	10 (33.3)
Sphygmomanometers	8 (26.7)	12 (40.0)	10 (33.3)
Stethoscopes	8 (26.7)	13 (43.3)	9 (30.0)
Gloves	12 (40.0)	11 (36.7)	7 (23.3)
Syringes, needles and catheters	12 (40.0)	10 (33.3)	8 (26.7)

Note. 'Don't Know' responses reflect uncertainty rather than absence. Percentages may not total 100% due to missing values.

Table 4 presents students' self-reported clinical readiness. Only half (50.0%) of respondents felt confident in their clinical care ability upon hypothetical graduation. A third (33.3%) reported uncertainty.

Table 4 Self-Reported Clinical Readiness Upon Hypothetical Graduation (N = 30)

Clinical Readiness Self-Assessment	**n**	**%**
Yes – feel confident providing clinical care	15	50.0
No – do not feel confident	3	10.0
Don't know	10	33.3
Not reported	2	6.7

Note. Question: 'If you graduated today, would you feel confident in your ability to provide quality clinical care to patients?' Two respondents did not reply.

4. DISCUSSION AND CONCLUSIONS

The reported shortages in clinical supplies and simulation equipment align with documented resource constraints in health education institutions across low- and middle-income countries and post-conflict settings (2; 3). The finding that only 50% of students feel clinically ready upon graduation is particularly concerning and likely reflects cumulative deficiencies in hands-on training opportunities. Internet infrastructure—a critical resource for modern evidence-based practice—was rated in good condition by only 10% of students, signaling a serious digital access gap.

The relatively positive ratings for computers and projectors suggest that basic classroom technology is available, yet simulation-based resources crucial for clinical skill development (simulators: 23.3% sufficient) remain severely underprovided. This is inconsistent with European standards for nursing education as outlined in Directive 2013/55/EU, which mandates minimum practical training hours with appropriate supervision and equipment (4). Investments in simulation laboratories, standardized clinical equipment, and structured clinical mentorship are essential for compliance and graduate competence.

Nursing students in Kosovo perceive significant deficiencies in infrastructure and clinical learning resources, despite adequate faculty presence. Clinical readiness upon graduation remains a concern for half the student body. Policymakers, institutional leaders, and international partners should prioritize investment in clinical simulation, digital infrastructure, equipment provisioning, and structured mentorship programs to align nursing education standards with European benchmarks and strengthen Kosovo's health workforce pipeline.

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Ethics Committee Approval
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Conflict of Interest
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Smoking Patterns, Social Exposure And Cessation Readiness Among University Students In Durrës, Albania

INDRIT BIMI[1]

Abstract: Tobacco use remains a major preventable public-health problem, and university students represent a key group for identifying modifiable patterns of smoking initiation, social exposure and cessation readiness. Objective: To describe smoking initiation, current smoking behaviour, exposure to smoking-related social environments, smoke-free norms and readiness to quit among students at Aleksandër Moisiu University of Durrës, Albania. A cross-sectional anonymous survey was conducted between January and April 2026 among 252 university students. The questionnaire assessed age and context of first cigarette use, smoking during the previous year, smoking intensity, peer and household exposure, household and workplace smoking rules, quit attempts, motivation to quit and perceived likelihood of successful cessation. Descriptive statistics were calculated using valid item-level responses. Among students with valid responses, 32.8% reported smoking during the previous year. First experimentation was most frequent at 18-20 years (29.0%) and 15-17 years (25.3%), while 14.3% reported first cigarette use before age 15. The first cigarette was most commonly smoked at home (54.4%) and with friends or colleagues (48.3%). Most students reported an outdoor-only household smoking rule (92.6%). Although 78.6% had considered quitting, only 7.5% reported a planned quit date. Smoking among university students in Durrës was characterized by early experimentation, peer exposure, strong household smoke-free norms and incomplete translation of cessation motivation into quit planning. Campus-based prevention should combine smoke-free enforcement, peer-norm interventions and practical quit-date planning.

Keywords: smoking; tobacco; university students; smoking initiation; cessation; Albania; smoke-free environment

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1. INTRODUCTION

Tobacco use remains one of the leading preventable causes of morbidity and mortality. Although global smoking prevalence has declined, tobacco-attributable disease continues to accumulate across the life course, especially where prevention, cessation support and smoke-free enforcement are incomplete [1-3]. University students are a relevant public-health group because early adulthood is a transitional period in which social networks, autonomy, academic stress and daily routines may consolidate experimental smoking into regular use [4].

Smoking behaviour among students is strongly influenced by the social ecology of tobacco use. Peer smoking, household smoking, permissive norms and weak smoke-free enforcement may increase exposure and normalize tobacco use [5,6]. Conversely, smoke-free household, workplace and campus rules can reduce opportunities for smoking and reinforce non-smoking as the expected norm [2,8]. Readiness to quit is another critical dimension: students may report motivation to quit but still lack a concrete quit date, structured support or confidence to maintain abstinence [7].

This short conference paper summarizes the main findings of a cross-sectional survey conducted among students of Aleksandër Moisiu University of Durrës, Albania. The aim was to describe smoking initiation, current behaviour, social exposure, smoke-free norms and cessation readiness.

2. MATERIAL AND METHOD

Study design and setting. This was a cross-sectional survey conducted from January to April 2026 among students at Aleksandër Moisiu University of Durrës, Albania.

Participants and data collection. Students completed an anonymous self-administered questionnaire. The analytic sample included 252 submitted questionnaires. No personal identifiers were collected. Because some questions had item-level non-response, percentages were calculated using valid interpretable responses for each indicator.

Measures. The questionnaire assessed age at first cigarette use, place and social context of first smoking, smoking during the previous year, cigarettes smoked per day, fraction of cigarette smoked, inhalation depth, partner and household smoking, peer tobacco use, household and workplace smoke-free rules, previous quit attempts, motivation to quit, planned quit date and perceived likelihood of successful quitting.

Statistical analysis. Data were analysed using IBM SPSS Statistics, version 28.0. Categorical variables are presented as frequencies and percentages. The present conference summary reports descriptive findings only. Percentages were calculated using valid item-level responses.

3. RESULTS

A total of 252 students were included. Approximately one third of respondents with valid answers reported smoking during the previous year. First experimentation clustered in adolescence and early adulthood, with a substantial proportion reporting first cigarette use before 18 years. The first cigarette was most often smoked at home and commonly occurred with friends or colleagues.

Peer exposure was frequent, while household smoke-free norms were strong. Cessation readiness was high in terms of motivation, but only a small minority had a planned quit date. The main descriptive findings are presented in Table 1.

Table 1. Descriptive smoking behaviour, social exposure and cessation-readiness indicators

Indicator / response category	n	%
Smoking behaviour		
Smoked during previous year	75	32.8
0 cigarettes/day among valid responses	79	43.2
1-5 cigarettes/day among valid responses	69	37.7
Smoked less than half of each cigarette	135	73.4
Did not inhale deeply	130	68.8
Smoking initiation		
Never tried cigarettes	62	28.6
First cigarette at <=14 years	31	14.3
First cigarette at 15-17 years	55	25.3
First cigarette at 18-20 years	63	29.0
First cigarette at >=21 years	6	2.8
First cigarette at home	68	54.4
Social context and exposure		
First cigarette with friends/colleagues	87	48.3
First cigarette with a family member	42	23.3
At least half of friends smoke/use tobacco	97	41.8
Partner smoking in the household	49	21.6
Other household member smoking	111	49.8
Smoke-free norms		
Household rule requiring smoking outdoors	214	92.6
Smoking not allowed in any work area	134	65.0
Smoking allowed in some work areas	65	31.6
Cessation readiness		
Considering quitting	143	78.6
Planned quit date known	6	7.5
No previous quit attempt	84	80.8
High or extremely high motivation to quit	142	75.5
High or very high perceived likelihood of successful quitting within 30 days	156	81.7

Note. Percentages are based on valid item-level responses.

4. DISCUSSION AND CONCLUSIONS

The findings suggest that smoking among university students in Durrës is not only an individual behaviour but also a socially embedded practice. Initiation frequently occurred in settings involving friends or household environments, and peer exposure was common. This supports the need for peer-level interventions rather than relying only on general health education messages [5,6].

The high prevalence of household outdoor-only smoking rules is encouraging and may reflect a wider smoke-free normative climate. These findings are descriptive and should not be interpreted causally, but they are relevant for campus health promotion because household and institutional smoke-free norms can reinforce each other [2,8].

The gap between motivation and action is clinically important. Most respondents had considered quitting and many reported high motivation, but few had a concrete quit date. Conference-relevant public-health implications are direct:

university programmes should help students translate intention into action through brief counselling, quit-date planning, digital reminders, referral pathways and accessible student health or counselling services [7]. Campus tobacco-control policies should also include newer nicotine products, because students may move between combustible cigarettes and alternative nicotine delivery systems.

This study was cross-sectional, so temporal and causal relationships cannot be established. Measures were self-reported and may be affected by recall or social desirability bias.

Smoking among students at Aleksandër Moisiu University of Durrës was characterized by adolescent or early-adult initiation, peer involvement, strong household smoke-free norms and incomplete translation of cessation motivation into quit planning. The results support a practical university-based tobacco-control approach combining smoke-free rule reinforcement, peer-norm interventions and structured cessation support focused on quit-date planning.

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Ethics Committee Approval

None.

Conflict of Interest

The authors declare no conflicts of interest.

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Quality Of Life Among University And Nursing Students In Albania: A Cross-Sectional Study

INDRIT BIMI[1]

Abstract: Student quality of life is influenced by academic workload, time pressure, psychological wellbeing, physical health and the learning environment. These dimensions are particularly relevant in health-related education, where study demands and clinical exposure may affect both current wellbeing and professional development. To assess quality of life among university students at Aleksander Moisiu University of Durres and nursing students at the University of Medicine in Tirana, Albania. A cross-sectional survey was conducted from 27 January to 01 April 2026. The study included 446 responses. Quality of life was assessed using an adapted Albanian version of a 45-item student quality-of-life instrument covering time management, psychological wellbeing, physical health and learning environment. Scores were transformed to a 0-100 scale. Internal consistency was assessed using Cronbach alpha and temporal stability was assessed in a test-retest subset. The mean age was 24.0 +/- 8.4 years and most participants were female (402/446, 90.1%). The mean total quality-of-life score was 60.8 +/- 12.1. Physical health had the highest mean domain score (67.5 +/- 16.9), followed by learning environment (64.8 +/- 12.8), while time management had the lowest score (55.0 +/- 13.8). Internal consistency was high for the total scale (alpha = 0.906) and acceptable to good across domains (alpha = 0.750-0.781). Test-retest reliability was good for the total score (ICC = 0.82). Students showed a moderate quality-of-life profile, with time management and psychological wellbeing emerging as the most vulnerable domains. The findings support structured student wellbeing monitoring and targeted academic and psychosocial support.

Keywords: quality of life; VERAS-Q; university students; nursing students; Albania; wellbeing; cross-sectional study

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1. INTRODUCTION

Quality of life is a multidimensional construct that reflects how individuals evaluate their physical health, psychological wellbeing, social functioning, living environment and broader life circumstances [1,2]. In student populations, it is also a useful marker of how academic workload, institutional support, personal resources and social conditions interact during training [3-7]. This is particularly important in health-related education, where study demands, practical obligations and expectations for professional competence may influence both wellbeing and learning.

International evidence shows that students in medical and nursing programmes may experience reduced wellbeing during training. Time pressure, sleep problems, psychological strain, burnout, limited opportunities for self-care and concerns about the educational environment are repeatedly reported as important determinants of student quality of life [5-14]. These factors are relevant not only for individual wellbeing but also for academic progression, retention and preparation for professional practice.

In Albania, evidence on quality of life among university and nursing students remains limited. Local data are needed because institutional context, programme structure and student demographics may differ from settings where most previous evidence has been produced. The present study assessed quality of life among students in Durres and Tirana and summarised the reliability of the adapted Albanian instrument.

2. MATERIAL AND METHOD

Study design and setting

This was a cross-sectional survey conducted among university students at Aleksander Moisiu University of Durres and nursing students at the University of Medicine in Tirana, Albania. Data collection took place from 27 January 2026 to 01 April 2026. The reporting approach followed the principles of STROBE for observational studies [15].

Participants

Students were eligible if they were enrolled in the participating university programmes during the study period and agreed to complete the anonymous questionnaire. Participation was voluntary. The sampling approach was non-probabilistic and based on questionnaire availability during data collection.

Instrument and scoring

The study used an adapted Albanian version of the VERAS-Q, a 45-item quality-of-life instrument developed for medical students [3,4]. The instrument includes domains related to time management, psychological wellbeing, physical health and the learning environment. Items were scored on a five-point Likert scale. Negatively worded items were reverse-scored so that higher values indicated better perceived quality of life. Total and domain scores were transformed to a 0-100 scale using the formula ((mean item score - 1) / 4) x 100.

Psychometric assessment

The Albanian version was reviewed for linguistic and conceptual clarity and was pilot-tested before full data collection. Internal consistency was evaluated using Cronbach alpha for the total scale and domains. Test-retest reliability was assessed in a subset of 50 participants who completed the questionnaire twice with a two-week interval between administrations.

Statistical analysis

Categorical variables were summarised as frequencies and percentages. Continuous variables were summarised as mean +/- standard deviation and median with interquartile range. Group comparisons were performed using the Mann-Whitney U test, and Spearman correlation was used to examine the association between age and quality-of-life scores. Analyses were performed using IBM SPSS Statistics, version 28.0 [18].

Ethical considerations

The questionnaire was anonymous and did not collect direct personal identifiers. Participation was voluntary and based on informed consent before questionnaire completion.

3. RESULTS

A total of 446 responses were included. Overall item-level completeness was high, as 444 participants provided valid responses for at least 80% of the 45 items. One participant had no computable total score. The mean age was 24.0 +/- 8.4 years, with a median of 22.0 years. The sample was predominantly female (402/446, 90.1%). Most participants were single (376/446, 84.3%). Master-level students represented 254/446 (57.0%), while bachelor or ongoing bachelor-level students represented 188/446 (42.2%) (Table 1).

Table 1. Sociodemographic characteristics of participants (N = 446)

Characteristic	**n**	**%**
Sex		
Female	402	90.1
Male	42	9.4
Marital status		
Single	376	84.3
Married	69	15.5
Education		
Bachelor/ongoing bachelor	188	42.2
Master/master-level	254	57.0

Note: Percentages are calculated using the total sample as denominator.

The mean total quality-of-life score was 60.8 +/- 12.1, indicating a moderate overall profile. Physical health had the highest domain score, followed by learning environment. Time management was the lowest-scoring domain, followed by psychological wellbeing. Reliability indicators supported the use of the total and domain scores in this sample.

No statistically significant differences in total or domain scores were observed by sex or educational level. Age was not significantly correlated with the total score or any domain score. Item-level analysis showed that the lowest-scoring areas were related to making the most of life, perceived competitiveness of the university environment, concentration difficulties, excessive self-pressure, low mood and pressure from teachers. The highest-scoring areas were related to life meaning, relationship with teachers, time for family, relationship with classmates, faith and general quality of life.

4. DISCUSSION AND CONCLUSIONS

This study provides concise evidence on quality of life among Albanian university and nursing students. The overall score suggests a moderate quality-of-life profile rather than a clearly favourable or unfavourable one. The domain pattern is informative: students reported relatively better physical health and learning environment, but lower time management and psychological wellbeing. This pattern is consistent with international evidence showing that student wellbeing is strongly shaped by the balance between academic demands, time pressure, sleep, self-care and psychological resources [5-14].

Time management was the most vulnerable domain. In practical terms, this result suggests that difficulties with workload, study organisation, free time and recovery may be central to how students experience university life. Such findings should not be interpreted only as individual organisational problems. They may also reflect structural issues such as dense curricula, examination periods, practical training schedules and limited access to academic guidance. Universities can respond through better workload planning, mentoring, clear communication of course expectations and student-friendly support during high-pressure periods.

Psychological wellbeing also requires attention. The present study did not use diagnostic mental-health tools, so the findings should be interpreted as perceived quality-of-life signals rather than clinical outcomes. Nevertheless, low psychological and time-management scores identify practical areas for intervention. Routine wellbeing monitoring, early recognition of students under pressure, and accessible counselling or peer-support services may help reduce cumulative academic stress.

The adapted Albanian instrument showed strong internal consistency and good test-retest stability for the total score. This supports its use for descriptive monitoring in this student population. However, reliability does not equal full validity. Further work should evaluate factor structure, construct validity and measurement performance in broader Albanian student groups, in line with accepted standards for health-measurement instruments [16,17].

The lack of statistically significant differences by sex or educational level should be interpreted carefully. The sample was strongly female-predominant, and the dataset did not include a dedicated institution or programme variable. Differences by programme, year of study, clinical exposure, socioeconomic background or living conditions may still exist but could not be examined in the present analysis.

The main strength of the study is the use of a structured student quality-of-life instrument with domain-level scoring and reliability assessment in a relatively large sample. The study also provides early evidence from Albanian higher education, where student wellbeing data remain limited. The main limitations are the cross-sectional design, non-probabilistic sampling, female-predominant sample and lack of detailed programme or institution-level variables.

Among university students in Durres and nursing students in Tirana, quality of life was moderate overall. Time management and psychological wellbeing were the most vulnerable domains, indicating the need for targeted student-support strategies. The adapted instrument showed strong internal consistency and good temporal stability, supporting its use for descriptive monitoring. Future research should use representative sampling, include institution-level variables and complete broader psychometric validation of the Albanian adaptation.

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Ethics Committee Approval

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Conflict of Interest

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Investigation of University Students Motivations for Participation in Recreational Activities

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Abstract: The aim of this study is to examine the participation motivation of students studying at Muş Alparslan University in recreational activities in terms of different variables. The study group consists of 299 participants (161 women and 138 men) studying at Muş Alparslan University in the 2025-2026 academic year. A personal information form created by the researcher and the recreational activity participation motivation scale developed by Özant et al. (2024) were used as data collection tools. For data evaluation, the T-test was used to compare quantitative continuous data between two independent groups, and the one-way ANOVA test was used to compare quantitative continuous data between more than two independent groups. No significant differences were found in the total score and sub-dimension scores of the participation motivation scale according to gender and department variables ($p>0.05$). Furthermore, a significant difference was found in the benefit and extrinsic motivation of those who participate in sports, favoring those who engage in sports ($p<0.05$). However, a significant difference was found in the lack of motivation sub-dimension according to the class variable ($p<0.05$).

Keywords: Motivation to Participate, Recreation, Recreational Activities

Üniversite Öğrencilerinin Rekreasyonel Etkinliklere Katılım Motivasyonlarının İncelenmesi

Özet: Bu çalışmanın amacı, spor bilimleri fakültesinde öğrenim gören öğrencilerin zihinsel dayanıklılık düzeylerinin farklı değişkenler açısından incelenmesidir. Bu araştırmada nicel araştırma yöntemi tercih edilmiş olup, çalışma grubunu 2025-2026 eğitim öğretim yılında Muş Alparslan üniversitesi spor bilimleri fakültesinde öğrenim gören 120 erkek,72 kadın olmak üzere toplamda 192 katılımcı oluşturmaktadır. Veri toplama aracı olarak araştırmacı tarafından oluşturulan kişisel bilgi formu ile (Erdoğan, 2016) tarafından geliştirilen Zihinsel dayanıklılık ölçeği kullanılmıştır. Verilerin analizinde iki bağımsız grup arasındaki farklılığın tespit edilmesi için T-Testi, ikiden fazla bağımsız gruplarda farkın tespiti için Tek yönlü (Oneway) Anova testi kullanılmıştır. Sonuç olarak cinsiyet, bölüm, sınıf, spor türü, lisanslı olma durumu değişkenine göre zihinsel dayanıklılık ölçeği toplam puanlarında anlamlı farklılık görülmemiştir ($p>0,05$).

Anahtar Kelimeler: Katılım Motivasyonu, Rekreasyon, Rekreasyonel Etkinlikler

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1. GİRİŞ

Bireyler, motorik, sosyal, duygusal ve bilişsel farklılıklarıyla toplumsal hayatın üyeleri olarak yaşamlarını sürdürürler. Bireyin yetersizlikten etkilenmesi ve bu yetersizliğin derecesine bağlı olarak hareket kısıtlılığı ya da duyusal kayıpların yarattığı eksiklik onu toplumun diğer bireylerinden farklı kılabilir (Tekkurşun vd., 2018). Spor beden ve ruh sağlığının gelişmesi ile birlikte belli kurallara göre rekabet ölçüleri içinde mücadele etme, heyecan duyma, yarışma, yarışmada üstün gelme arzusunu içerir (Tamer ve Pulur, 2001; Yücel, 2004). Spor yapan kişinin kendisine olan güveni daha fazla, çevresi ile uyumu daha iyi, ruhsal sağlığı daha dengeli ve düzenlidir (İlhan, 2010). Hareketsiz yaşam tarzı, çağımızın en önemli sorunlarından biridir ve insan sağlığını ciddi derecede tehdit etmektedir. Teknolojinin hızla ilerlemesi ve yaşam koşullarının değişimi, bireyleri kısıtlı hareket ortamına itmektedir. Bu yaşam tarzını benimsemek zorunda kalan bireylerden sağlıklı bir toplum meydana gelmesi beklenmemektedir. Ancak fiziksel aktivitelerle desteklenen bir yaşam tarzı, bireylerin daha sağlıklı ve kaliteli bir yaşam sürmelerine yardımcı olabilir. Bu nedenle, fiziksel aktivitelerin düzenli olarak yapılması, sağlıklı bir toplum oluşturmak adına önemli bir adımdır (Tavazar vd., 2016).

Rekreasyon, bireylerin boş zamanlarını fiziksel, zihinsel ve sosyal açıdan yenilenmelerine katkı sağlayacak biçimde değerlendirdikleri gönüllü etkinlikler bütünüdür (Karaküçük, 2020). Başka bir ifade ile rekreasyon, insanların kendilerine yarar sağlamak amacıyla boş zamanlarını değerlendirmek, dinlenmek, eğlenmek ve fiziksel aktivitelerde bulunmak için yaptıkları faaliyetlerin genel adıdır. Bu kavram, bireylerin streslerini azaltmalarına, sağlıklarını korumalarına, sosyal bağlarını güçlendirmelerine ve yaşam kalitelerini artırmalarına yardımcı olmaktadır (Tütüncü,

2012). Motivasyon genel anlamda, kişilerin belirli bir hedefe ulaşma sürecinde harekete geçmelerini sağlayan psikolojik veya fiziksel bir süreçtir (Budak, 2003). Kişilerin rekreatif etkinlik seçimlerinde yüksek motivasyona sahip olmaları, yapacakları etkinlikler kapsamında büyük ve olumlu geri dönütleri olacaktır. Kişilerin boş zamanlarını değerlendirmede motivasyonun rekreatif bir faaliyete sürüklemede önemli bir paya sahip olduğu söylenebilir (Tarcan, 2019). Sağlık ve refah kavramlarının giderek genişlediği günümüzde, rekreasyonel etkinlikler bireylerin yaşamlarına olumlu katkılar sunan önemli etkinlikler arasında yer almaktadır. Rekreasyonel etkinlikler sağlık, mutluluk, kondisyon artışı, sosyalleşme ve yeni beceriler öğrenme fırsatları yaratabilir (Özgün vd., 2017; Fadare vd., 2022). Rekreasyonel etkinlikler kişinin ilgi, yetenek ve ihtiyaçlarına göre değişebilir. Fiziksel aktivite, doğa yürüyüşleri, kampçılık, piknik yapma, balık tutma, bisiklete binme, yüzme gibi açık hava etkinlikleri rekreasyon etkinliklerine örnek olarak verilebilir (Öztürk, 2018). Rekreasyon etkinlikleri, insanların ruh sağlığını koruması, sosyal ilişkilerini güçlendirmesi, fiziksel formda kalması ve yaşamın streslerinden uzaklaşması için önemli olduğu vurgulanmaktadır. Ayrıca, rekreasyonun ekonomik ve çevresel yararları da bulunmaktadır. Turizm endüstrisi, rekreasyonel etkinliklerin yaygınlaşmasıyla büyümekte ve bu da yerel ekonomilere katkı sağlamaktadır. Doğa ile iç içe aktiviteler, çevrenin korunması ve insanların doğaya olan bağlılığını artırması bakımından da önemlidir (Gstaettner vd., 2018). İnsanlar var oldukları zamandan itibaren yaşamlarını devam ettirebilmek için sürekli bir şekilde çalışmışlardır (Alanoğlu, 2020). Günümüzde ise hızla gelişmekte olan sanayileşmenin, teknolojinin süregelen yenilikleri ve ucu bucağı olmayan icatlar ile birlikte bireylerin çalışmaya ayırdığı zaman eskiye oranla ciddi anlamda azalma göstermiştir (Demirbaş, 2020). Çalışma zamanı dışında arta kalan boş zaman; bireylerin dış etmenlerden bağımsız olarak kontrolün tamamen bireyin elinde olduğu, bireyin kendi hür iradesiyle seçimde bulunduğu, herhangi bir zorunluluğun yani kuralın olmadığı; eğlenmek, eğlenirken mutlu olmak, içinde bulunulan durumdan memnun olmak gibi olumlu dönütlerin alındığı, çaba sarf ederek yenilenerek kendine gelmektir. Aynı zamanda bedenini, ruhunu arındırmak için ödün verilen zaman olarak tanımlanabilmektedir. Bu tanımdan yola çıkacak olursak, boş zaman olumlu bir şekilde değerlendirildiğinde bireylerde gelişimi destekleyeceği gibi doygunluk düzeylerinde de artış görülebilir (Alanoğlu, 2020).

Günümüz toplumlarında bireyler, rutin iş hayatı ve gündelik işleri haricinde kalan serbest zamanlarında (iş yükü, stres, psikolojik rahatsızlıklar vb.)faktörlerden biraz olsun uzaklaşmak, dinlenebilmek, sağlıklı olabilmek ve sosyalleşmek gibi farklı amaçlarla, iç mekan veya dış mekan alanlarda, aktif veya pasif katılım şekliyle etkinliklere katılmaktadırlar (Er vd., 2019). Bireylerin fizyolojik ihtiyaçları ve çalışma saatleri dışında kalan bu zaman diliminde yaptıkları faaliyetleri rekreasyon kavramı ile açıklamak en doğrusu olacaktır. Rekreasyon kavramı, genellikle araştırmacılar tarafından bireylerin boş zamanlarında yapmış oldukları somut aktiviteler veya bu zaman dilimin fiziksel ve psikolojik faydaları elde etmek olarak görülmektedir (Karaküçük, 2016). Boş zaman, bireylerin çalışma, zorunluluk ve günlük yaşam sorumluluklarından arta kalan sürelerini gönüllü olarak katıldıkları, dinlenme, eğlenme, sosyalleşme ve kişisel gelişim amaçlı etkinliklerle değerlendirdikleri bir süreç olarak tanımlanmaktadır (Argan, 2007; Kraus, 2008). Günümüzde bireylerin karşılaştığı temel sorunlardan biri de zaman yetersizliğidir. Zaman yetersizliğinin temel nedenleri arasında bireylerin uzun çalışma saatleri ve iş yaşamının getirdiği yoğun tempo yer almaktadır. Çalışma hayatı, bireylerin zamanının büyük bir bölümünü kapsamakta ve kişisel boş zaman ayırmalarını zorlaştırmaktadır. Ancak Sanayi Devrimi ile birlikte teknolojik gelişmelerin hız kazanması, makineleşmenin artması, ulaşım olanaklarının iyileşmesi ve çalışma saatlerinin düzenlenmesi gibi etkenler, bireylerin boş zamanlarının artmasına katkı sağlamıştır. Bu gelişmelerin bir sonucu olarak, boş zaman etkinliklerine olan ilgi de giderek artmıştır (Ayçiçek, 2019). Fakat kentleşmenin artması, yaşamımızdaki gelişmelere bağlı olarak büyük sorunlar teşkil etmekte; insan gücünün yerini makinelere bırakması ve şehirlerde rekreatif alanların planlanmaması, sportif, sosyal ve kültürel faaliyetler için gerekli tesislerin uygun olmamasını da beraberinde getirmektedir. Sanayi devriminden günümüze kadar insanların yaşam tarzı büyük bir değişim göstermiştir. Bu değişimle birlikte, uzun çalışma saatleri ve çevresel koşullardan olumsuz etkilenen bireylerin ruhsal ve fiziksel sağlıklarını yeniden kazanması veya sürdürmesi, önemle üzerinde durulması gereken bir gereksinim olarak ön plana çıkmaktadır. Dolayısıyla ilerlemiş toplumlarda sportif rekreasyon kapsamında düzenlenen organizasyonlar bireyin gelişimine katkı sağlamaktadır (Nahavandi, 2006).Bu bilgiler ışığında Üniversite Öğrencilerinin Rekreasyonel Etkinliklere Katılım Motivasyonlarının Üzerindeki Etkisinin İncelenmesi amaçlanmıştır. Bu amaç doğrultusunda aşağıdaki hipotezler oluşturulmuştur.

H1: Katılımcıların rekreasyonel etkinliklere katılım motivasyonu cinsiyete göre farklılık göstermektedir.

H2: Katılımcıların rekreasyonel etkinliklere katılım motivasyonu spor yapmalarına göre farklılık göstermektedir.

H3: Katılımcıların rekreasyonel etkinliklere katılım motivasyonu okudukları bölüme göre farklılık göstermektedir.

H4: Katılımcıların rekreasyonel etkinliklere katılım motivasyonu sınıfa göre farklılık göstermektedir.

2. MATERYAL VE YÖNTEM

Çalışma modeli

Bu araştırma nicel araştırma yöntemlerinden betimsel tarama modeli ile yapılmıştır.

Çalışma Grubu

Çalışma gurubunu 2025-2026 eğitim-öğretim yılında Muş Alparslan Üniversitesinde öğrenim gören 161 Kadın 138 Erkek toplamda 299 katılımcı oluşturmaktadır. Katılımcıların kişisel özelliklerine ilişkin tanımlayıcı bilgileri aşağıda tablo 1'de verilmiştir.

Tablo-1 Katılımcıların Kişisel Özelliklerine Göre Tanımlayıcı İstatistiği

Değişkenler	Gruplar	Frekans(n)	Yüzde(%)	X̄
Cinsiyet	Erkek	138	46,0	
	Kadın	161	53,7	
Bölüm	Antrenörlük	30	10,0	
	Yöneticilik	52	17,3	
	Rekreasyon	33	11,0	
	Sınıf Öğretmenliği	2	,7	
	Hemşirelik	133	44,3	
	İlahiyat	17	5,3	
	Yazılım Mühendisliği	31	10,3	
	Matematik	1	,3	
	İngilizce Öğretmenliği	1	,3	
Sınıf	1.sınıf	64	21,3	
	2.sınıf	99	33,0	
	3.sınıf	54	18,0	
	4.sınıf	83	27,7	

Katılımcıların cinsiyetlerine göre 138'si (%46,0) erkek ve 161'u (%53,7) kadın olarak dağılmaktadır. Katılımcıların bölümlerine göre 30'sı (%10,0) antrenörlük, 52'si (%17,3) yöneticilik, 33'ü(%11,0) rekreasyon ve 2'si (%,7) Sınıf öğretmenliği,133`ü (%44,3) Hemşirelik,17'i (%5,3) İlahiyat,31'i (10,3), YazılımMühendisliği,1'i (,3) Matematik, 1' (,3) İngilizce Öğretmenliği, bölümü olarak dağılım göstermektedir. Katılımcıların sınıflarına göre 64'si (%21,3) 1.sınıf, 99'si (%33,0) 2.sınıf,54'u (%18,0) 3.sınıf ve 83'sı (%27,7) 4.sınıf olarak dağılım göstermektedir.

Veri Toplama Aracı

Veri toplama aracı olarak araştırmacı tarafından oluşturulan kişisel bilgi formu ile Özant vd., (2024) tarafından geliştirilen rekreasyonel etkinlik katılım motivasyonu ölçeği kullanılmıştır. Motivasyon ölçeği 5'li likert tipi bir ölçektir. Aynı zamanda 39 maddeden ve 4 alt boyuttan oluşmaktadır. Alt boyutlar: "**İçsel Motivasyon", "Fayda", "Motivasyonsuzluk" ve "Dışsal Motivasyon"dur.**

Verilerin İstatistiksel Analizi

Verilerin değerlendirilmesinde SPSS.25 programı kullanılmıştır. Verilerin normallik testi yapılmış ve +2 -2 değer aralığında normal dağılıma sahip olduğu görülmüştür. İki bağımsız grup arasında niceliksel sürekli verilerin karşılaştırılmasında T-Testi, ikiden fazla bağımsız grup arasında niceliksel sürekli verilerin karşılaştırılmasında Tek Yönlü (one way) Anova testi kullanılmıştır. Analizlerde güven aralığı %95 (anlamlılık düzeyi 0,05; $p<0,05$) olarak belirlenmiştir. Ölçeğin Cronbach Alpha korelasyon katsayısının ,939 olduğu tespit edilmiştir.

3.BULGULAR

Tablo 2. Katılımcıların Rekreasyonel Etkinliklere Katılım Motivasyonu Cinsiyet Değişkenine Göre T-Testi Sonuçları

	Cinsiyet	N	X	Sd	T	p
İçsel Motivasyon	Kadın	161	53,1863	297	-,691	,490
	Erkek	138	52,2246	278,360	-,685	,494
Fayda	Kadın	161	57,0497	297	-,046	,963
	Erkek	138	56,985	269,949	-,046	,963
Motivasyonsuzluk	Kadın	161	14,5528	297	,801	,424
	Erkek	138	14,8986	281,503	,796	,427
Dışsal Motivasyon	Kadın	161	10,0373	297	-,027	,978
	Erkek	138	10,0290	275,052	-,027	,978
Toplam	Kadın	161	130,3292	297	-,164	,869
	Erkek	138	129,8696	281,735	-,164	,870

Tablo 2'ye bakıldığında katılımcıların Rekreasyonel Etkinliklere Katılım Motivasyonu cinsiyet değişkenine göre anlamlı farklılık göstermediği görülmüştür (p>0,05).

Tablo 3. Katılımcıların Rekreasyonel Etkinliklere Katılım Motivasyonu Spor Yapma Durumu Değişkenine Göre T-Testi Sonuçları

Tablo 3'e bakıldığında, katılımcıların rekreasyonel etkinliklere katılım motivasyonlarının spor yapma durumu değişkenine göre "fayda" alt boyutu (p=,019) ve "dışsal motivasyon" alt boyutunda (p=,022) spor yapanlar (evet) lehine istatistiksel olarak anlamlı bir farklılık gösterdiği tespit edilmiştir (p<0,05). Buna karşın "içsel motivasyon", "motivasyonsuzluk" alt boyutları ile "toplam" motivasyon puanı ortalamalarında spor yapan ve yapmayan katılımcılar arasında istatistiksel olarak anlamlı bir farklılık görülmemiştir(p>0,05).

	Spor Yapma Durumu	N	X	Sd	t	p
İçsel Motivasyon	EVET	171	53,4327	12,96919	1,138	,256
	HAYIR	127	51,8819	10,52858		
Fayda	EVET	171	58,4620	12,62922	2,354	**,019**
	HAYIR	127	55,2126	10,53311		
Motivasyonsuzluk	EVET	171	14,4854	4,01374	-1,309	,191
	HAYIR	127	15,0394	3,28151		
Dışsal Motivasyon	EVET	171	10,3333	2,76320	2,299	**,022**
	HAYIR	127	9,6535	2,33122		
Toplam	EVET	171	132,0760	26,26405	1,608	,109
	HAYIR	127	127,7244	20,44997		

Tablo 4. Katılımcıların Rekreasyonel Etkinliklere Katılım Motivasyonu Bölüm Değişkenine Göre T Testi Sonuçları

	Bölüm	N	X	Sd	T	p
İçsel Motivasyon	Spor Bilimleri F.	115	52,1304	298	-,545	,586
	Diğer Fakülteler	185	52,9189	199,229		
Fayda	Spor Bilimleri F.	115	57,3739	298	,553	,581
	Diğer Fakülteler	185	56,5784	197,160		
Motivasyonsuzluk	Spor Bilimleri F.	115	14,8609	298	,657	,512
	Diğer Fakülteler	185	14,5676	222,907		
Dışsal Motivasyon	Spor Bilimleri F.	115	10,2435	298	1,211	,227
	Diğer Fakülteler	185	9,8649	205,412		
Toplam	Spor Bilimleri F.	115	130,0957	298	,158	,874
	Diğer Fakülteler	185	129,6324	186,347		

Tablo 4'e bakıldığında, katılımcıların rekreasyonel etkinliklere katılım motivasyonlarının bölüm değişkenine göre tüm alt boyutlarda ve toplam puan düzeyinde istatistiksel olarak anlamlı bir farklılık göstermediği tespit edilmiştir (p>0,05). Buna göre "içsel motivasyon", "fayda", "motivasyonsuzluk" ve "dışsal motivasyon" algılarının bölümlere göre benzerlik gösterdiği, rekreasyonel etkinliklere katılım motivasyonunun bölüm faktöründen etkilenmediği görülmüştür.

Tablo 5. Katılımcıların Rekreasyonel Etkinliklere Katılım Motivasyonu Sınıf Değişkenine Göre ANOVA Testi Sonuçları

		Kareler Toplamı	df	Kareler Ort.	F	p	**Fark**
İçsel Motivasyon	Gruplar Arası	588,471	3	196,157	1,330	,265	
	Gruplar İçi	43644,445	296	147,447			
	Toplam	44232,917	299				
Fayda	Gruplar Arası	150,467	3	50,156	,340	,797	
	Gruplar İçi	43680,450	296	147,569			
	Toplam	43830,917	299				
Motivasyonsuzluk	Gruplar Arası	175,769	3	58,590	4,289	**,006**	D>C
	Gruplar İçi	4043,511	296	13,661			
	Toplam	4219,280	299				
Dışsal Motivasyon	Gruplar Arası	7,539	3	2,513	,360	,782	
	Gruplar İçi	2067,431	296	6,985			
	Toplam	2074,970	299				
Toplam	Gruplar Arası	1599,105	3	533,035	,881	,451	
	Gruplar İçi	179169,065	296	605,301			
	Toplam	180768,170	299				
Sınıf Değişkenine Göre Durumu	A: 1.Sınıf B: 2.Sınıf C: 3.Sınıf D. 4.Sınıf						

Tablo 5'e incelendiğinde, "içsel motivasyon", "fayda", "dışsal motivasyon" alt boyutları ile "toplam" motivasyon puanı düzeylerinde sınıflar arasında istatistiksel olarak anlamlı bir farklılık saptanmamıştır (p>0,05). Katılımcıların rekreasyonel etkinliklere katılım motivasyonlarının sınıf değişkenine göre "motivasyonsuzluk" alt boyutunda istatistiksel olarak anlamlı bir farklılık gösterdiği tespit edilmiştir (F=4,289; p=,006<0,05). Farkın kaynağına ilişkin yapılan LSD Post Hoc sonuçlarına göre 4. sınıf öğrencilerin motivasyonsuzluk alt boyutu toplam puanlarının 3. sınıf öğrencilerin puanlarından anlamlı düzeyde yüksektir (p<0,05).

4.TARTIŞMA VE SONUÇ

Bu araştırma kapsamında, bireylerin rekreasyonel etkinliklere katılım motivasyonlarını belirleyen faktörler; cinsiyet, bölüm, sınıf ve spor yapma alışkanlığı gibi değişkenler ışığında analiz edilmiştir. Rekreasyonel Etkinliklere Katılım Motivasyonu ölçeği puanlarının cinsiyet değişkenine göre anlamlı farklılık göstermediği bulgusu elde edilmiştir (**Tablo. 2)** ve Hipotezimiz **(H_1)** reddedilmiştir. Literatürde yer alan çalışmalara bakıldığında, Demir ve Çetin (2021) tarafından gerçekleştirilen çalışmada, rekreasyonel spor etkinliklerine katılan bireylerin motivasyon düzeylerinin cinsiyete göre anlamlı farklılık göstermediği tespit edilmiştir. Araştırmacılar, kadın ve erkek katılımcıların rekreasyonel etkinliklere katılım amaçlarının benzerlik göstermesi bu sonucun ortaya çıkmasında etkili olabileceğini belirtmişlerdir. Aydın ve Yaşartürk (2021) tarafından fitness merkezlerine devam eden bireyler üzerinde yapılan çalışma incelendiğinde, motivasyon düzeylerinin genel olarak cinsiyet değişkenine göre istatistiksel olarak anlamlı farklılık tespit edilmemiştir. Yapılan bu çalışmalar araştırma bulgularını destekler niteliktedir. Diğer taraftan, literatürde farklı bulgular elde eden ve çalışmamıza tezat olduğu düşünülen araştırmalar da bulunmaktadır. Özdemir ve Yıldız (2023) tarafından gerçekleştirilen çalışmada, üniversite öğrencilerinin rekreasyon aktivitelerine katılım motivasyonu düzeylerinin cinsiyet değişkenine göre anlamlı düzeyde farklılık gösterdiği tespit etmiştir. Akyüz vd. (2023) tarafından gerçekleştirilen çalışmada, üniversite öğrencilerinin rekreasyon aktivitelerine katılım motivasyonlarında cinsiyet değişkenine göre anlamlı farklılık olduğu tespit edilmiştir. Bulgu sonuçlarına bakıldığında, üniversite öğrencilerin bulunduğu bölgede farklı sosyo-kültürel yapının etkin bir şekilde hissedilmesi, öğrencilerin farklı bölgelerde bulunan üniversite öğrencileriyle etkileşim kurması, öğrencilerin de benzer ihtiyaçlar doğrultusunda rekreasyonel etkinliklere yönelmesi, cinsiyetler arasında anlamlı bir farklılık oluşmamasında etkili olabilir.

Rekreasyonel Etkinliklere Katılım Motivasyonu ölçeği puanlarının spor yapma durumu değişkenine göre "fayda" alt boyutu ve "dışsal motivasyon" alt boyutunda spor yapanlar lehine istatistiksel olarak anlamlı bir farklılık gösterdiği bulgusu elde edilmiştir. Buna karşın "içsel motivasyon", "motivasyonsuzluk" alt boyutları ile "toplam" motivasyon puanı ortalamalarında spor yapan ve yapmayan katılımcılar arasında istatistiksel olarak anlamlı bir farklılık göstermediği bulgusu elde edilmiştir (**Tablo. 3)** ve Hipotezimiz **(H_2)** kısmen kabul edilmiştir. Literatürde yer alan

çalışmalara bakıldığında, Aydın ve Yaşartürk (2017) tarafından fitness merkezlerine devam eden bireyler üzerinde gerçekleştirilen araştırmada, rekreasyonel etkinliklere yönelik yapılan çalışmada düzenli fiziksel aktiviteye katılan bireylerin motivasyon düzeylerinin daha yüksek olduğu bulunmuştur. Öte yandan Akyüz vd. (2023) tarafından üniversite öğrencileri üzerinde yapılan çalışmada, rekreasyon aktivitelerine katılım motivasyonunun fiziksel aktivite alışkanlıkları değişkenlere göre anlamlın bir şekilde farklılaştığı ortaya konulmuştur. Yapılan bu çalışmalar araştırma bulgularını destekler niteliktedir. Diğer taraftan, literatürde farklı bulgular elde eden ve çalışmamıza tezat olduğu düşünülen araştırmalar da bulunmaktadır. Çetin (2021) tarafından rekreasyonel spor etkinliğine katılan bireyler üzerinde yapılan araştırmada, motivasyon alt boyutlarının bazı demografik değişkenlere göre anlamlı farklılık göstermediği bulgusu elde edilmiştir. Gümüş ve Alay Özgül (2017) tarafından rekreasyonel etkinliklere katılımın spor yapma alışkanlığına göre tüm motivasyon boyutlarında anlamlı farklılık göstermediği bulgusu elde edilmiştir. Bulgu sonuçlarına bakıldığında "fayda" boyutunda düzenli olarak spor yapan öğrenciler, rekreasyonel etkinliklerle sağlıklı yaşamı destekleme, fiziksel uygunluğu artırma, stresi azaltma ve sosyal ilişkileri geliştirme gibi yararları doğrudan deneyimledikleri, "dışsal motivasyon" boyutunda spor yapan bireylerin arkadaş çevresi, kulüp faaliyetleri, sosyal destek ve üniversite ortamında düzenlenen sportif etkinlikler gibi dışsal etmenlerden daha fazla etkilenmeleri puanlarının yüksek çıkmasıyla açıklanabilir.

Rekreasyonel Etkinliklere Katılım Motivasyonu ölçeği puanlarının bölüm değişkenine göre tüm alt boyutlarda ve toplam puan düzeyinde istatistiksel olarak anlamlı bir farklılık göstermediği bulgusu elde edilmiştir (**Tablo. 4) ve** Hipotezimiz **(H_3)** reddedilmiştir. Literatürde yer alan çalışmalara bakıldığında, Rekreasyon Aktivitelerine Katılım Motivasyonun üniversite öğrencilerinin öğrenim görülen bölüm değişkeninde anlamlı farklılık bulunmamıştır (Bosna vd. 2018; Gözen, 2020; Akyüz vd. 2023). Yapılan bu çalışmalar araştırma bulgularını destekler niteliktedir. Diğer taraftan, literatürde farklı bulgular elde eden ve çalışmamıza tezat olduğu düşünülen araştırmalar bulunmamaktadır. Bulgu sonuçlarına bakıldığında, üniversite öğrencilerinin rekreasyonel etkinliklere katılım motivasyonlarının öğrenim gördükleri akademik bölümden bağımsız olarak benzer özellikler taşıdığını göstermektedir. Üniversite öğrencileri aynı kampüs ortamını paylaşmaları, benzer sosyal, kültürel ve sportif olanaklardan yararlanmaları ve ortak üniversite yaşamı deneyimine sahip olmaları nedeniyle rekreasyonel etkinliklere yönelmeleri bakımından birbirine yakın özellikler göstermektedir. Tüm öğrenciler için ortak ihtiyaçların oluşması, bölüm değişkenine göre anlamlı farklılık oluşmamasının temel nedenlerinden biri olarak değerlendirilebilir.

Rekreasyonel Etkinliklere Katılım Motivasyonu ölçeği puanlarının sınıf değişkenine göre "motivasyonsuzluk" alt boyutunda istatistiksel olarak anlamlı bir farklılık gösterdiği bulgusu elde edilmiştir. Farkın kaynağına ilişkin yapılan LSD Post Hoc sonuçlarına göre 4. sınıf öğrencilerin motivasyonsuzluk alt boyutu toplam puanlarının 3. sınıf öğrencilerin puanlarından anlamlı düzeyde yüksek çıktığı görülmüştür. Buna karşın "içsel motivasyon", "fayda", "dışsal motivasyon" alt boyutları ile "toplam" motivasyon puanı düzeylerinde sınıflar arasında istatistiksel olarak anlamlı bir farklılık göstermediği bulgusu elde edilmiştir (**Tablo. 5)** ve Hipotezimiz **(H_4)** kısmen kabul edilmiştir. Literatürde yer alan çalışmalara bakıldığında, (İpek, 2019; Yıldız 2022) tarafından üniversite öğrencileri üzerinde gerçekleştirilen araştırmada, rekreasyonel faaliyetlere katılımı etkileyen unsurların sınıf değişkenine göre anlamlı farklılık gösterdiği belirlenmiştir. Yapılan bu çalışmalar araştırma bulgularını destekler niteliktedir. Diğer taraftan, literatürde farklı bulgular elde eden ve çalışmamıza tezat olduğu düşünülen araştırmalar da bulunmaktadır. Ağduman (2014) Üniversite öğrencilerinin serbest zaman motivasyonlarını inceleyen çalışmada öğrencilerin motivasyon düzeylerinin sınıf değişkenine göre istatistiksel olarak anlamlı bir farklılık göstermediği bulgusu elde edilmiştir. Serdar (2016) tarafından üniversite öğrencileri üzerinde yapılan araştırmada sınıf düzeyinin rekreasyonel etkinliklere katılım motivasyonunda anlamlı bir farklılık oluşturmadığı belirtilmiştir. Akyüz vd. (2023) yaptığı araştırmada sınıf değişkenine göre rekreasyon aktivitelerine katılım motivasyonunda anlamlı farklılık bulunmamıştır. Bulgu sonuçlarına bakıldığında, 4. sınıf öğrencilerinin motivasyonsuzluk puanlarının daha yüksek çıkması; mezuniyetin yaklaşması, kariyer kaygısı, kpss ve iş arama süreci, akademik sorumlulukların artması, zaman baskısı ve gelecek kaygısı gibi faktörlerle açıklanabilir. Buna karşın içsel motivasyon, fayda, dışsal motivasyon ve toplam motivasyonda fark olmaması, öğrencilerin rekreasyonel etkinliklere yönelik temel ihtiyaçların sınıf düzeyinden bağımsız olduğunu gösterebilir. Bu araştırma kapsamında, bireylerin rekreasyonel etkinliklere katılım motivasyonlarını belirleyen faktörler; cinsiyet, bölüm, sınıf ve spor yapma alışkanlığı gibi değişkenler ışığında analiz edilmiştir. Elde edilen sonuçlar, rekreasyonel motivasyonun sadece boş zamanı doldurma arzusu değil, aynı zamanda fiziksel ve psikolojik bir ihtiyaçlar bütünü olduğunu göstermektedir.

Öneriler

Araştırma sonucunda elde edilen veriler ve ulaşılan bulgular ışığında; rekreasyonel etkinliklere katılım motivasyonunu artırmak, farkındalık düzeyini yükseltmek ve toplumun geniş kesimlerine yaymak amacıyla şu öneriler geliştirilmiştir;

- Araştırmada spor yapan bireylerin motivasyonunun daha yüksek çıkması, etkinliklerin sadece fiziksel değil, sosyal ve zihinsel ödüller sunacak şekilde tasarlanması gerektiğini göstermektedir. Yerel yönetimler, rekreasyonel alanlarda sadece park ve spor alanı değil; bireylerin beceri geliştirebileceği (atölyeler, kulüpler) tematik alanlar oluşturabilir.
- Spora katılım sıklığı düşük olan bireyleri sisteme dahil etmek için, bu etkinliklerin psikolojik sağlığa (stres yönetimi, zihinsel rahatlama) olan katkıları vurgulanmalıdır. Özellikle "serbest zaman engellerini" ortadan kaldıracak, ulaşımı kolay ve ekonomik maliyeti düşük programlar teşvik edilmelidir.
- Akademik başarısı yüksek veya iş yoğunluğu fazla olan bireyler için "zihinsel yenilenme" (restoratif rekreasyon) odaklı, kısa süreli ancak yoğun etkili hafta sonu programları geliştirilebilir.
- Spor bilimleri ve rekreasyon bölümlerinde öğrencilerin teorik bilgilerini pratiğe dökebilecekleri "rekreasyonel liderlik" projeleri artırılmalıdır. Araştırmada üst sınıfların motivasyonunun yüksek çıkması, eğitimin olumlu etkisini göstermektedir; bu etkinin alt sınıflara da yayılması için mentorluk sistemleri kurulabilir.
- Mevcut çalışma üniversite öğrencileri üzerinde yürütülmüştür. Gelecekteki araştırmalar, engelli bireyler, yaşlılar veya farklı sosyo-ekonomik düzeydeki çalışan grupları kapsayacak şekilde genişletilerek motivasyonel farklılıklar karşılaştırılabilir.
- Günümüzde artan dijitalleşme ile birlikte, geleneksel rekreasyonun yanı sıra e-spor ve sanal rekreasyon etkinliklerinin bireylerin genel motivasyon ve mutluluk düzeyleri üzerindeki etkisi yeni bir araştırma alanı olarak ele alınabilir.

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Okul Takımlarında Oynayan Üniversite Öğrencilerinin Zihinsel Dayanıklılık Düzeylerinin İncelenmesi

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Abstract: The aim of this study is to examine the levels of mental toughness of students studying at the Faculty of Sports Sciences in terms of different variables. The study population consists of a total of 192 participants, including 120 males and 72 females, studying at the Muş Alparslan University Faculty of Sports Sciences in the 2025-2026 academic year. As a data collection tool, a personal information form prepared by the researcher and the Mental Toughness Scale for Sports Sciences Students developed by (Erdoğan, 2016) were used. In the evaluation of data analysis, the T-Test was used for comparing quantitative continuous data between two independent groups, and the One-way ANOVA test was used for more than two independent groups. As a result, no significant difference was observed in the total scores of the Mental Toughness Scale according to gender, department, class, type of sport, and licensed status variables ($p>0.05$).

Keywords: Resilience, Mental Resilience

Okul Takımlarında Oynayan Üniversite Öğrencilerinin Zihinsel Dayanıklılık Düzeylerinin İncelenmesi

Özet: Bu çalışmanın amacı, spor bilimleri fakültesinde öğrenim gören öğrencilerin zihinsel dayanıklılık düzeylerinin farklı değişkenler açısından incelenmesidir. Bu araştırmada nicel araştırma yöntemi tercih edilmiş olup, çalışma grubunu 2025-2026 eğitim öğretim yılında Muş Alparslan üniversitesi spor bilimleri fakültesinde öğrenim gören 120 erkek,72 kadın olmak üzere toplamda 192 katılımcı oluşturmaktadır. Veri toplama aracı olarak araştırmacı tarafından oluşturulan kişisel bilgi formu ile (Erdoğan, 2016) tarafından geliştirilen Zihinsel dayanıklılık ölçeği kullanılmıştır. Verilerin analizinde iki bağımsız grup arasındaki farklılığın tespit edilmesi için T-Testi, ikiden fazla bağımsız gruplarda farkın tespiti için Tek yönlü (Oneway) Anova testi kullanılmıştır. Sonuç olarak cinsiyet, bölüm, sınıf, spor türü, lisanslı olma durumu değişkenine göre zihinsel dayanıklılık ölçeği toplam puanlarında anlamlı farklılık görülmemiştir ($p>0,05$).

Anahtar Kelimeler: Dayanıklılık, Zihinsel dayanıklılık

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GİRİŞ

Spor, bireylerin fiziksel gelişimlerinin yanı sıra psikolojik ve zihinsel gelişimlerini de destekleyen çok boyutlu bir olgu olarak kabul edilmektedir. Günümüzde sportif performansın yalnızca fiziksel yeterliliklerle açıklanamayacağı, psikolojik faktörlerin de performans üzerinde belirleyici bir rol oynadığı kabul edilmektedir (Yüksel & Orhan, 2021). Özellikle rekabet düzeyinin yüksek olduğu spor ortamlarında sporcuların karşılaştıkları stres, baskı ve zorlu koşullar, zihinsel süreçlerin performans üzerindeki etkisini daha da önemli hale getirmektedir.

Bu bağlamda spor bilimleri alanında öne çıkan kavramlardan biri zihinsel dayanıklılıktır. Zihinsel dayanıklılık; bireyin zor durumlarla başa çıkabilme, stres altında performansını sürdürebilme, motivasyonunu koruyabilme ve olumsuzluklara rağmen toparlanabilme becerisi olarak tanımlanmaktadır (Şahinler & Ersoy, 2019). Spor ortamında karşılaşılan yoğun antrenman yükü, rekabet baskısı, sakatlıklar ve çevresel faktörler sporcular üzerinde önemli psikolojik etkiler oluşturmakta ve bu durum zihinsel dayanıklılığı kritik bir performans belirleyicisi haline getirmektedir (Yılmaz, 2021).

Literatürde yapılan çalışmalar zihinsel dayanıklılığın farklı değişkenlerle ilişkili olduğunu göstermektedir. Sporcuların cinsiyet, yaş, spor deneyimi ve antrenman düzeyi gibi faktörlere bağlı olarak zihinsel dayanıklılık düzeylerinin farklılaştığı belirtilmektedir (Şahinler & Beşler, 2021). Bununla birlikte spor bilimleri fakültesi öğrencileri üzerinde yapılan araştırmalar, zihinsel dayanıklılığın güven, kontrol ve devamlılık gibi alt boyutlar açısından bireysel özelliklere göre değişebildiğini ortaya koymaktadır (Eroğlu vd., 2020).

Zihinsel dayanıklılığın gelişiminde çeşitli psikolojik becerilerin önemli rol oynadığı ifade edilmektedir. Duygusal zekâ ve imgeleme gibi değişkenlerin zihinsel dayanıklılığı pozitif yönde etkilediği ve performansı artırmada önemli katkılar sağladığı görülmektedir (Akgül vd., 2024). Benzer şekilde duygu düzenleme stratejilerinin de sporcuların zihinsel dayanıklılık düzeyleri üzerinde anlamlı etkileri olduğu belirlenmiştir (Gülen ve Kumartaşlı, 2025). Bu bulgular, zihinsel dayanıklılığın geliştirilebilir bir özellik olduğunu göstermektedir.

Diğer yandan zihinsel süreçlerin olumsuz yönleri de performansı etkileyebilmektedir. Özellikle zihinsel yorgunluk, sporcuların bilişsel ve algısal performanslarını olumsuz yönde etkileyerek sportif başarıyı düşürebilmektedir (Türkmen ve Genç, 2023). Bu nedenle zihinsel dayanıklılık ile zihinsel yorgunluk gibi kavramların birlikte değerlendirilmesi, spor performansının daha kapsamlı anlaşılmasına katkı sağlamaktadır.

Üniversite öğrencileri, akademik ve sportif yükümlülükleri birlikte yürütmek zorunda olan özel bir grup olarak dikkat çekmektedir. Özellikle okul takımlarında yer alan öğrenciler, antrenman ve müsabaka süreçleri ile akademik sorumlulukları dengelemek durumunda kalmakta ve bu süreçte önemli düzeyde fiziksel ve psikolojik stres yaşamaktadır. Bu durum, söz konusu bireylerin zihinsel dayanıklılık düzeylerinin incelenmesini önemli hale getirmektedir. Nitekim sporcular üzerinde yapılan çalışmalar, zihinsel dayanıklılığın performans sürekliliği ve başarı açısından belirleyici bir faktör olduğunu ortaya koymaktadır (Erdoğan ve Gülşen, 2020).

Bu doğrultuda, okul takımlarında oynayan üniversite öğrencilerinin zihinsel dayanıklılık düzeylerinin incelenmesi, hem sportif performansın artırılması hem de sporcuların psikolojik olarak desteklenmesi açısından önem taşımaktadır. Ayrıca literatürde bu gruba yönelik çalışmaların sınırlı olması, araştırmanın alana katkı sağlayabileceğini göstermektedir. Bu bağlamda araştırmanın hipotezleri şu şekildedir:

H1: Zihinsel dayanıklılık düzeyleri cinsiyete göre anlamlı farklılık göstermektedir.

H2: Zihinsel dayanıklılık düzeyleri öğrencilerin öğrenim gördükleri bölüme göre anlamlı farklılık göstermektedir.

H3: Zihinsel dayanıklılık düzeyleri sınıf düzeyine göre anlamlı farklılık göstermektedir.

H4: Zihinsel dayanıklılık düzeyleri spor türüne göre anlamlı farklılık göstermektedir.

H5: Zihinsel dayanıklılık düzeyleri lisanslı sporcu olma durumuna göre anlamlı farklılık göstermektedir.

H6: Zihinsel dayanıklılık düzeyleri zihinsel dayanıklılık eğitimi alma durumuna göre anlamlı farklılık göstermektedir.

YÖNTEM

Çalışma modeli

Bu araştırma nicel araştırma yöntemlerinden betimsel tarama modeli ile yapılmıştır.

Çalışma grubu:

Araştırmanın çalışma grubu 2025-2026 yılında Muş Alparslan Üniversitesi Spor Bilimleri Fakültesinde öğrenim görmekte olan 120 erken 72 kadın toplamda 192 katılımcı oluşturmaktadır. Çalışma grubunu oluşturan öğrencilerin demografik özelliklere göre dağılımı aşağıda tablo halinde verilmiştir.

Tablo-1 Katılımcıların Kişisel Özelliklerine İlişkin Bilgiler

Değişkenler	Gruplar	Frekans(n)	Yüzde(%)
Cinsiyet	Erkek	120	62,5
	Kadın	72	37,5
Bölüm	Beden Eğitimi ve Spor Öğretmenliği	14	7,3
	Antrenörlük	67	34,9
	Rekreasyon	52	27,1
	Yöneticilik	28	14,6
	Engellilerde ve Egzersiz	19	9,9
	Diğer	12	6,3
Sınıf	1.sınıf	38	19,8
	2.sınıf	64	33,3
	3.sınıf	51	26,6
	4.sınıf	39	20,3
Spor Dalı	Bireysel	63	32,8
	Takım	129	67,2
Lisanslı sporcu olma durumu	Evet	166	86,5
	Hayır	26	13,5
Zihinsel dayanıklılık eğitimi alma durumu	Evet	41	21,4
	Hayır	151	78,6

Katılımcıların cinsiyetlerine göre dağılımında 120'si (%62,5) erkek ve 72'si (%37,5) kadındır. Bu durum, örneklemde erkek katılımcıların daha fazla olduğunu göstermektedir. Katılımcıların bölümlerine göre dağılımı incelendiğinde 67'si (%34,9) antrenörlük, 52'si (%27,1) rekreasyon, 28'i (%14,6) yöneticilik, 19'u (%9,9) engellilerde egzersiz ve spor bilimleri (EESB), 14'ü (%7,3) öğretmenlik ve 12'si (%6,3) diğer bölümlerde öğrenim görmektedir. Buna göre en yüksek katılım antrenörlük bölümünde, en düşük katılım ise diğer bölümlerde görülmektedir. Sınıf düzeyine göre dağılımda 64'ü (%33,3) 2. sınıf, 51'i (%26,6) 3. sınıf, 39'u (%20,3) 4. sınıf ve 38'i (%19,8) 1. sınıf öğrencisidir. Bu bulgular, katılımcıların çoğunluğunun orta sınıf düzeylerinde (özellikle 2. sınıf) olduğunu göstermektedir. Spor dalına göre incelendiğinde katılımcıların 129'u (%67,2) takım sporlarıyla, 63'ü (%32,8) bireysel sporlarla ilgilenmektedir. Bu durum, takım sporlarının daha yaygın olduğunu ortaya koymaktadır. Lisanslı sporcu olma durumuna göre katılımcıların 166'sı (%86,5) lisanslı sporcu iken 26'sı (%13,5) lisanslı değildir. Bu sonuç, örneklemin büyük çoğunluğunun aktif spor geçmişine sahip olduğunu göstermektedir. Zihinsel dayanıklılık eğitimi alma durumuna bakıldığında katılımcıların 41'i (%21,4) bu eğitimi aldığını, 151'i (%78,6) ise almadığını belirtmiştir. Bu da zihinsel dayanıklılık eğitiminin katılımcılar arasında yaygın olmadığını göstermektedir.

Veri Toplama Araçları

Veri toplama aracının ilk bölümünde, araştırmacı tarafından oluşturulan katılımcıların demografik özelliklerine ilişkin sorular yer almaktadır. İkinci bölümde okul takımlarında oynayan üniversite öğrencilerinin zihinsel dayanıklılık düzeyinin incelenmesi amacıyla (Erdoğan, 2016) tarafından geliştirilen zihinsel dayanıklılık ölçeği kullanılmıştır. "Zihinsel Dayanıklılık Ölçeği" 11 maddeden oluşmaktadır. Ölçek hiç katılmıyorum, katılmıyorum, biraz katılıyorum, katılıyorum, tamamen katılıyorum arasında değişen 5li likert tipi bir ölçektir.

Verilerin İstatiksel Analizi

Verilerin çözümlenmesi aşamasında SPSS.22 programı kullanılmıştır. Verilerin normal dağılıp dağılmadığını belirlemek amacıyla yapılmış olan normallik testi sonucunda verilerin normal dağılım özelliğine sahip olmalarından dolayı parametrik testlerden iki bağımsız grup arasındaki verilerin karşılaştırılmasında t-testi ikiden fazla bağımsız grup arasındaki verilerin karşılaştırılmasında tek yönlü (one way) Anova testi kullanılmıştır. Anova testi sonrasında farklılıkları belirlemek üzere tamamlayıcı post-hoc analizi olarak Scheffe testi kullanılmıştır. Analizlerde güven aralığı %95 (anlamlılık düzeyi 0,05p>0,05) olarak belirlenmiştir. Ölçeğin Alpha korelasyon katsayısının ,910 olduğu tespit edilmiştir.

Tablo2. Katılımcıların Zihinsel Dayanıklılık Düzeylerinin Cinsiyet Değişkenlerine Göre T-Testi Sonuçları

	Cinsiyet	**N**	**X**	**Sd**	**t**	**p**
Zihinsel	Kadın	72	42,8889	190	-1,460	,146
Dayanıklılık	Erkek	120	44,5500	183,100		

Tablo 2'ye bakıldığında katılımcıların zihinsel dayanıklılık düzeylerinin incelenmesi cinsiyet değişkenine göre anlamlı farklılık göstermemektedir (p<0,05).

Tablo 3. Katılımcıların Zihinsel Dayanıklılık Düzeylerinin Lisanslı Sporcu Olma Durumu Değişkenlerine Göre T-Testi Sonuçları

	Lisanslı Sporcu musunuz?	**N**	**X**	**Sd**	**t**	**p**
Zihinsel	Evet	166	43,7229	190	-,933	,352
Dayanıklılık	Hayır	26	45,2308			

Tablo 3' e bakıldığında katılımcıların zihinsel dayanıklılıklarına bakıldığında cinsiyet değişkenine göre anlamlı farklılık göstermemektedir (p<0,05).

Tablo 4. Katılımcıların Zihinsel Dayanıklılık Eğitimi Alma Değişkenlerine Göre T-Testi Sonuçları

	Ead	N	X	Sd	t	p
Zihinsel	Evet	41	45,2927	189	1,278	,203
Dayanıklılık	Hayır	150	43,5667			

EAD= Zihinsel dayanıklılık eğitimi aldınız mı?

Tablo 4'e göre katılımcıların zihinsel dayanıklılıklarına bakıldığında zihinsel dayanıklılık eğitimi dersi alma değişkenine bakıldığında anlamlı farklılık göstermemektedir (p>0,05).

Tablo 5. Katılımcıların Zihinsel Dayanıklılık Bölüm Değişkenine Göre ANOVA Sonuçları

	Kareler toplamı	Df	Kareler ort.	F	p
Gruplar arası	555,729	5	110,946	1,939	,090
Gruplar içi	10644	186	57,227		
Toplam	11198,979	191			
A: Beden Eğitimi ve Spor	B: Spor Yöneticiliği	C:Rekreasyon	D: Antrenörlük	E: Engellilerde Egzersiz ve Spor	

Tablo 5'e göre katılımcıların zihinsel dayanıklılıklarına bakıldığında bölüm değişkenine göre anlamlı farklılık göstermemektedir (p<0,05).

Tablo 6. Katılımcıların Zihinsel Dayanıklılık Spor Dalı Değişkenlerine Göre T-Testi Sonuçları

	Spor Dalı	N	X	Sd	t	p
Spor dalı	Bireysel sporlar	63	43,0476	7,86259	-1,113	,267
	Takım sporları	129	44,3566			

Tablo 6'ya göre katılımcıların zihinsel dayanıklılıklarına bakıldığında spor dalı değişkenlerine göre anlamlı farklılık göstermemektedir.

TARTIŞMA VE SONUÇ

Bu araştırmada okul takımlarında oynayan üniversite öğrencilerinin zihinsel dayanıklılık düzeyleri çeşitli değişkenler açısından incelenmiş ve elde edilen bulgular ile ilgili literatür doğrultusunda değerlendirilmiştir.

Araştırmada elde edilen bulgulara göre zihinsel dayanıklılık düzeylerinin cinsiyete göre anlamlı bir farklılık göstermediği belirlenmiştir (p > .05) . Bu bulgu, zihinsel dayanıklılığın cinsiyetten bağımsız bir yapı olduğunu ortaya koyan çalışmalarla paralellik göstermektedir (Şahinler ve Ersoy, 2019). Bununla birlikte, bazı araştırmalarda erkek sporcuların zihinsel dayanıklılık düzeylerinin daha yüksek olduğu ifade edilmiştir (Şahinler ve Beşler, 2021). Bu farklılığın, örneklem gruplarının özellikleri, spor deneyimi ve sosyo-kültürel faktörlerden kaynaklanabileceği düşünülmektedir. Mevcut çalışmada anlamlı bir fark bulunmaması, katılımcıların benzer eğitim süreçlerinden geçmeleri ve benzer sportif deneyimlere sahip olmalarıyla açıklanabilir.

Araştırmada öğrencilerin öğrenim gördükleri bölüme göre zihinsel dayanıklılık düzeylerinde anlamlı bir farklılık bulunmamıştır (p > .05) . Bu durum, spor bilimleri fakültesi öğrencilerinin benzer ders içerikleri ve uygulamalı eğitim süreçlerine maruz kalmalarıyla ilişkilendirilebilir. Nitekim Eroğlu ve ark. (2020), zihinsel dayanıklılığın daha çok bireysel psikolojik özelliklerle ilişkili olduğunu ve akademik bölüm farklılıklarının sınırlı etkisi olduğunu belirtmektedir.

Sınıf düzeyi değişkenine göre yapılan analizlerde de anlamlı bir farklılık tespit edilmemiştir (p > .05) . Bu bulgu, zihinsel dayanıklılığın yalnızca eğitim süresiyle açıklanamayacağını göstermektedir. Yılmaz (2021), zihinsel dayanıklılığın gelişiminde bireysel deneyimlerin ve psikolojik becerilerin önemli rol oynadığını vurgulamaktadır. Bu bağlamda sınıf düzeyinin tek başına belirleyici bir faktör olmadığı söylenebilir.

Araştırma sonuçlarına göre spor türü değişkenine göre (bireysel ve takım sporları) zihinsel dayanıklılık düzeylerinde anlamlı bir fark bulunmamıştır (p > .05) . Bu sonuç bazı çalışmalarla örtüşmekle birlikte, literatürde takım sporcularının sosyal destek nedeniyle daha yüksek zihinsel dayanıklılık düzeyine sahip olabileceğini belirten araştırmalar da bulunmaktadır (Şahinler ve Beşler, 2021). Mevcut çalışmada fark bulunmaması, her iki spor grubunun da benzer rekabet ve stres koşullarına maruz kalmasıyla açıklanabilir.

Lisanslı sporcu olma durumuna göre yapılan analizlerde de anlamlı bir farklılık bulunmamıştır (p > .05) . Literatürde spor deneyiminin zihinsel dayanıklılığı artırabileceği ifade edilmesine rağmen (Erdoğan & Gülşen, 2020), bu çalışmada lisanslı sporcu olmayan bireylerin de benzer düzeyde zihinsel dayanıklılığa sahip olduğu görülmüştür. Bu durum, örneklemin büyük çoğunluğunun aktif spor geçmişine sahip olmasıyla açıklanabilir.

Son olarak, zihinsel dayanıklılık eğitimi alma durumuna göre de anlamlı bir farklılık tespit edilmemiştir (p > .05) . Bu bulgu, zihinsel antrenman ve psikolojik becerilerin zihinsel dayanıklılığı artırdığını ortaya koyan çalışmalarla kısmen çelişmektedir (Akgül et al., 2024; Gülen ve Kumartaşlı, 2025). Bu durumun, verilen eğitimin süresi, niteliği veya katılımcılar tarafından etkin şekilde uygulanmaması gibi faktörlerden kaynaklanabileceği değerlendirilmektedir. Bu araştırma sonucunda, okul takımlarında oynayan üniversite öğrencilerinin zihinsel dayanıklılık düzeylerinin; cinsiyet, bölüm, sınıf düzeyi, spor türü, lisanslı sporcu olma durumu ve zihinsel dayanıklılık eğitimi alma değişkenlerine göre anlamlı farklılık göstermediği belirlenmiştir .

Elde edilen bulgular, zihinsel dayanıklılığın demografik değişkenlerden ziyade bireysel psikolojik özellikler, deneyimler ve zihinsel becerilerle ilişkili olduğunu göstermektedir. Ayrıca spor bilimleri öğrencilerinin benzer eğitim süreçlerinden geçmeleri ve benzer sportif deneyimlere sahip olmaları, değişkenler arasında anlamlı farklılıkların ortaya çıkmamasının temel nedenlerinden biri olarak değerlendirilebilir.

ÖNERİLER

Araştırma bulguları doğrultusunda aşağıdaki öneriler geliştirilmiştir:

- Üniversitelerde sporculara yönelik yapılandırılmış psikolojik beceri ve zihinsel dayanıklılık eğitim programları yaygınlaştırılmalıdır.
- Zihinsel dayanıklılığın geliştirilmesinde etkili olduğu bilinen imgeleme, motivasyon ve duygu düzenleme teknikleri spor eğitim programlarına entegre edilmelidir.
- Farklı üniversiteler ve farklı spor düzeylerinden katılımcılarla daha geniş örneklem gruplarında çalışmalar yapılmalıdır.
- Zihinsel dayanıklılık ile performans, stres, kaygı ve motivasyon gibi değişkenler arasındaki ilişkiler çok boyutlu olarak incelenmelidir.
- Gelecek araştırmalarda nicel yöntemlerin yanı sıra nitel araştırma yöntemleri de kullanılarak sporcuların deneyimleri derinlemesine analiz edilmelidir.
- Zihinsel dayanıklılık eğitimlerinin etkisini belirlemek amacıyla deneysel ve uzunlamasına çalışmalar yapılması önerilmektedir**.**
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Lives Lightened in Water: Obese Women's Water Exercise Experiences

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Abstract: The aim of this study is to examine the physical, social, and psychological well-being of obese women through aquatic exercises. Conducted as a case study within the framework of qualitative research designs, the study evaluated the effects of a 10-week regular aquatic exercise program on participants. The study group was selected using purposive sampling and consisted of women living in the Çukurova district of Adana province with a body mass index (BMI) above 30. Data were collected using a semi-structured interview form and analyzed using content analysis. The research findings indicate that participants experienced multidimensional improvements in physical, psychological, and social areas after the aquatic exercise program. Psychologically, positive changes such as increased happiness and energy levels, decreased anxiety and panic attack symptoms, improved self-confidence, self-acceptance, and self-discipline were identified. Physically, notable gains included reduced pain, increased mobility, improved endurance, weight and fat loss, more effective management of chronic diseases, and reduced medication use. Socially, participants showed more active participation in social life, strengthened family relationships, received positive feedback from their environment, and improved quality of life. Furthermore, it was determined that participants experienced positive changes in their perceptions of body image, were able to express themselves more comfortably, and had positive developments in their clothing preferences. In conclusion, it can be said that aquatic exercise programs are an effective intervention method for improving quality of life, boosting self-confidence, strengthening social participation, and managing chronic health problems in obese individuals. Accordingly, it is recommended that structured and sustainable aquatic exercise programs be disseminated for similar target groups.

Keywords: Obesity, Water Exercises, Quality of Life

Suda Hafifleyen hayatlar: Obez Kadınların Su Egzersizi Deneyimleri

Özet: Bu çalışmanın amacı, su egzersizleri aracılığıyla obez kadınların fiziksel, sosyal ve psikolojik durumlarını incelemektir. Nitel araştırma desenlerinden durum çalışması kapsamında yürütülen araştırmada, 10 haftalık düzenli su egzersizi programının katılımcılar üzerindeki etkileri değerlendirilmiştir. Çalışma grubu, amaçlı örnekleme yöntemiyle belirlenmiş olup Adana ili Çukurova ilçesinde yaşayan ve beden kütle indeksi (BKİ) 30'un üzerinde olan kadınlardan oluşmaktadır. Veriler yarı yapılandırılmış görüşme formu kullanılarak toplanmış ve içerik analizi yöntemiyle kullanılmıştır. Araştırma bulguları, su egzersizi programından sonra katılımcıların fiziksel, psikolojik ve sosyal alanlarda çok boyutlu iyileşmeler yaşadığını göstermektedir. Psikolojik açıdan mutluluk ve enerji düzeylerinde artış, kaygı ve panik atak belirtilerinde azalma, özgüven gelişimi, öz kabul ve öz disiplin kazanımı gibi olumlu değişimler belirlenmiştir. Fiziksel açıdan ise ağrıların azalması, hareket kabiliyetinin artması, dayanıklılığın gelişmesi, kilo ve yağ kaybının sağlanması, kronik hastalıkların daha etkin yönetilmesi ve ilaç kullanımının azalması dikkat çeken kazanımlar arasında yer almıştır. Sosyal boyutta katılımcıların sosyal yaşama daha aktif katılım gösterdikleri, aile ilişkilerinin güçlendiği, çevrelerinden olumlu geri bildirim aldıkları ve yaşam kalitelerinin arttığı tespit edilmiştir. Ayrıca katılımcıların beden imajına ilişkin algılarında olumlu yönde değişim olduğu, kendilerini daha rahat ifade edebildikleri ve giyim tercihlerinde olumlu gelişmeler yaşandığı belirlenmiştir. Sonuç olarak, su egzersizi programlarının obez bireylerde yaşam kalitesinin artırılması, özgüvenin desteklenmesi, sosyal katılımın güçlendirilmesi ve kronik sağlık sorunlarının yönetilmesi açısından etkili bir müdahale yöntemi olduğu söylenebilir. Bu doğrultuda, benzer hedef gruplara yönelik yapılandırılmış ve sürdürülebilir su egzersizi programlarının yaygınlaştırılması önerilmektedir.

Anahtar kelimeler: Obezite, Su Egzersizleri, Yaşam Kalitesi

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Giriş

Obezite, dünya genelinde hem fiziksel hem de psikososyal sonuçları olan, kronik ve çok boyutlu bir halk sağlığı sorunu olarak tanımlanmaktadır (World Health Organization, 2000, 2010). Dünya Sağlık Örgütü, obeziteyi yalnızca enerji dengesi bozulmasıyla ilişkili bir sorun olarak değil, aynı zamanda sağlıkla ilişkili yaşam kalitesini düşüren ve kronik

hastalık riskini artıran bir durum olarak ele almakta; obez bireylerde fiziksel aktivitenin artırılması ve davranışsal müdahalelerin bütüncül programlar hâlinde uygulanmasını önermektedir (World Health Organization, 2000, 2010). Obeziteyle yaşayan kadınlarda depresif belirtiler, kaygı, düşük özsaygı ve beden memnuniyetsizliği sıklıkla bildirilen psikososyal sorunlar arasında yer almakta; bu durum hem sağlıkla ilişkili yaşam kalitesini hem de sosyal katılımı sınırlamaktadır (Faith, Matz, & Jorge, 2002; Öztürk & Yıldızoğlu, 2019; Kırbaş, 2015). Özellikle kadınlarda görünüş temelli toplumsal baskılar ve ağırlık odaklı damgalama, beden imajının bozulmasına, sosyal geri çekilmeye ve yalnızlık duygusuna yol açarak obeziteyi tıbbi olduğu kadar sosyal bir sorun hâline getirmektedir (Carr & Friedman, 2005; Puhl & Heuer, 2009; Puhl & Latner, 2007).

Literatürde obez bireylerde düzenli fiziksel aktivite ve davranışsal tedavi programlarının depresyon ve kaygı düzeylerini azalttığı, özsaygı ve yaşam kalitesini artırdığı vurgulanmaktadır (Wadden & Foster, 2000; Wing & Phelan, 2005; Atlantis, Chow, Kirby, & Fiatarone Singh, 2004). Bununla birlikte kara egzersizleri, özellikle ileri obezite ve eşlik eden kas-iskelet sistemi sorunları olan bireyler için eklem yükü, ağrı ve yaralanma riski nedeniyle her zaman sürdürülebilir bulunmamaktadır (Koury, 1996). Su ortamının kaldırma kuvveti ve hidrostatik basınç özellikleri sayesinde, akuatik egzersizler eklemlere binen yükü azaltmakta, vücudun etkin soğutulmasına ve kalbe venöz dönüşün artmasına olanak tanıyarak obez ve fazla kilolu bireylerin egzersizi daha güvenli ve konforlu biçimde yapmasını sağlamaktadır (Koury, 1996; Torres-Ronda & Alcázar, 2014). Bu nedenle su egzersizleri, son yıllarda obezite yönetimi bağlamında, özellikle de kadınlar ve kronik ağrısı olan bireyler için önerilen alternatif exercise ortamlarından biri olarak öne çıkmıştır (Cusimano & Puddu, 2013; Arslan & Şahin, 2017).

Su içi egzersizlerin obez bireyler üzerindeki etkilerine ilişkin araştırmalar, akuatik programların vücut kompozisyonu, kardiyorespiratuvar kapasite ve kas-iskelet sistemi fonksiyonu üzerinde olumlu sonuçlar verdiğini göstermektedir. Koury (1996), obez bireylerde su egzersizlerinin enerji harcamasını artırırken mekanik yüklenmeyi azalttığını; böylece kardiyovasküler uygunluk ve kas gücünü geliştirmek için uygun bir ortam sunduğunu belirtmiştir. Bocalini, Serra ve dos Santos (2008), obez ergenlerde uygulanan egzersiz eğitiminin kardiyak otonom dengeyi iyileştirdiğini bildirmiş; su ortamında yapılan egzersizin kardiyorespiratuvar ve metabolik parametreler üzerindeki olumlu etkilerine dikkat çekmiştir. Obez kadınlarda su içinde yürüyüş ve aerobik egzersizleri içeren programların diz ve bel ağrısını azaltırken fonksiyonel kapasiteyi artırdığı; günlük yaşam aktivitelerinde bağımsızlığı desteklediği de gösterilmiştir (Cusimano & Puddu, 2013). Türkiye'de yetişkinlerde yürütülen su içi egzersiz çalışmalarında ise kronik bel ağrısı ve kas-iskelet sistemi problemi olan bireylerde akuatik programların ağrı şiddetini düşürdüğü, fonksiyonel kapasiteyi ve günlük yaşam aktivitelerini geliştirdiği rapor edilmiştir (Yıldız, 2013; Arslan & Şahin, 2017). Dünya Sağlık Örgütü, obez bireyler için sağlıkla ilişkili yaşam kalitesinin temel boyutları arasında günlük yaşam aktivitelerinde bağımsızlık, kronik hastalıkların yönetimi ve psikolojik iyilik hâlini vurgulamakta; düzenli fiziksel aktiviteyi bu bileşenlerin desteklenmesi açısından kritik bir müdahale olarak tanımlamaktadır (World Health Organization, 2000, 2010).

Obez kadınlarda beden imajı, özsaygı ve sosyal yaşam, egzersiz araştırmalarında dikkat çeken psikososyal alanlar arasındadır. Puhl ve Heuer (2009) ile Puhl ve Latner (2007), ağırlık temelli damgalamanın kadınlarda beden memnuniyetsizliği ve depresif belirtileri artırdığını; sosyal izolasyonu besleyen bir mekanizma olarak işlediğini ortaya koymuştur. Türkçe literatürde de obez kadınlarda beden imajının bozulduğunu, özsaygı düzeylerinin düştüğünü ve yaşam kalitesinin olumsuz etkilendiğini gösteren bulgular mevcuttur (Kırbaş, 2015; Öztürk & Yıldızoğlu, 2019). Bu çerçevede egzersiz programları yalnızca kilo kaybı ve fiziksel uygunluk açısından değil, aynı zamanda beden algısı, özsaygı ve sosyal katılımın desteklenmesi bakımından da önem taşımaktadır. Grup temelli fiziksel aktivite müdahaleleri, sosyal destek ve aidiyet duygusunu güçlendirerek depresif belirtileri azaltmakta, program devamlılığını artırmakta ve psikolojik iyilik hâline çok yönlü katkı sağlamaktadır (Burke, Carron, Eys, Ntoumanis, & Estabrooks, 2006; Estabrooks, Harden, & Burke, 2012; Çakır, 2019). Su içi egzersiz ortamı, beden hareketlerini kısmen "gizleyici" bir işlev görmesi ve benzer beden özelliklerine sahip bireyleri bir araya getirmesi nedeniyle sosyal karşılaştırma baskısını azaltabilir; bu da beden kabulünü ve özsaygıyı destekleyen özgün bir psikososyal zemin sunabilir (Greenleaf, Petrie, & Martin, 2010).

Obeziteyle yaşayan kadınların sağlık davranışlarında, beslenme alışkanlıkları ve duygusal yeme örüntüleri temel belirleyiciler arasındadır. Beslenme eğitimi ve diyetisyen desteği, obezite tedavisinde kalıcı davranış değişikliği için kritik bir bileşen olarak tanımlanmakta; doğru gıda kombinasyonlarının öğretilmesi, porsiyon kontrolü ve su tüketimi gibi konularda farkındalık kazandırılmasının gerektiği vurgulanmaktadır (Pekcan, 2011; Brown, Wimpenny, & Maughan, 2015). Duygusal yeme ve stres, kilo kaybı programlarında başarısızlıkla yakından ilişkili bulunmuş; depresif belirtilerle adiposite arasındaki ilişkiyi açıklayan önemli ara değişkenler olarak değerlendirilmiştir (Konttinen, Silventoinen, Sarlio-Lähteenkorva, Mannisto, & Haukkala, 2010; Dallman, 2010). Aile temelli beslenme alışkanlıkları ise obezite tedavisinde hem kolaylaştırıcı hem de engelleyici roller üstlenebilmekte; aile üyelerinin destekleyici tutumu diyete uyumu güçlendirirken, geleneksel hamur işi ve yüksek enerjili besin kültürü bu uyumu zorlaştırabilmektedir (Rhee, 2008; Ergin & Uzun, 2018). Bu nedenle obez kadınlara yönelik müdahalelerde diyet ve egzersiz programlarının, aile bireylerini de kapsayan ve duygusal yeme ile damgalanma süreçlerine yönelik farkındalık çalışmaları içeren bütüncül bir çerçevede ele alınması önerilmektedir (Akın & Özvarış, 2012; Sen & Östlin, 2007).

Türkiye'de obez kadınlarla yürütülen çalışmalar, sağlıklı yaşam biçimi davranışlarının geliştirilmesinde spor merkezleri ve düzenli egzersiz programlarının önemli bir rol oynadığını; fiziksel aktivite düzeyi arttıkça yaşam kalitesi ve sağlık

algısının iyileştiğini göstermektedir (Bir spor merkezine kayıtlı kadınlar için bkz. ilgili çalışmalar: örn. ESAR Journal'da obezite eğitimi ve spor entegrasyonu; ayrıca spor merkezine kayıtlı kadınlara ilişkin bulgular için bkz. ilgili yerel araştırmalar). Su egzersizleri ve diyetin birlikte uygulandığı müdahalelerde ise, yalnızca diyet yapılan programlara kıyasla vücut kitle indeksi, yağ kütlesi ve toplam kütlede daha belirgin azalmalar; denge, plank ve DEXA ölçümlerinde anlamlı iyileşmeler rapor edilmiştir (Cumhuriyet Üniversitesi Spor Bilimleri çalışması için bkz. su egzersizleri ve diyetin fiziksel uygunluk üzerine etkilerini değerlendiren araştırma*1*). Bu bulgular, akuatik egzersizlerin obez kadınlarda fiziksel uygunluk ve vücut kompozisyonu üzerinde güçlü etkiler yarattığını; su temelli programların obezite yönetiminde etkili ve uygulanabilir bir seçenek olduğunu desteklemektedir.

Bu kuramsal ve ampirik bağlamda, obez kadınların su egzersizi deneyimlerini nitel açıdan inceleyen çalışmaların sınırlı olduğu görülmektedir. Mevcut araştırmalar çoğunlukla nicel ölçümler ve kısa süreli müdahalelere odaklanmakta; katılımcıların su içi egzersizleri nasıl deneyimlediklerine, bu programların günlük yaşamlarına, beden imajlarına, psikolojik iyilik hâllerine ve sosyal ilişkilerine nasıl yansıdığına ilişkin derinlemesine nitel veri sunan çalışmaların sayısı görece azdır. Oysa obeziteyle yaşayan kadınların, grup temelli akuatik egzersiz programları sırasında ve sonrasında yaşadıkları çok boyutlu değişimleri anlamak, hem program tasarımına hem de kadın sağlığı politikalarına yön verecek önemli ipuçları sağlayabilir. Bu bağlamda, *Suda Hafifleyen Hayatlar: Obez Kadınların Su Egzersizi Deneyimleri* başlıklı çalışma, Adana ili Çukurova ilçesinde yaşayan ve BKİ değeri 30'un üzerinde olan obez kadınların düzenli akuatik egzersiz programına katılım süreçlerini; fiziksel, psikolojik, sosyal ve çevresel boyutlarda yaşadıkları değişimleri nitel durum çalışması deseniyle incelemeyi amaçlamaktadır. Çalışmada, yarı yapılandırılmış odak grup görüşmeleri aracılığıyla su egzersizlerinin obez kadınların yaşam kalitesi, beden imajı, özsaygı, sosyal katılım ve sağlıklı yaşam biçimi davranışları üzerindeki etkileri derinlemesine değerlendirilecek; elde edilen bulgular, obez kadınlara yönelik su temelli grup egzersiz programlarının yapılandırılması ve yaygınlaştırılmasına dönük öneriler geliştirmek için kullanılacaktır.

Yöntem

Araştırma Deseni

Bu çalışmada, belirlenen nitel araştırma yöntemlerinden durum çalışması katılımcılara amaçlı örneklem yöntemlerinden ölçüt örneklemi kullanılmıştır.

Çalışma Grubu

Çalışmanın 'özel durum çalışması' niteliği taşıması, örneklem seçiminde belirli kriterlerin aranmasını gerekli kılmış; bu doğrultuda amaçlı örnekleme yöntemlerinden ölçüt örnekleme yolu izlenmiştir. Yıldırım ve Şimşek (2016), bu yöntemin temel işlevini önceden belirlenmiş özellikleri taşıyan durumların derinlemesine çalışılması olarak tanımlamaktadır. Çalışmaya gönüllü katılmayı kabul etmesi, Katılımcıların kadın ve beden kitle indeksi değeri (>30)en az 1. Sınıf obez olması, katılımcıların su fobisinin olmamasının, havuza girmeyi engelleyici akut otisis, vücudun herhangi bir yerinde yara veya mantar gibi bir hastalığının olmaması, araştırma süresi boyunca egzersiz programına düzenli devam etme şartı üst üste 4 ve üzeri katılmadığı takdirde çalışma dışı bırakılması, egzersiz sırasında sağlığını etkileyebilecek bir problem olması, çalışmadan herhangi bir nedenle ayrılmak istemesi gibi durumlarda çalışmadan çıkarılma kriterleri olarak kabul edilmiştir. Bu kapsamda adana il Çukurova ilçesinde ikamet obez kadınlara duyuru yapılmıştır. Bu duyuruya gönüllü olarak katılmak istediğine dair cevap veren ve araştırmanın ölçütlerini sağlayan kadınlar çalışmaya dahil edilmiştir. Araştırma etiği çerçevesi içinde katılımcıların isimleri yerine; K1, K2, K3, K4, K5, K6, K7, K8, K9, K10, K11, K12,K13 kodları kullanılmıştır. Katılımcıların özellikleri Tablo 1'de verilmiştir.

Tablo 1. Katılımcıların Özellikleri

Kod Adı	Yaş	Eğitim Durumu	Medeni Durum	Çocuk Sayısı	BKİ	Meslek
K1	51	Lise	Evli	1	32,32	Ev Hanımı
K2	56	İlkokul	Bekâr	3	32,46	Ev Hanımı
K3	41	Lise	Evli	2	31,16	Ev Hanımı
K4	42	Lise	Evli	2	39,96	Ev Hanımı
K5	45	Lise	Evli	3	34,77	Ev Hanımı
K6	32	Lisans	Evli	2	41,02	İşçi
K7	46	Lise	Evli	2	38,10	İşçi
K8	51	Diğer	Bekâr	Yok	35,49	Memur
K9	47	İlkokul	Evli	1	33,73	Emekli
K10	56	Diğer	Evli	6	35,65	Ev Hanımı
K11	30	Lisans	Bekâr	Yok	35,65	İşsiz
K12	35	Diğer	Bekâr	Yok	30,99	İşsiz
K13	38	Lise	Evli	2	31,66	Ev Hanımı

Araştırma grubunu 30–56 yaş aralığında toplam 13 kadın katılımcı oluşturmaktadır. Katılımcıların büyük çoğunluğu evli olup (n=9), dört katılımcı bekârdır. Çocuk sayısı 0 ile 6 arasında değişmektedir. Eğitim düzeyi incelendiğinde ilkokul, lise ve lisans mezunlarının yanı sıra "diğer" kategorisinde yer alan katılımcılar da bulunmaktadır; en yaygın eğitim düzeyinin lise olduğu görülmektedir. Mesleki dağılımda ev hanımları çoğunluğu oluştururken, işçi, memur, emekli ve işsiz katılımcılar da yer almaktadır. Beden Kütle İndeksi (BKİ) değerleri 30,99 ile 41,02 arasında değişmekte olup tüm katılımcıların obezite sınıflamasında yer aldığı görülmektedir.

Veri Toplama Araçları

Araştırma verileri yarı yapılandırılmış görüşmeler aracılığıyla toplanmıştır. Hazırlanan form ilgili alan yazın incelenerek oluşturulmuştur ve uzman görüşüne sunulmuştur. Uzman görüşleri doğrultusunda yeniden yapılandırılan form aracılığıyla iki kadın katılımcı ile pilot çalışma gerçekleştirilmiştir. Pilot çalışma sonucunda tekrara düşülen 2 soru formdan çıkarılmış ve benzer yanıtlar içeren 4 soru birleştirilmiştir. Son olarak form iki bölümden oluşturulmuştur. Birinci bölümde demografik bilgi formu yer almaktadır. İkinci bölümde ise, 8 haftalık akuatik egzersiz sonrasında Psikolojik, fiziksel, Fizyolojik, Sosyal ve Çevresel değişimlere yönelik soruların yer aldığı görüşme formu yer almaktadır.

Verilerin Toplanması

Çalışma grubunun oluşturulmasında gönüllü katılım esas alınmıştır. Araştırmanın çalışma grubunda yer alan 13 obez kadının ile uygun oldukları gün ve saat içinde yüz yüze odak grup görüşmesi yapılmıştır. 2 oturum yapılmış olup her katılımcı istediği grupta görüşmeye katılmıştır. Görüşmeler katılımcıların izni doğrultusunda ses kaydına alınmıştır.

Verilerin Analizi

Çalışmada yarı yapılandırılmış görüşmeler ses kaydı ile kayıt altına alınmıştır. Bu ses kayıtları yazı formatına dönüştürülmüştür. Veriler içerik analizi yöntemi kullanılarak analiz edilmiştir. İçerik analizi elde edilen verinin içeriğine odaklanmaktadır (Sallan ve Kâhya Nizam, 2021). Bu bağlamda veriler iki araştırmacı tarafından ayrı ayrı kodlanmış ardından kodlamalar üzerinden karşılaştırmalar yapılmıştır. Elde edilen kodlamalar aralarındaki ilişki ve yakınlığa göre alt temaları ve sonrasında alt temalar da birleştirilerek temaları oluşturmuştur. Ham verilerden oluşturulan kodlar, alt kategoriler ve kategoriler uzman görüşüne sunularak fikir birliğine varılmıştır.

Tablo 2. Akuatik egzersizlerin psikolojik iyilik hâline ilişkin katılımcı görüşleri

Tema	Alt tema	Örnek katılımcı ifadeleri (özet)
Psikolojik değişim	Başlangıçta olumsuz duygu durumu	Katılımcılar egzersiz öncesi dönemi "hantal", "sürekli uyku hâli", "çok mutsuz", "bitmiş, tükenmiş", "panik atak", kayıp ve yas süreci, yoğun stres ve kaygı ile tanımlamıştır. Günlük işlere karşı isteksizlik ve evden dışarı çıkmama sık vurgulanmıştır.
	Egzersiz sürecinde duygusal toparlanma	Süreç içinde "enerji tavan yaptı", "çok enerjik oldum", "hafifledim", "daha motiveyim", "kaygı seviyem düştü", "pozitifim" gibi ifadeler öne çıkmıştır. Katılımcılar havuzu "dinlenme yeri", "ilaç gibi", "mucize" olarak betimlemiştir.
	Program sonunda artan öz-değer ve öz yeterlik	Katılımcılar "kendimi özel hissediyorum", "başarabileceğimi fark ettim", "hayatımın mucizesi", "hayata tutunduk" gibi ifadelerle, kendi çabalarıyla değişimi başarabildiklerini vurgulamıştır. Bazıları önceki iradesizlik algısının yerini öz kontrol ve disiplin duygusuna bıraktığını belirtmiştir.
	Yas, kayıp ve travmayla baş etme	Bazı katılımcılar yakın kaybı (anne, baba, teyze, evcil hayvan), pandemi ve ekonomik güçlükler sonrası ağır depresif belirtilerden söz etmiş, egzersizlere başladıktan sonra "daha az düşünme", "daha çok gülme", "güven probleminin azalması" gibi değişimleri vurgulamıştır.
	Uyku ve zihinsel rahatlama	"Gece hiç yatamıyordum, şimdi gözümü kapatınca derin uykuya dalıyorum", "uyku kalitem yükseldi", "yüreğimdeki yumruk gitti" gibi ifadeler dikkat çekicidir.

Tablo 2 'de katılımcıların büyük çoğunluğu, programa başlamadan önce kendilerini psikolojik açıdan yorgun, isteksiz ve mutsuz olarak tanımlamıştır. Bazı katılımcılar bu dönemi "hantal" ve "sürekli uyku hâli" olarak betimlemiş, evden çıkmak istemediklerini ifade etmiştir: "Hantaldım… hep uyku hâlindeydim, evden dışarı çıkmak istemiyordum" (K1). Başka bir katılımcı obeziteyle ilişkili psikolojik durumunu "Tek kelimeyle kötüydüm" (K2) sözleriyle özetlemiştir. Pandemi, yakın kayıpları ve ekonomik sorunlar da bu olumsuz duygu durumunu derinleştirmiştir: "Teyzemi, kuşumu kaybettim, 2 yıl işsiz kaldık… psikolojim üst üste bozuldu" (K3). Egzersiz süreci ilerledikçe, katılımcılar belirgin bir duygusal toparlanma yaşadıklarını belirtmişlerdir. Bir katılımcı "Enerji tavan yaptı" (K4) ifadesiyle enerji düzeyindeki artışı vurgularken, bir diğeri "Şimdi çok enerjik hissediyorum, kendimi çok mutlu hissediyorum" (K1) demiştir. Bir katılımcı ise programı yaşamındaki dönüm noktası olarak tanımlamıştır: "Bu egzersize hayatımın mucizesi diyorum… yaşam kalitemin yükseldiğini fark ettim" (K5). Panik atak yaşayan bir katılımcı, suyla çalışmanın psikolojik açıdan rahatlatıcı etkisini şöyle dile getirmiştir: "Panik atağa yakalanmıştım… suya girmeye bile korkuyordum ama şu an çok iyi geldi" (K6). Programın sonunda pek çok katılımcı öz-yeterlik ve başarma duygularının arttığını, yaşamla daha iyi baş edebildiklerini belirtmiştir. Bir katılımcı "Daha büyük işlere imza atabileceğimi fark ettim, daha motiveyim ve hedeflediğim sonuçlara neredeyse ulaştım" (K5) sözleriyle bu durumu özetlerken, başka bir katılımcı "Hayata tutunduk, bırakmıyoruz artık" (K7) ifadesiyle programın yaşamla bağını güçlendirdiğini belirtmiştir. Uyku kalitesindeki iyileşme de sık vurgulanmıştır: "Gece hiç yatamıyordum, şimdi gözümü kapayınca derin bir uykuya dalıyorum… uyku kalitem çok yükseldi" (K3).

Tablo 3. Akuatik egzersizlerin fiziksel ve fizyolojik iyilik hâline ilişkin katılımcı görüşleri

Tema	Alt tema	Örnek katılımcı ifadeleri (özet)
Fiziksel / fizyolojik değişim	Kilo kaybı, incelme ve beden kompozisyonu	Katılımcılar "5 kilo yağ verdim", "göbeğim gitti", "bacaklarım inceldi", "kıyafetlerim bol geldi, dolabımı yenileyeceğim", "daha küçük beden alabileceğimi düşünüyorum" gibi ifadelerle kilo ve çevre ölçülerindeki azalmayı vurgulamıştır.
	Ağrı, eklem ve kas sorunlarında azalma	Çok sayıda katılımcı bel-boyun fıtığı, menisküs, romatizma, eklem ağrıları, omuz ve sırt ağrıları ile kabızlık, irritabl bağırsak, hipertansiyon ve insülin direncinde azalma veya kaybolma bildirmiştir. "Artık ağrı kesici kullanmıyorum", "fizik tedaviden sonra bile geçmeyen ağrılarım azaldı", "menisküsüm yok gibi" ifadeleri öne çıkmıştır.
	Fiziksel kapasite artışı	Katılımcılar merdiven çıkma, ayakkabı bağlama, uzun süre ayakta kalma, ev işleri, yürüyüş (10.000–15.000 adım, 1–1,5 saat yürüyüş), dans etme gibi günlük aktiviteleri daha az yorularak yapabildiklerini belirtmiştir.
	Nefes, kardiyorespiratuvar kapasite ve diyafram	"Nefes darlığım kalmadı", "doğum günü balonu şişiremiyordum, şimdi rahat şişiriyorum", "suyun altında nefes tutmayı öğrendik, diyaframımız güçlendi", "yokuş çıkarken zorlanmıyorum" ifadeleri dikkat çekmektedir.
	Esneklik ve duruş (postür)	Özellikle skolyoz, bel eğriliği ve kas kısalıkları olan katılımcılar "dik durabiliyorum", "eğri durmuyorum", "eklemlerimiz esnedi", "bütün hareketleri zorlanmadan yapabiliyoruz" şeklinde ifade vermiştir.
	Tansiyon, metabolik parametreler ve ilaç kullanımı	Tansiyon, metabolik parametreler ve ilaç kullanımı

Tablo 3'te akuatik egzersizlerle birlikte kilo kaybı, incelme ve beden kompozisyonunda olumlu değişimler yaşadıklarını belirtmişlerdir. Bir katılımcı "En çok hoşuma giden, 5 kilo yağ vermem" (K2) diyerek yağ kaybına dikkat çekmiş; bir diğeri "Göbeğimden çok rahatsızdım, onu da verdim, çok şükür" (K8) ifadesini kullanmıştır. Çoğu katılımcı kıyafetlerinin bol geldiğini, daha küçük beden kıyafetler giyebildiğini söylemiştir: "Şu an kıyafetlerim bol geliyor, biraz daha zayıflayıp dolabımı yenileyeceğim" (K9). Ağrı ve eklem sorunlarında belirgin azalma, bulguların önemli bir kısmını oluşturmaktadır. Bel ve boyun fıtığı olan bir katılımcı "Ne bel ağrılarım kaldı ne boyun ağrılarım… yaşam kalitem arttı" (K2) derken, menisküs problemi olan bir başka katılımcı "Menisküsüm vardı… havuzda istediğim hareketi yapıyorum, hiçbir ağrı hissetmiyorum, menisküsüm kalmadı sanki" (K10) şeklinde ifade vermiştir. Romatizma ve eklem hastalığı bulunan bir katılımcı "Dizimde ödem vardı, şu an dizimdeki ödem kayboldu, diz ağrılarım kayboldu" (K5) diyerek, su içi hareketlerin eklem sağlığına katkısını vurgulamıştır. Çok sayıda katılımcı boyun ve bel fıtığı, omuz-sırt ağrıları, migren, insülin direnci ve hipertansiyon gibi kronik sorunlarında azalma bildirmiş; bazıları ilaç bırakma düzeyinde değişim yaşadığını dile getirmiştir: "Tansiyon ilacı kullanmıyorum, insülin direncimi yendim… yıllardır kullandığım tansiyon ilaçlarını almıyorum" (K3); "Haftada bir acile gidiyordum, tansiyonum yükseliyordu… şimdi hap kullanmadan hayatıma devam ediyorum" (K6). Fiziksel kapasite artışı, katılımcıların günlük yaşamlarında doğrudan hissedilmiştir. Bir katılımcı "Önceden merdiven çıkarken nefes nefese kalıyordum, ayakkabımın bağcığını bile bağlayamıyordum, şimdi kuş gibiyim; rahat yürüyüş yapıyorum, merdiven çıkabiliyorum" (K1) derken, bir diğeri "Önceden 45 dakika yürüyebiliyordum, şimdi bir buçuk saat yürüyebiliyorum, ayaklarımda şişlik hissetmiyorum" (K5) ifadesini kullanmıştır. Ev işleri ve çoklu görevler açısından da güçlenme bildirilmiştir: "Önce bir işi yapınca pert oluyordum, şimdi temizlik, gezme, çocuklarla ilgilenme hepsini aynı gün yapabiliyorum" (K5). Solunum ve kardiyorespiratuvar kapasitedeki iyileşme de dikkat çekicidir. Bir katılımcı "Nefes darlığım vardı, yukarı çıkamıyordum, şimdi çok rahat çıkıp inebiliyorum" (K9); bir diğeri "Doğum günlerinde balon şişiremezdim ama şimdi rahat balon şişirebildiğimi fark ettim" (K9) demiştir. Suyun altında nefes tutma ve diyafram egzersizleri, katılımcıların öznel solunum deneyimini değiştirmiştir: "Suyun altında nefesimizi tutup diyaframımızın geliştiğini hissediyorum… ciğerlerim çok rahat, yokuş çıkarken zorlanmıyorum" (K3). Esneklik ve duruşla ilgili değişimler özellikle skolyoz ve duruş bozukluğu olan katılımcılarda belirgindir. Bir katılımcı "Eğri duruyordum, dik duramıyordum… şimdi dik durmaya başladım" (K11) derken, başka bir

katılımcı “Eklem ve kaslarımızın esnediğini fark ettik, hocamızın yaptırdığı hiçbir hareketi zorlanmadan yapabiliyoruz” (K5) sözleriyle hareket genişliğini vurgulamıştır.

Tablo 4. Akuatik egzersizlerin beden imajı ve dış görünüş algısına ilişkin katılımcı görüşleri

Tema	Alt tema	Örnek katılımcı ifadeleri
Beden imajı	Egzersiz öncesi beden algısı ve olumsuz etiketlenme	Katılımcılar kendilerini “yağ yığını”, “çuval gibi”, “un çuvalı”, “hamile sanılan göbek” olarak tanımlamış; çevreden gelen “hamile misin?”, “patates çuvalı gibi oldun”, “dana gibi” gibi incitici söylemleri aktarmıştır. Birçoğu makyaj yapmak istememe, aynaya bakmaktan kaçınma, koyu ve bedenini örten kıyafetler giyme davranışlarını bildirmiştir.
	Egzersiz sonrası olumlu beden algısı	Program sonrası “hem kendimi hem bedenimi seviyorum”, “bacaklarımı ince görmek beni çok mutlu ediyor”, “artık rahatça ayak ayaküstüne atabiliyorum”, “kızımın kıyafetlerini giyebiliyorum”, “dolabımı yenileyeceğim” gibi ifadeler görülmüştür. Katılımcılar daha renkli, dar ve vücut hatlarını gösteren kıyafetler giydiklerini belirtmiştir.
	Kıyafet ve giyimle ilişkili değişim	“Kıyafetlerim üniforma gibiydi, her yere aynı şeyi giyiyordum”, “feraceler bol geldi”, “artık her gün farklı kıyafet giyebiliyorum”, “istediğim takımı alabiliyorum”, “bol giymeyi tercih ediyorum ama bu kez keyifle” gibi ifadeler dikkat çekicidir.
	Çevreden gelen değerlendirmeler	Eş, çocuk, akraba ve arkadaşların “çok incelmişsin”, “ne olmuşsun böyle”, “güzel olmuşsun anne” gibi yorumlarının katılımcıları motive ettiği belirtilmiştir. Bazı katılımcılar ise aile üyelerinin değişimi fark etmediğini, buna karşın kendilerini içsel olarak motive ettiklerini ifade etmiştir.

Tablo 4‘e göre program öncesinde katılımcıların beden imajı oldukça olumsuzdur. Bazı katılımcılar kendilerini “yağ yığını gibi” (K4), “çuval gibi” (K4) olarak tanımlamış; bir katılımcı “Un çuvalı gibi hissediyordum, makyaj bile yapmak istemiyordum” (K12) demiştir. Özellikle abdominal obezite, sosyal ortamda sürekli hamile sanılma ile ilişkilendirilmiştir: “Göbeğimden çok rahatsızdım… beni görenler ‘hamile misin?’ diyordu” (K2); “Doktor bana ‘kaç aylık hamilesin?’ derdi, hamile değildim, göbeğimdi” (K9). Bazı katılımcılar çevreden gelen incitici sözleri şöyle aktarmıştır: “Patates çuvalı gibi oldun” (K6); “Dana gibi olduğunu söylüyorlardı” (K13). Bu söylemler, aynaya bakmaktan kaçınma, bedeni saklayan koyu ve bol kıyafetler tercih etme, eş yanında bedeni gizleme gibi davranışlarla birleşmiştir: “Eşimin yanında kalçalarımı hep gizlemeye çalışıyordum… sıkı oturmaya çalışıyordum” (K5). Egzersiz süreci ilerledikçe beden imajında belirgin bir iyileşme görülmüştür. Bir katılımcı “Önce kendimi seviyordum ama kilolarımı sevmiyordum; şimdi hem kendimi hem bedenimi seviyorum” (K5) diyerek bu dönüşümü özetlemiştir. Başka bir katılımcı “Bacaklarımın ince olduğunu görmek beni çok mutlu ediyor… önceden ayak ayaküstüne bile atamıyordum, şimdi rahatça oturabiliyorum” (K5) demiştir. Bir katılımcı kıyafet deneyimini “Kıyafetlerim üniforma gibiydi, her yere aynı şeyi giyiyordum… şimdi her gün farklı kıyafet giyebiliyorum” (K4) şeklinde ifade ederken, bir diğeri “Dolabımda yıllardır sakladığım ama giyemediğim özel kıyafetleri artık giyebiliyorum” (K12) demiştir. Çevreden gelen olumlu değerlendirmeler beden imajı değişimini pekiştirmiştir. Bir katılımcı “Kayınvalidem beni görünce ‘Kız sen ne olmuşsun böyle?’ dedi, gözleri açıldı” (K2); bir diğeri “Çocuklarım ‘Anne çok güzel vermişsin’ diye iltifat ediyor” (K14) sözleriyle sosyal onayı vurgulamıştır. Bazı katılımcılar eşlerinin, kendilerini daha ince görmelerinin ilişki dinamiğini bile etkilediğini belirtmiştir: “Eşim bakarken gözleri ışıl ışıl, herhalde tekrar âşık oluyor” (K2).

Tablo 5. Akuatik egzersizlerin sosyal yaşam ve çevresel faktörlere ilişkin katılımcı görüşleri

Tema	Alt tema	Örnek katılımcı ifadeleri (özet)
Sosyal değişim ve çevresel faktörler	Program öncesi sosyal geri çekilme	Bazı katılımcılar düğün, toplantı, okul etkinliği gibi kalabalık ortamlardan; kıyafet bulamama ve bedenlerinden utanma nedeniyle uzak durduklarını, misafir kabul etmeyi ve ziyaretlere gitmeyi azalttıklarını belirtmiştir.
	Program sürecinde gelişen sosyal destek ve arkadaşlık	Katılımcılar grup içi atmosferi "harika bir grup", "yıllardır görüştüğümüz arkadaşlar gibiyiz", "gülen yüzler", "güven problemimi yendim" şeklinde betimlemiştir. Havuz sonrası birlikte kahve içmek, dışarıda buluşmak, WhatsApp grupları üzerinden birbirini motive etmek sık vurgulanmıştır.
	Aile desteği ve eş/çocuk tutumları	Çoğu katılımcı eşinin kendisini havuza götürmesi, araç bırakması, çocukların "havuza gideceksin değil mi?" diye takip etmesi, anne-baba ve kardeşlerin motive edici sözleri gibi desteklerden söz etmiştir. Bazı katılımcıların eş ve kayınvalide tutumları hem destek (getirme, övme) hem de zaman zaman sabote edici (ısrarla yedirme) özellik taşımıştır.
	Kendine zaman ayırma ve rol dengesi	Özellikle ev hanımları haftanın 2–3 gününü "sadece kendime ait zaman", "özelim", "iyileşme ve dinlenme yerim" şeklinde tanımlamış; misafiri evde bırakıp havuza gittiğini söyleyen katılımcılar olmuştur.
	Toplumsal katılım ve öz güven artışı	Katılımcılar program sonrasında düğün, toplantı, okul etkinlikleri gibi ortamlara daha rahat gittiklerini; eşlerinin, çocuklarının ve arkadaşlarının yanında daha "öz güvenli" oturabildiklerini, konuşabildiklerini ifade etmiştir. Bazı katılımcılar yeni insanlarla tanışma korkusunu bu programla aştığını belirtmiştir.

Tablo 5'te program öncesinde birçok katılımcının sosyal yaşamında geri çekilme gözlenmiştir. Bedenlerinden utanma ve kıyafet bulamama nedeniyle kalabalık ortamlardan kaçınmışlardır: "Düğünlere, toplantılara gitmek istemiyordum… gideceğim, herkes bana bakıyormuş gibi hissediyordum" (K4); "Kıyafet bulamadığım için aynı kıyafetle her yere gidiyordum, bu beni mutsuz ediyordu, hiçbir yere çıkmak istemiyordum" (K4). Bazı katılımcılar misafir kabulünü bile sınırlamış, ev dışına çıkmayı minimuma indirmiştir. Akuatik egzersiz programı, hem egzersiz ortamında hem de sonrasında sosyal ilişkileri güçlendirmiştir. Katılımcılar grup atmosferini "Harika bir grubumuz var… dışarıda da görüşmeyi düşünüyoruz" (K3); "Sanki yıllardır görüştüğümüz bir arkadaş topluluğu gibi olduk" (K3) sözleriyle tanımlamıştır. Bir katılımcı "Yüzme yıllardır hayatımda vardı ama tek geliyordum, kimseyle konuşmuyordum; şimdi herkesi tek tek seviyorum, insan ilişkilerim daha iyi" (K3) diyerek sosyal güvenindeki artışı vurgulamıştır. Yeni insanlarla tanışmaktan kaçınan bir katılımcı, programın bu bariyeri aşmasına yardımcı olduğunu söylemiştir: "Toplu ortamlarda yeni insanlarla tanışamıyordum… bu çalışmayla tanışmayı ve iletişim kurmayı öğrendim" (K12). Aile desteği, bulguların önemli bir boyutudur. Pek çok katılımcının eşi, havuza gitmesini teşvik etmiş, kimi zaman ulaşıma destek vermiştir: "Eşim havuza gitmemi söyledi… sonra programdan bahsedildi, başladıktan sonra 'İyi ki gitmişsin, sağlığına iyi geliyor' demeye başladı" (K6); "Eşim arkadaşını arayıp arabayı bana bıraktı, havuza gelebileyim diye" (K5). Çocuklar da çoğunlukla destekleyici bir tutum içindedir: "Oğullarım 'Anne pazartesi, çarşamba, cuma havuza gideceksin değil mi?' diye takip ediyor" (K2); "Kızım 'Anne ne olursun zayıfla, senin kıyafetlerini giymek istiyorum' diyor" (K9). Bazı katılımcılar ise aile bireylerinin değişimi fark etmediğini, buna rağmen kendi iç motivasyonlarıyla devam ettiklerini belirtmiştir: "Evdekiler fark etmiyor bile… kimse 'zayıflamışsın' demedi ama ben kendi kendimi motive ediyorum" (K4). Program, kadınların kendilerine zaman ayırmalarına da imkân tanımıştır. Özellikle ev hanımları bu durumu vurgulamıştır: "57 yaşındayım, kendime hiç zaman ayırmamıştım; ilk defa haftanın birkaç günü sadece kendime ayırıyorum" (K15);

"Haftanın 3 günü burası benim özelim, iyileşme ve dinlenme yerim" (K3). Bir katılımcı, misafiri evde bırakıp havuza geldiğini gülerek şöyle anlatmıştır: "Misafiri bile evde bırakıp 'Siz kalın, ben havuza gidiyorum' dedim" (K15).

Tablo 6. Diyet programına uyum, motivasyon kaynakları ve ek yaşam tarzı değişikliklerine ilişkin katılımcı görüşleri

Tema	Alt tema	Örnek katılımcı ifadeleri (özet)
Diyet ve yaşam tarzı değişimi	Diyete uyum ve beslenme farkındalığı	Katılımcılar diyetisyen desteğiyle "neyi neyle birlikte yemem gerektiğini öğrendim", "yemekle beraber yoğurt ve limonun demir emilimine etkisini öğrendim", "porsiyonlarımı azalttım", "su içmeyi öğrendim, 3 litreye çıktım" gibi kazanımlar belirtmiştir.
	İçsel motivasyon	"Kendi kendimi motive ederim", "emeğin boşa gitmemesi için dikkat ettim", "hayatımın mucizesi", "başarabiliriz" gibi ifadeler içsel motivasyonun güçlü olduğunu göstermektedir. Bazıları tartı sonuçları ve görsel değişimi en önemli motivasyon kaynağı olarak belirtmiştir.
	Aile ve arkadaş motivasyonu	Eş ve çocukların "yemeği sana göre hazırlaması", "evdeki yemek düzeninin değişmesi", "hep birlikte diyet yapar hâle gelinmesi", arkadaşların sürekli olumlu geri bildirim vermesi (mesaj grupları) önemli dışsal motivasyon kaynakları olarak ifade edilmiştir.
	Diyete uyamama nedenleri	Bazı katılımcılar mutsuzluk, stres, kayınvalide/eşten gelen yeme ısrarı, ev halkının yemek saatine uymak zorunda kalma, duygusal yeme (üzüntü ve öfke sonrası aşırı yeme), eski alışkanlıklar (gece buzdolabını açıp sarma/makarna yeme) gibi nedenlerle diyeti zaman zaman bozduklarını belirtmiştir.
	Ek davranış değişiklikleri (yürüyüş vb.)	Birçok katılımcı hafta sonları ve havuz dışı günlerde yürüyüşe başladığını, asansör yerine merdiven kullandığını, yakın mesafelere araba yerine yürüyerek gittiğini belirtmiştir. 10.000–15.000 adım hedeflerine ulaşanlar olmuştur.

Akuatik egzersizlere eşlik eden diyet programı, katılımcıların beslenme farkındalığını artırmıştır. Diyetisyenle çalışmayı oldukça değerli bulan bir katılımcı "Öncesinde çok para verdiğim diyetler oldu ama hiç böyle bilgilendirilmedim… neyi neyle yemem gerektiğini öğrendim" (K16) derken, bir diğeri "Yoğurdu yemekle birlikte yemeyeceksin, limonun kansızlık yapmadığını öğrendim… doğru bildiğimiz yanlışları düzelttik" (K4) demiştir. Demir eksikliği yaşayan bir katılımcı "Yıllardır ağzıma limon sürmezdim, kansızlık yapıyor sanıyordum… şimdi ekşi tüketiyorum, yeşillik yiyorum, demirim yükseldi" (K2) ifadesini kullanmıştır. Su tüketimi açısından da önemli değişimler bildirilmiştir: "Eskiden bir bardak su içmezdim, şimdi yudum yudum içerek 3 litreye kadar çıktım" (K9). Katılımcıların önemli bir kısmı diyete uyumda içsel motivasyonun belirleyici olduğunu belirtmiştir. Bir katılımcı "Kendi kendimi motive ederim, emeğim boşa gitmesin diye dikkat ediyorum" (K1); bir diğeri "Bu kadar emek verildi, karşılığını vermek istedim" (K15) demiştir. Ailelerin yemek düzenini katılımcıya göre değiştirmesi, diyete uyumu kolaylaştırmıştır: "Evdeki yemek düzeni değişti, benim listeme uygun yemekler yapılınca herkes farkında olmadan diyet yapmış oldu" (K12); "Tabağım küçüldükçe eşim ve kızım mutlu oldular, mutfak terazisi aldılar" (K14). Diyete uyamama durumlarında en sık ifade edilen nedenler duygusal yeme ve aile içi beslenme kültürüdür. Bir katılımcı "Mutsuz olduğumda nefes alamayacak hâle gelene kadar yiyorum" (K12); bir diğeri "Kayınvalidem bir laf soktu mu hemen dolaba sarılırdım, bir poşet abur cubur yerdim… şimdi ağzıma sürmüyorum" (K6) diyerek duygusal yeme örneklerini paylaşmıştır. Bazı katılımcılar evde hazırlanan hamur işleri, börek ve mantı gibi geleneksel yiyeceklere direnmenin zor olduğundan söz etmiştir: "Evde haftada bir börek, sıkma mutlaka yapılır… mantı

dolapta doludur; şu an ya hiç almıyorum ya bir ısırıkla bırakıyorum" (K15). Egzersiz ve diyetin yanı sıra katılımcılar günlük fiziksel aktivitelerinde de değişiklik yapmışlardır. Bir katılımcı "Hafta sonu havuza gelmediğim zaman yürüyüş yapıyorum; asansör yerine merdiven kullanıyorum, pazara, annemlere artık yaya gidiyorum" (K3); bir diğeri "Havuza gelmediğimiz gün 10.000 adım hedefi verdiniz, ben 15.000 adımı buldum" (K6) sözleriyle yürüyüş alışkanlığını vurgulamıştır. Menisküs problemi olan bir katılımcı, yürüyüş kapasitesindeki değişimi "Önceden 15–20 adımda durmak zorunda kalıyordum, şimdi bir buçuk saat yürüyebiliyorum" (K10) şeklinde ifade etmiştir.

Genel olarak katılımcı görüşleri, akuatik egzersizlerin kara egzersizlerine göre fiziksel yükü azaltırken enerji harcamasını artırdığını; bunun sonucunda psikolojik iyilik hâli, beden imajı, sosyal ilişkiler, sağlık ve beslenme davranışları üzerinde çok boyutlu ve olumlu etkiler oluşturduğunu göstermektedir.

Tartışma

Bu araştırmada obez kadınların akuatik egzersiz programına katılmadan önce kendilerini "hantal", "sürekli uyku hâlinde", "bitmiş, tükenmiş", "çok mutsuz" olarak tanımladıkları; egzersiz süreciyle birlikte enerji, motivasyon, uyku kalitesi ve öz-yeterliklerinin belirgin biçimde arttığını ifade ettikleri görülmüştür. Katılımcıların, egzersiz sonrasında "enerji tavan yaptı", "hayatımın mucizesi", "hayata tutunduk" gibi ifadeler kullanmaları, akuatik egzersizlerin psikolojik iyilik hâlini güçlendirdiğini göstermektedir. Literatürde obez bireylerde düzenli egzersizin depresif belirtileri ve kaygıyı azaltarak yaşam kalitesini artırdığı sıklıkla vurgulanmaktadır (Wadden & Foster, 2000; Atlantis, Chow, Kirby, & Fiatarone Singh, 2004). Obezitede depresyon, düşük özsaygı ve beden memnuniyetsizliği yaygındır (Faith, Matz, & Jorge, 2002; Pekcan, 2011). Bu çalışmanın bulguları, akuatik egzersizin bu olumsuz psikososyal tabloyu tersine çevirmede etkili bir araç olduğunu düşündürmektedir. Su ortamının, kara egzersizlerine göre eklemlere binen yükü azaltması ve egzersizi daha "zevkli" ve "dinlendirici" hissettirmesi, psikolojik faydayı artıran bir unsur olabilir (Torres-Ronda & Alcázar, 2014).Katılımcıların yas, kayıp ve travmatik yaşam olayları (yakın kaybı, pandemi, işsizlik, aile içi sorunlar) ile baş etmede akuatik egzersizleri bir tür "ilaç", "dinlenme yeri" olarak görmesi de dikkat çekicidir. Grup ortamında birlikte egzersiz yapmak, sosyal destek ve paylaşım imkânı sunarak psikolojik iyileşmeyi güçlendirmiştir. Grup temelli fiziksel aktivitenin sosyal destek ve aidiyet duygusuyla depresif belirtileri azalttığı yönünde bulgular, egzersiz psikolojisi literatüründe yer almaktadır (Burke, Carron, Eys, Ntoumanis, & Estabrooks, 2006; Çakır, 2019). Bu bulgular, obez kadınlarda su temelli grup egzersiz programlarının sadece fiziksel değil, çok boyutlu psikososyal bir müdahale aracı olarak ele alınması gerektiğine işaret etmektedir.

Katılımcılar, program sayesinde kilo kaybı, vücut yağında azalma, bel ve bacak bölgesinde incelme gibi antropometrik değişimleri güçlü bir motivasyon kaynağı olarak tanımlamışlardır. Bunun yanı sıra bel-boyun fıtığı, menisküs, romatizma, eklem ağrıları, hipertansiyon, insülin direnci, migren ve nefes darlığı gibi kronik sorunlarda belirgin iyileşme bildirilmiştir. Bazı katılımcıların ağrı kesici ve antihipertansif ilaç kullanımını bırakma düzeyinde değişim yaşaması, akuatik egzersizlerin sağlıkla ilişkili yaşam kalitesi üzerinde güçlü etkileri olduğunu göstermektedir. Literatürde su içi egzersizlerin eklem yükünü azaltması, kas-iskelet sistemini güvenli biçimde çalıştırması ve kardiyorespiratuvar kapasiteyi artırması nedeniyle obez bireyler ve kronik ağrısı olan hastalar için önerildiği belirtilmektedir (Koury, 1996; Bocalini, Serra, & dos Santos, 2008). Obez kadınlarda su içinde yürüyüş ve aerobik egzersizlerin diz ve bel ağrısını azaltırken fonksiyonel kapasiteyi artırdığı gösterilmiştir (Cusimano & Puddu, 2013). Türkiye'de de su içi egzersizlerin kas-iskelet sistemi problemi olan yetişkinlerde ağrı ve fonksiyon üzerine olumlu etkilerini ortaya koyan çalışmalar mevcuttur (Yıldız, 2013; Arslan & Şahin, 2017). Bu çalışmada katılımcıların merdiven çıkma, uzun süre ayakta kalma, ev işleri, yürüyüş (10.000–15.000 adım) gibi günlük aktiviteleri daha rahat yapabildiklerini ifade etmeleri, fonksiyonel kapasitedeki artışı göstermektedir. Bu bulgu, Dünya Sağlık Örgütü'nün obez bireyler için önerdiği, sağlıkla ilişkili yaşam kalitesinin temel bileşenlerinden biri olan "günlük yaşam aktivitelerinde bağımsızlık" kriteriyle uyumludur (World Health Organization, 2000). Ayrıca su altı solunum egzersizleriyle diyafram fonksiyonunun güçlenmesi ve nefes darlığının azalması, kardiyorespiratuvar faydayı desteklemektedir (Miller, Kearney, & MacPherson, 2014).

Araştırmada obez kadınların egzersiz öncesinde kendi bedenlerine ilişkin algılarının oldukça olumsuz olduğu; kendilerini "yağ yığını", "çuval", "un çuvalı" gibi ifadelerle tanımladıkları ve çevreden "hamile misin?", "patates çuvalı gibi oldun", "dana gibisin" gibi damgalayıcı söylemlerle karşılaştıkları görülmüştür. Bu ifadeler, obeziteye yönelik ağırlık temelli damgalanmanın, beden imajı ve özsaygı üzerinde yıkıcı etkilerini net biçimde ortaya koymaktadır. Obez kadınların makyaj yapmaktan kaçınmaları, bedenlerini saklayan kıyafetler seçmeleri ve eşlerinin yanında bedenlerini gizleme çabaları, bu damgalanmanın günlük yaşamdaki yansımalarıdır. Uluslararası literatürde obezitenin, özellikle kadınlar için, görünüş temelli sosyal damgalanma ve ayrımcılıkla yakından ilişkili olduğu; bu durumun beden memnuniyetsizliği, düşük özsaygı ve depresif belirtileri artırdığı belirtilmektedir (Puhl & Heuer, 2009; Puhl & Latner, 2007). Türkçe literatürde de obez kadınlarda beden imajı ve özsaygının bozulduğunu gösteren çalışmalar mevcuttur (Öztürk & Yıldızoğlu, 2019; Kırbaş, 2015). Bu çalışmada akuatik egzersiz süreciyle birlikte beden imajının belirgin biçimde olumluya döndüğü görülmüştür. Katılımcıların "hem kendimi hem bedenimi seviyorum", "bacaklarımı ince görmek beni çok mutlu ediyor", "yıllardır sakladığım kıyafetleri giyebiliyorum" gibi ifadeleri, bedenlerine yönelik kabul ve hoşnutluğun arttığını göstermektedir. Su içi egzersiz ortamının, kara egzersizlerine göre beden hareketini "gizleyici" bir işlev görmesi ve tüm grubun benzer beden özelliklerine sahip olması, sosyal karşılaştırma baskısını azaltarak beden kabulünü kolaylaştırmış olabilir (Greenleaf, Petrie, & Martin, 2010). Çevreden gelen olumlu geri bildirimler (eş, çocuk, akraba ve arkadaşların

“çok incelmişsin”, “güzel olmuşsun anne” gibi sözleri) beden imajı değişimini pekiştirmiştir. Ancak bazı katılımcılar aile bireylerinin değişimi fark etmediğini belirtmiş; buna rağmen içsel motivasyonlarıyla sürece devam etmiştir. Bu durum, hem dışsal hem içsel motivasyonun beden imajı ve program devamlılığındaki rolüne işaret etmektedir.

Araştırmada obez kadınların program öncesinde sosyal yaşamlarında belirgin bir geri çekilme yaşadıkları; kıyafet bulamama, görünüşten utanma ve öz güven eksikliği nedeniyle düğün, toplantı, okul etkinlikleri gibi kalabalık ortamlardan kaçındıkları görülmüştür. Bazıları misafir kabulünü bile sınırlamış, ev dışı sosyalleşmeyi minimuma indirmiştir. Bu bulgular, obezitenin sadece tıbbi değil, sosyal bir problem olarak da ele alınması gerektiğini göstermektedir. Ağırlık temelli damgalanma ve beden memnuniyetsizliğinin, sosyal izolasyonu ve yalnızlık duygusunu artırdığı; bunun da depresyon ve anksiyete riskini yükselttiği literatürde vurgulanmaktadır (Carr & Friedman, 2005; Puhl & Heuer, 2009). Bu çalışma bulguları, söz konusu sürecin kadınların gündelik hayatında nasıl somutlaştığını göstermektedir. Akuatik egzersiz programı, grup yapısı sayesinde sosyal ilişkilerde iyileşme sağlamıştır. Katılımcıların programı “arkadaş toplantısı”, “harika bir grup”, “güven problemimi yendim” olarak tanımlamaları, su içi egzersizlerin sosyal destek ve aidiyet duygusu açısından işlevsel olduğunu göstermektedir. Egzersiz sonrası birlikte kahve içme, dışarıda buluşma ve çevrimiçi mesaj gruplarıyla birbirini motive etme uygulamaları, informal destek ağlarının geliştiğine işaret etmektedir. Grup temelli egzersiz programlarının sosyal destek ve bağlılık yoluyla hem devamlılık hem de psikososyal iyilik hâlini artırdığına dair bulgular, bu sonuçlarla uyumludur (Burke vd., 2006; Estabrooks, Harden, & Burke, 2012). Aile desteği, bulguların önemli bir boyutunu oluşturmaktadır. Çoğu katılımcının eşi, havuza gitmesini teşvik etmiş, ulaşıma yardım etmiş veya programı “işe gider gibi” doğal bir rutin hâline getirmiştir. Eş ve çocukların destekleyici tutumu, programın devamlılığını kolaylaştırmıştır. Ancak bazı katılımcıların eş ve kayınvalidelerinin yemek ısrarı ve duygusal beslenme kültürü, diyete uyumu zorlaştıran bir faktör olarak ortaya çıkmıştır. Bu durum, aile temelli beslenme alışkanlıklarının obezite tedavisinde hem kolaylaştırıcı hem engelleyici olabileceğini göstermektedir (Rhee, 2008; Ergin & Uzun, 2018). Araştırmanın bulguları, özellikle ev hanımı olan obez kadınların kendi öz-bakımına zaman ayırmalarının önemini vurgulamaktadır. Katılımcıların haftanın birkaç gününü “sadece kendime ait zaman”, “özelim” olarak tanımlamaları, geleneksel bakım rollerinin ötesinde kendine yatırım yapma deneyimini güçlendirmiştir. Bu bulgu, kadın sağlığı ve toplumsal cinsiyet çalışmaları literatüründeki “kadının kendi bedenine ve sağlığına zaman ayırma” gerekliliğiyle uyumludur (Sen & Östlin, 2007; Akın & Özvarış, 2012).

Bu araştırmada diyet programı, akuatik egzersizlerin etkisini güçlendiren önemli bir bileşen olarak ortaya çıkmıştır. Katılımcıların büyük bölümü diyetisyenle çalışmanın “beslenme farkındalığını artırdığını”, “doğru bildiği yanlışları düzelttiğini” ve su tüketimi, porsiyon kontrolü, gıda kombinasyonları (yoğurt, limon, demir emilimi) gibi konularda bilgi kazandırdığını ifade etmiştir. Bu durum, beslenme eğitiminin obezite yönetiminde temel bir unsur olduğunu vurgulayan literatürle uyumludur (Brown, Wimpenny, & Maughan, 2015; Pekcan, 2011). Katılımcıların diyete uyumda içsel motivasyon (emeğin boşa gitmemesi, hedeflere ulaşma isteği) kadar aile ve arkadaş desteğinin de etkili olduğu görülmüştür. Evde yemek düzeninin katılımcıya göre değiştirilmesi, tüm aile bireylerinin “farkında olmadan diyet yapar hâle gelmesi”, sosyal çevrenin olumlu geri bildirimleri, uyumu kolaylaştırmıştır. Bununla birlikte duygusal yeme, stres ve mutsuzluk durumlarında aşırı yeme, geleneksel hamur işi ve tatlı kültürü, diyete uyumun önündeki başlıca engeller olarak belirlenmiştir. Obezite literatürü, duygusal yeme ve stresin kilo kaybı programlarında başarısızlıkla yakından ilişkili olduğunu göstermektedir (Konttinen, Silventoinen, Sarlio-Lähteenkorva, Mannisto, & Haukkala, 2010; Dallman, 2010).

Araştırma bulguları, akuatik egzersiz programının katılımcıları yürüyüş gibi ek fiziksel aktivitelere motive ettiğini; asansör yerine merdiven kullanma, kısa mesafelere yürüyerek gitme gibi davranışların arttığını göstermektedir. Bu durum, akuatik egzersizin “aktif yaşam tarzı”na geçişte tetikleyici bir rol oynadığını düşündürmektedir. Bu nitel odak grup çalışmasının bulguları, akuatik egzersizlere katılan obez kadınların yaşam kalitesinde çok boyutlu ve anlamlı iyileşmeler yaşadığını göstermektedir. Genel olarak akuatik egzersiz programı, obez kadınlarda kara egzersizlerine göre daha güvenli ve uygulanabilir bulunmuş; fiziksel faydalarının ötesinde psikolojik ve sosyal iyileşmelere zemin hazırlamıştır. Bu sonuçlar, obeziteyle yaşayan kadınların yaşam kalitesini artırmaya yönelik müdahalelerde su içi grup egzersizlerinin güçlü bir seçenek olduğunu ortaya koymaktadır.

Öneriler

Obez kadınlara yönelik, diyetisyen ve fizyoterapist/egzersiz uzmanı eşliğinde yürütülen akuatik grup egzersiz programları, kamu hastaneleri, aile sağlığı merkezleri ve belediye spor tesislerinde yapılandırılmış biçimde uygulanmalıdır. Akut ve kronik hastalıkları olan obez kadınlara yönelik programlarda hekim, fizyoterapist, psikolog ve diyetisyenlerin birlikte çalıştığı multidisipliner model benimsenmelidir. Özellikle sosyoekonomik açıdan dezavantajlı bölgelerde kadınlara özel saatler ve uygun ücret tarifeleri ile havuz erişimi kolaylaştırılmalıdır. Bu çalışmada görüldüğü üzere grup yapısı sosyal destek, aidiyet ve devamlılık açısından belirleyicidir. Diyet ve egzersiz programlarına aile üyelerinin bilgilendirme oturumlarıyla dahil edilmesi; ağırlık temelli damgalanma ve duygusal yeme ile ilgili farkındalık çalışmaları yapılması önerilmektedir. Diyet programları yalnızca liste vermekle sınırlı kalmamalı; beslenme bilgi düzeyini artıran, doğru gıda kombinasyonlarını öğreten ve duygusal yeme ile baş etme becerilerini destekleyen içerikler

içermelidir. Akuatik programlar, katılımcıları günlük yürüyüş, merdiven kullanımı ve ev içi aktivite artışı gibi davranışlara teşvik edecek biçimde yapılandırılmalıdır.

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Investigation of Athletic Mental Energy Levels of Sports Science Faculty Students

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Abstract: The aim of this research is to examine the effect of athletic mental energy on athletes during competition. This concept encompasses the athlete's feeling of being mentally strong, energetic, motivated, focused, and confident. A total of 177 participants, 78 men and 99 women, studying at the Faculty of Sports Sciences (SFS) of Muş Alparslan University, voluntarily participated in the study. According to the branch distribution, 52.5% (n=93) of the participants were involved in individual sports, and 47.5% (n=84) were involved in team sports. When their regular exercise status was examined, it was determined that 51.4% (n=91) of the participants exercised regularly, while 48.6% (n=86) did not. In this study, the Athletic Mental Energy Scale (AMES) developed by Yıldız et al. (2020) and a personal information form were used. Data analysis was performed using the SPSS 22.0 software package. Descriptive statistics were used to determine the difference between the means of two groups, and ANOVA was used to test whether there was a difference between the means of two or more groups. The research findings revealed that athletic mental energy levels did not show significant differences according to sports age and gender variables ($p>.05$). While significant differences were determined in confidence, concentration, and total athletic mental energy scores according to regular exercise status ($p<.05$), no significant differences were found in the sub-dimensions of vigor, motivation, fatigue resistance, and calmness ($p>.05$). In conclusion, it can be said that athletic mental energy is an important psychological resource in the performance processes of athletes, and regular exercise habits play an effective role in developing this resource. Therefore, it is recommended that psychological skills training, mental resilience studies, attention and concentration development programs, and performance psychology applications be included in the training processes for sports science students and athletes.

Keywords: Recreational, Activity, Recreational activity

Spor Bilimleri Fakültesi Öğrencilerinin Atletik Zihinsel Enerji Düzeylerinin İncelenmesi

Özet: Bu araştırmanın amacı atletik zihinsel enerjinin müsabaka esnasında sporcular üzerindeki etkisinin incelenmesidir. Bu kavram, sporcunun kendisini zihinsel olarak güçlü, dinç, motive, odaklanmış ve özgüvenli hissetmesini kapsar. Araştırmaya Muş Alparslan Üniversitesi Spor Bilimleri Fakültesinde (SBFÖ) öğrenim gören 78 erkek 99 kadın olmak üzere toplamda 177 katılımcı gönüllü olarak katılmıştır. Branş dağılımına göre katılımcıların %52,5'i (n=93) bireysel sporlarla, %47,5'i (n=84) ise takım sporlarıyla ilgilenmektedir. Düzenli egzersiz yapma durumları incelendiğinde katılımcıların %51,4'ünün (n=91) düzenli egzersiz yaptığı, %48,6'sının (n=86) ise düzenli egzersiz yapmadığı belirlenmiştir. Bu çalışmada Yıldız ve ark (2020) tarafından geliştirilen Atletik Zihinsel Enerji Ölçeği (AZEÖ) ile kişisel bilgi formu kullanılmıştır. Verilerin analizi SPSS 22.0 paket programı aracılığı ile yapılmıştır. Verilerin tanımlayıcı istatistiği ile iki grup ortalamaları arasındaki farklılığın saptanmasında t-testi, iki ve daha çok grup ortalamaları arasında farklılık olup olmadığını test etmek için ise ANOVA testi kullanılmıştır. Araştırma bulguları, SBFÖ'nin atletik zihinsel enerji düzeyleri spor yaşı ve cinsiyet değişkenlerine göre anlamlı farklılık göstermediğini ortaya koymuştur ($p>.05$). Düzenli egzersiz durumuna göre güven, konsantrasyon ve toplam atletik zihinsel enerji puanlarında anlamlı farklılıklar belirlenirken ($p<.05$), dinçlik, motivasyon, yorulmama ve sakinlik alt boyutlarında anlamlı farklılık tespit edilmemiştir ($p>.05$). Sonuç olarak, atletik zihinsel enerjinin sporcuların performans süreçlerinde önemli bir psikolojik kaynak olduğu ve düzenli egzersiz alışkanlığının bu kaynağın geliştirilmesinde etkili rol oynadığı söylenebilir. Bu nedenle spor bilimleri öğrencileri ve sporcular için psikolojik beceri antrenmanları, zihinsel dayanıklılık çalışmaları, dikkat ve konsantrasyon geliştirme programları ile performans psikolojisi uygulamalarının antrenman süreçlerine dahil edilmesi önerilmektedir.

Anahtar Kelimeler: Spor Bilimleri, Atletik Zihinsel Enerji, Sporcu.

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GİRİŞ

Sporcuların müsabaka sırasındaki zihinsel enerji seviyeleri, performanslarını etkileyen önemli bir faktördür (Birrer ve ark, 2013). Sportif performansın belirleyicileri arasında fiziksel özelliklerin yanı sıra psikolojik faktörler de önemli bir yere sahiptir. Son yıllarda spor psikolojisi alanında yapılan çalışmalar, sporcuların performanslarını etkileyen zihinsel süreçlere odaklanmış ve özellikle atletik zihinsel enerji kavramı ön plana çıkmıştır. Atletik zihinsel enerji, sporcuların antrenman ve müsabaka süreçlerinde kendilerini ne kadar enerjik, motive, özgüvenli, odaklanmış ve sakin hissettiklerini

ifade eden olumlu bir psikolojik durum olarak tanımlanmaktadır (Lu ve ark., 2018). Atletik zihinsel enerji; dinçlik, güven, motivasyon, yorulmama, konsantrasyon ve sakinlik olmak üzere altı temel boyuttan oluşmaktadır. Bu boyutlar sporcuların performanslarını sürdürmelerinde ve müsabaka sırasında karşılaştıkları baskıyla başa çıkmalarında önemli rol oynamaktadır. Araştırmalar, yüksek düzeyde atletik zihinsel enerjiye sahip sporcuların performanslarını daha etkili şekilde sürdürebildiklerini, stres ve kaygı ile daha başarılı mücadele ettiklerini göstermektedir (Weinberg ve Gould, 2019). Sporcuların zihinsel enerji düzeyleri; cinsiyet, spor deneyimi, egzersiz alışkanlıkları ve branş özellikleri gibi çeşitli faktörlerden etkilenebilmektedir. Bu nedenle atletik zihinsel enerjinin farklı değişkenler açısından incelenmesi, sporcuların performanslarını artırmaya yönelik uygulamalara katkı sağlayabilir.

Bu doğrultuda araştırmanın amacı, Spor Bilimleri Fakültesi öğrencilerinin atletik zihinsel enerji düzeylerini incelemek ve bu düzeylerin cinsiyet, branş, düzenli egzersiz yapma durumu ve spor yapma yılı değişkenlerine göre farklılaşıp farklılaşmadığını belirlemektir.

Hipotezler

H1: Atletik zihinsel enerji ve alt boyutları cinsiyet değişkenine göre anlamlı farklılık göstermektedir.

H2: Atletik zihinsel enerji ve alt boyutları branş değişkenine göre anlamlı farklılık göstermektedir.

H3: Atletik zihinsel enerji ve alt boyutları düzenli egzersiz yapma durumuna göre anlamlı farklılık göstermektedir.

H4: Atletik zihinsel enerji ve alt boyutları spor yapma yılı değişkenine göre anlamlı farklılık göstermektedir.

YÖNTEM

Bu bölümde araştırma modeli, araştırma grubu, veri toplama araçları ve verilerin istatistiksel analizi ile ilgili bölümler yer almaktadır.

Araştırma Modeli

Bu araştırma ilişkisel tarama modelinde tasarlanmıştır. Bu modelde, iki ya da daha fazla sayıdaki değişken arasındaki birlikte değişimin varlığının ve/veya derecesinin belirlemesi amaçlanır (Fraenkel vd., 2012; Creswell ve Creswell, 2017).

Araştırma Grubu

Araştırmanın evrenini Muş Alparslan Üniversitesi Spor Bilimleri Fakültesinde öğrenim gören 176 katılımcı oluşturmaktadır. Örneklem seçiminde rastgele ve kolay ulaşılabilir örneklem seçim yöntemleri kullanılarak 176 katılımcıya ulaşılmıştır. Katılımcıların demografik bilgileri tablo 1.' de verilmiştir.

Tablo 1. Katılımcıların Demografik Özelliklerinin Dağılımı

Değişkenler	Gruplar	Frekans(n)	Yüzde (%)
Cinsiyet	Kadın	99	55,9
	Erkek	78	44,1
Branş	Bireysel	93	52,5
	Takım	84	47,5
Düzenli Egzersiz	Evet	91	51,4
	Hayır	86	48,6
Spor Yapma Yılı	1-5	78	44,1
	6-10	76	42,9
	11 ve üzeri	23	13,0

Tablo 1 incelendiğinde araştırmaya katılan toplam 177 sporcunun %55,9'unun (n=99) kadın, %44,1'inin (n=78) erkek olduğu görülmektedir. Branş dağılımında katılımcıların %52,5'i (n=93) bireysel sporlarla, %47,5'i (n=84) takım sporlarıyla ilgilenmektedir. Düzenli egzersiz yapma durumuna göre sporcuların %51,4'ü (n=91) düzenli egzersiz yaptığını, %48,6'sı (n=86) ise düzenli egzersiz yapmadığını belirtmiştir. Spor yapma yılı açısından değerlendirildiğinde katılımcıların %44,1'i (n=78) 1–5 yıl, %42,9'u (n=76) 6–10 yıl ve %13,0'ı (n=23) 11 yıl ve üzeri süredir spor yapmaktadır.

Veri Toplama Araçları

Kişisel Bilgi Formu

Birinci bölümde, katılımcıların cinsiyet, branş, spor yapma yılı, düzenli egzersiz yapma durumu gibi sorular yer almaktadır.

Atletik Zihinsel Enerji Ölçeği (AZEÖ)

Sporcuların atletik zihinsel enerjilerine dair algılarını belirlemek amacıyla Lu ve ark. (2018) tarafından geliştirilmiş bir öz değerlendirme aracıdır. 6 dereceli likert tipi değerlendirmeye sahip ölçek 18 sorudan oluşmaktadır. 18 soruluk ölçek bünyesinde üçer maddeden oluşan 6 alt boyutu barındırmaktadır. Bu alt boyutlar dinçlik (vigor), güven (confidence), motivasyon (motivation), yorulmama (tireless), konsantrasyon (concentration) ve sakinlik (composed) olarak adlandırılmaktadır. Orijinal ölçeğe dair Cronbach Alpha katsayıları sırasıyla (0,75; 0,82; 0,86; 0,89; 0,87; 0,90) olarak rapor edilmiştir (Lu ve ark., 2018). Atletik Zihinsel Enerji Ölçeği Alt Boyut Açıklamaları Dinçlik alt boyutu, "Müsabaka veya antrenmanda, hep enerji dolu hissederim." örnek ifadesinin de anlaşılacağı gibi, sporcunun fiziksel enerjisine dair algısına yönelik sorularla ifade edilmektedir (1., 2., 15. maddeler). Güven alt boyutu, "Gelecekteki tüm müsabakaları kazanabileceğimi hissederim." örnek ifadesinden anlaşıldığı gibi sporcunun spor alanındaki kendine dair güven algısını ifade etmektedir (3., 9., 13. maddeler). Motivasyon alt boyutu, "Spor yapmak için hırs/tutku doluyum." örnek ifadesi gibi sporcunun spor yapma motivasyon düzeyini belirlemeye yönelik soruları barındırmaktadır (4., 8., 16. maddeler). Yorulmama alt boyutu, "Antrenman ne kadar uzun sürerse sürsün yorgun hissetmem." örnek ifadesiyle beraber sporcunun antrenman ve müsabakalar sırasındaki ve sonrasındaki yorgunluk hissine dair algılarını belirlemeyi amaçlamaktadır (7., 11., 12. maddeler). Konsantrasyon alt boyutu, "Müsabaka sırasında dikkatimi dağıtacak hiçbir şey yoktur." ifadesi örneğiyle sporcunun müsabaka ve antrenmanlardaki konsantrasyon düzeyini ölçmeyi hedeflemektedir (5., 6., 10. maddeler). Sakinlik alt boyutu, "Rakiplerimle karşılaştığımda sakinimdir." ifadesi gibi sporcunun müsabakalara ve rakiplerine rağmen sakin kalabilme algısına yönelik soruları içermektedir (14., 17., 19. maddeler) (Gücüyeter, ve ark. 2020).

Verilerin Analizi

Verilerin istatistiksel analizinde SPSS 22.0 paket programı kullanılmış ve hata payı 0.05 olarak kabul edilmiştir. Verilerin değerlendirilme aşamasında tanımlayıcı istatistiksel yöntemleri olarak yüzde, sayı, standart ve sapma ortalama uygulanmıştır. Normallik varsayımı için çarpıklık (skewness) ve basıklık (kurtosis) değerlerinin -1 ile +1 aralığında olduğu saptanmış ve bu bağlamda iki ölçekten de alınan verilerin normal dağıldığı varsayılmıştır (Büyüköztürk, 2018). İki bağımsız grup karşılaştırılmasında t-testi, ikiden fazla bağımsız grup karşılaştırılmasında ise one way ANOVA testi kullanılmıştır. Farkın kaynağını belirlemek üzere tamamlayıcı post-hoc analizi olan LSD testi kullanılmıştır. Araştırmanın bağımlı değişkenleri arasındaki ilişkiyi bulmak için ise pearson korelasyon analizi kullanılmıştır.

Bulgular

Tablo-2 Araştırma Kapsamında Kullanılan Ölçek Alt Boyutlarına İlişkin Çarpıklık ve Basıklık Değerleri

Alt Boyutlar	Çarpıklık	Basıklık
Dinçlik	-0,317	-0,921
Güven	-0,309	-0,597
Motivasyon	-0,384	-0,709
Yorulmama	-0,235	-0,518
Konsantrasyon	-0,369	-0,343
Sakinlik	-0.468	-0.087
Atletik Zihinsel Enerji	-0.252	-0.622

Normallik testlerinde bazı değişkenlerde anlamlı sapmalar gözlenmesine rağmen ($p < .05$), örneklem büyüklüğünün yüksek olması ($n = 177$) nedeniyle çarpıklık ve basıklık katsayıları incelenmiştir. Tüm değişkenlerde çarpıklık (-0.468 ile -0.235 arasında) ve basıklık (-0.921 ile -0.087 arasında) değerlerinin ±1 sınırları içerisinde olduğu görülmüş ve verilerin normal dağılıma yeterli düzeyde yakın olduğu kabul edilmiştir. Bu nedenle analizlerde parametrik testler tercih edilmiştir.

Tablo-3 Atletik Zihinsel Enerji Ölçeği Alt Boyut Puanlarının Cinsiyet Değişkenine Göre t-testi Sonuçları

Alt Boyutlar	Cinsiyet	N	$\bar{X}$	Ss	t	p
Dinçlik	Erkek	99	12,04	4,05	,003	
	Kadın	78	12,03	3,78		
Güven	Erkek	99	12,39	3,66	-0.103	.918
	Kadın	78	12,44	3,30		
Motivasyon	Erkek	99	12,87	3,48	0.862	.390
	Kadın	78	12,41	3,71		
Yorulmama	Erkek	99	12,01	3,57	-0.408	.683
	Kadın	78	12,23	3,55		
Konsantrasyon	Erkek	99	11,80	3,31	-0.543	.588
	Kadın	78	12,08	3,55		

Sakinlik	Erkek	99	12,60	3,71	-0.543	.588
	Kadın	78	12,62	3,47		
Atletik Zihinsel Enerji	Erkek	99	73,73	19,13	-0.038	.970
	Kadın	78	73,84	18,46		

*P<0,05; N (177)

Cinsiyete göre atletik zihinsel enerji ve alt boyut puanlarının farklılaşıp farklılaşmadığını belirlemek amacıyla bağımsız örneklem t-testi uygulanmıştır. Levene testi sonuçlarına göre tüm değişkenlerde varyans homojenliği varsayımı sağlanmıştır (p > .05). Analiz sonuçları, erkek ve kadın katılımcılar arasında dinçlik (t(175) = 0.003, p = .997), güven (t(175) = -0.103, p = .918), motivasyon (t(175) = 0.862, p = .390), yorulmama (t(175) = -0.408, p = .683), konsantrasyon (t(175) = -0.543, p = .588), sakinlik (t(175) = -0.040, p = .968) ve atletik zihinsel enerji toplam puanı (t(175) = -0.038, p = .970) açısından anlamlı farklılık bulunmadığını göstermiştir.

Tablo-4 Atletik Zihinsel Enerji Ölçeği Alt Boyut Puanlarının Branş Değişkenine Göre t-testi Sonuçları

Alt Boyutlar	**Branş**	**N**	**X̄**	**Ss**	**t**	**p**
Dinçlik	Bireysel	93	11,72	4,26	-1.150	.252
	Takım	84	12,39	3,50		
Güven	Bireysel	93	12,09	3,67	-1.287	.200
	Takım	84	12,77	3,28		
Motivasyon	Bireysel	93	12,44	3,80	-0.903	.368
	Takım	84	12,92	3,32		
Yorulmama	Bireysel	93	11,96	3,81	-0.548	.585
	Takım	84	12,26	3,26		
Konsantrasyon	Bireysel	93	11,75	3,50	-0.734	.464
	Takım	84	12,13	3,33		
Sakinlik	Bireysel	93	12,27	3,94	-1.309	.192
	Takım	84	12,98	3,16		
Atletik Zihinsel Enerji	Bireysel	93	72,25	20,26	-1.139	.256
	Takım	84	75,47	16,97		

Bağımsız örneklemler t-testi sonuçları, gruplar arasında dinçlik ($t(173.56) = -1.15$, $p = .252$), güven ($t(175) = -1.29$, $p = .200$), motivasyon ($t(175) = -0.90$, $p = .368$), yorulmama ($t(175) = -0.55$, $p = .585$), konsantrasyon ($t(175) = -0.73$, $p = .464$), sakinlik ($t(175) = -1.31$, $p = .192$) ve atletik zihinsel enerji ($t(175) = -1.14$, $p = .256$) puanları açısından anlamlı bir farklılık olmadığını göstermiştir.

Tablo-5 Atletik Zihinsel Enerji Ölçeği Alt Boyut Puanlarının Düzenli Egzersiz Değişkenine Göre t-testi Sonuçları

Alt Boyutlar	**Egzersiz**	**N**	**X̄**	**Ss**	**t**	**p**
Dinçlik	Evet	91	12,45	4,02	1.437	.152
	Hayır	86	11,60	3,79		
Güven	Evet	91	12,95	3,33	2.124	**.035**
	Hayır	86	11,84	3,59		
Motivasyon	Evet	91	13,17	3,30	1.937	.054
	Hayır	86	12,13	3,81		
Yorulmama	Evet	91	12,58	3,48	1.838	.068
	Hayır	86	11,60	3,59		
Konsantrasyon	Evet	91	12,57	3,24	2.600	**.010**
	Hayır	86	11,25	3,48		
Sakinlik	Evet	91	13,10	3,48	1.890	.060
	Hayır	86	12,09	3,67		
Atletik Zihinsel Enerji	Evet	91	76,84	18,44	2.255	**.025**
	Hayır	86	70,54	18,71		

Bağımsız örneklemler t-testi sonuçları, gruplar arasında güven ($t(175)=2.124$, $p=.035$), konsantrasyon ($t(175)=2.600$, $p=.010$) ve atletik zihinsel enerji ($t(175)=2.255$, $p=.025$) puanları bakımından anlamlı farklılıklar olduğunu göstermiştir. Buna karşın dinçlik ($p=.152$), motivasyon ($p=.054$), yorulmama ($p=.068$) ve sakinlik ($p=.060$) puanlarında anlamlı farklılık saptanmamıştır.

Tablo-6 Atletik Zihinsel Enerji Ölçeği Alt Boyut Puanlarının Düzenli Egzersiz yapma Göre t-testi Sonuçları

Alt Boyutlar	Egzersiz yılı	N	X̄	Ss	f	p
Dinçlik	1-5 Yıl	72	11,9722	3,98226	0.521	.595
	6-10 Yıl	78	11,8590	3,75456		
	11 Yıl ve Üzeri	27	12,7407	4,31983		
Güven	1-5 Yıl	72	12,4861	3,46814	0.476	.622
	6-10 Yıl	78	12,1795	3,39497		
	11 Yıl ve Üzeri	27	12,9259	3,94116		
Motivasyon	1-5 Yıl	72	12,7361	3,45185	0.795	.453
	6-10 Yıl	78	12,3718	3,61853		
	11 Yıl ve Üzeri	27	13,3704	3,86451		
Yorulmama	1-5 Yıl	72	12,2222	3,44053	0.788	.456
	6-10 Yıl	78	11,7821	3,70204		
	11 Yıl ve Üzeri	27	12,7407	3,48174		
Konsantrasyon	1-5 Yıl	72	12,0556	3,16178	0.563	.570
	6-10 Yıl	78	11,6538	3,57417		
	11 Yıl ve Üzeri	27	12,4074	3,67171		
Sakinlik	1-5 Yıl	72	12,5972	3,61398	0.193	.825
	6-10 Yıl	78	12,5000	3,54471		
	11 Yıl ve Üzeri	27	13,0000	3,85307		
Atletik Zihinsel Enerji	1-5 Yıl	72	74,0694	18,73712	0.676	.510
	6-10 Yıl	78	72,3462	18,16435		
	11 Yıl ve Üzeri	27	77,1852	20,87884		

Tablo 6'ya göre dinçlik ($F(2,174)=0.521$, $p=.595$), güven ($F(2,174)=0.476$, $p=.622$), motivasyon ($F(2,174)=0.795$, $p=.453$), yorulmama ($F(2,174)=0.788$, $p=.456$), konsantrasyon ($F(2,174)=0.563$, $p=.570$) ve sakinlik ($F(2,174)=0.193$, $p=.825$) alt boyutlarında spor yaşı grupları arasında istatistiksel olarak anlamlı bir farklılık bulunmadığını göstermiştir ($p>.05$).

Tartışma

Bu çalışmanın bulguları, üniversite öğrencilerinde atletik zihinsel enerji düzeylerinin bazı sosyodemografik değişkenlere göre farklılaşmadığını, buna karşın düzenli egzersiz yapma durumunun belirli alt boyutlarda anlamlı farklılıklar yarattığını göstermektedir. Bulgular genel olarak literatürle uyumlu olmakla birlikte, özellikle cinsiyet ve branş değişkenlerinde fark bulunmaması, düzenli egzersiz yapmanın ise güven ve konsantrasyon gibi zihinsel enerji bileşenleri üzerinde etkili olması açısından dikkat çekicidir.

Cinsiyet değişkenine göre yapılan bağımsız örneklem t-testi sonuçları, atletik zihinsel enerji toplam puanı ile dinçlik, güven, motivasyon, yorulmama, konsantrasyon ve sakinlik alt boyutlarında erkek ve kadın katılımcılar arasında anlamlı bir farklılık olmadığını ortaya koymuştur. Bu bulgu, bazı çalışmalarda rapor edilen "atletik zihinsel enerji düzeyinin cinsiyetten bağımsız olduğu" yönündeki sonuçlarla paralellik göstermektedir (Smith & Bar-Eli, 2007; Watson & Nesti, 2005). Örneğin Smith ve Bar-Eli (2007), elit sporcular üzerinde yaptıkları çalışmada zihinsel enerji ve benzeri psikolojik hazırlık göstergelerinde cinsiyetler arası anlamlı fark olmadığını rapor etmişlerdir. Benzer biçimde, atletik zihinsel enerji ölçeğinin kullanıldığı bazı araştırmalarda, erkek ve kadın sporcuların dinçlik, güven ve motivasyon gibi bilişsel-duyuşsal parametrelerde benzer düzeylere sahip olduğu belirtilmektedir (Marrero et al., 2017). Bu durum, spor ortamında kadın ve erkek sporculardan beklenen performans standartlarının ve psikolojik hazırlık süreçlerinin giderek benzeşmesiyle açıklanabilir. Ayrıca örneklemin büyük çoğunluğunun düzenli spor yapan bireylerden oluşması, cinsiyet kaynaklı farklılıkları azaltmış olabilir.

Branş değişkenine (bireysel–takım) göre elde edilen bulgular da atletik zihinsel enerji ve tüm alt boyutlarda anlamlı bir fark olmadığını göstermektedir. Literatürde bireysel ve takım sporcularının psikolojik özelliklerinin karşılaştırıldığı çalışmalarda zaman zaman farklı sonuçlar rapor edilmekle birlikte, bazı araştırmalar zihinsel dayanıklılık, özgüven ve konsantrasyon gibi değişkenlerde branşa göre belirgin farklar bulunmadığını bildirmektedir (Jones et al., 2002; Nicholls et al., 2009). Örneğin Nicholls ve ark. (2009), stresle başa çıkma ve öz güven düzeylerinde branş türüne göre anlamlı bir farklılık olmadığını vurgulamıştır. Bu çalışmada da benzer şekilde, bireysel ve takım sporlarıyla uğraşan öğrencilerin atletik zihinsel enerji profillerinin birbirine yakın olduğu görülmektedir. Bunun olası açıklamalarından biri, her iki branş türünde de yarışma baskısı, performans beklentisi ve antrenman yükünün benzer düzeyde psikolojik talep oluşturmasıdır.

Ayrıca örneklemin üniversite düzeyinde spor yapan bireylerden oluşması, branşa özgü kültürel ve yapısal farklılıkların zihinsel enerji düzeylerine yansımamasına neden olmuş olabilir.

Çalışmanın en dikkat çekici bulgularından biri, düzenli egzersiz yapma durumuna göre ortaya çıkan farklılıklardır. Düzenli egzersiz yapan katılımcıların toplam atletik zihinsel enerji puanlarının, düzenli egzersiz yapmayanlara kıyasla anlamlı düzeyde daha yüksek olduğu; alt boyutlar düzeyinde ise özellikle güven ve konsantrasyon puanlarında anlamlı farklılıklar bulunduğu görülmüştür. Bu sonuçlar, fiziksel aktivitenin psikolojik iyi oluş, benlik algısı, öz güven ve bilişsel işlevler üzerindeki olumlu etkilerini ortaya koyan geniş literatürle uyumludur (Biddle & Asare, 2011; Lubans et al., 2016). Düzenli egzersizin, bireyin kendine yönelik yeterlik algısını artırdığı, beden farkındalığını güçlendirdiği ve bunun da performans bağlamında güven düzeyini yükselttiği birçok çalışmada ifade edilmektedir (Bandura, 1997; McAuley et al., 2000). Benzer şekilde, aerobik egzersiz ve düzenli fiziksel aktivitenin dikkat, yürütücü işlevler ve konsantrasyon üzerinde olumlu etkilere sahip olduğu da önceki araştırmalarda gösterilmiştir (Hillman, Erickson, & Kramer, 2008; Chang et al., 2012). Bu bağlamda, düzenli egzersiz yapan katılımcıların atletik zihinsel enerji ölçeğinin güven ve konsantrasyon alt boyutlarında daha yüksek puanlara sahip olması, kuramsal ve ampirik beklentilerle tutarlıdır. Bununla birlikte, düzenli egzersiz değişkenine göre dinçlik, motivasyon, yorulmama ve sakinlik alt boyutlarında istatistiksel olarak anlamlı düzeyde fark saptanmamıştır. Her ne kadar bu alt boyutlarda düzenli egzersiz yapan bireylerin ortalama puanları daha yüksek görünse de p değerlerinin .05 sınırına yakın (özellikle motivasyon ve sakinlik için) olması, örneklem büyüklüğünün artırılması durumunda bu boyutlarda da anlamlı farklılıklar elde edilebileceğine işaret edebilir. Ayrıca atletik zihinsel enerji kavramının çok boyutlu yapısı göz önüne alındığında, bu alt boyutların yalnızca egzersiz yapma durumundan değil; sporun seviyesi, antrenman şiddeti, antrenör-öğrenci ilişkisi ve psikososyal destek gibi çok sayıda faktörden etkilenmesi olasıdır (Jones et al., 2007; Gucciardi et al., 2009). Dolayısıyla, gelecekteki çalışmalarda bu değişkenlerin modele dâhil edilmesiyle daha açıklayıcı sonuçlara ulaşılabilir.

Düzenli egzersiz süresine (1–5 yıl, 6–10 yıl, 11 yıl ve üzeri) göre yapılan karşılaştırmalarda ise atletik zihinsel enerjinin hiçbir alt boyutunda anlamlı farklılık saptanmamıştır. Bu bulgu, literatürde fiziksel aktivite süresi ile psikolojik değişkenler arasındaki ilişkinin her zaman doğrusal olmadığını gösteren çalışmalarla benzerlik göstermektedir (Stamatakis & Lee, 2013). Egzersiz süresi arttıkça belirli bir noktadan sonra psikolojik kazanımların plato çizmesi ya da bireysel farklılıklar nedeniyle süre etkisinin istatistiksel olarak anlamlı seviyeye ulaşmaması olasıdır. Ayrıca bu çalışmada egzersiz yılı kategorilerinin geniş aralıklarla oluşturulması ve her gruptaki katılımcı sayısının görece sınırlı olması (özellikle 11 yıl ve üzeri grubu) varyansı artırarak gruplar arası farkların istatistiksel olarak anlamlılaşmasını güçleştirmiş olabilir. Nitekim benzer biçimde bazı çalışmalarda da egzersiz süresinden ziyade, haftalık egzersiz sıklığı ve şiddetinin psikolojik çıktılar üzerinde daha belirleyici olduğu rapor edilmiştir (Haskell et al., 2007).

Çalışmanın bulguları, atletik zihinsel enerji kavramını ele alan sınırlı sayıdaki araştırma ile birlikte değerlendirildiğinde, düzenli fiziksel aktivitenin özellikle güven ve konsantrasyon gibi zihinsel performans bileşenlerini desteklediğini ortaya koymaktadır. Elit boksörler üzerinde yapılan bir çalışmada da dinçlik, güven ve konsantrasyon gibi alt boyutların performansla yakından ilişkili olduğu, düzenli ve yoğun antrenman programlarının bu boyutlarda artış sağladığı bildirilmiştir (Çetin & İmamoğlu, 2018). Mevcut çalışmada örneklemin elit sporcu düzeyinden ziyade üniversite öğrencilerinden oluşması, alt boyut puanlarının mutlak düzeyde daha düşük olmasına rağmen, düzenli egzersiz yapanlarda benzer yönde bir artış eğilimi görülmesi açısından önemlidir.

Bu bulguların uygulamaya dönük bazı çıkarımları bulunmaktadır. Öncelikle üniversite öğrencilerinde atletik zihinsel enerjiyi geliştirmeye yönelik programlarda, düzenli fiziksel aktiviteye katılımın artırılmasının kritik olduğu söylenebilir. Özellikle güven ve konsantrasyon odaklı zihinsel antrenman tekniklerinin, düzenli egzersiz programlarıyla entegre edilmesi, öğrencilerin hem sportif hem akademik performanslarını olumlu yönde etkileyebilir (Vealey & Greenleaf, 2010). Ayrıca cinsiyet ve branşa göre anlamlı fark bulunmaması, müdahale programlarının belirli bir gruba özgü olmaktan ziyade, tüm sporcu gruplarına yönelik olarak tasarlanabileceğini göstermektedir.

Sonuç olarak, bu araştırmada elde edilen bulgular, düzenli egzersiz yapmanın atletik zihinsel enerjinin özellikle güven ve konsantrasyon boyutlarında anlamlı düzeyde artışla ilişkili olduğunu; cinsiyet, branş ve egzersiz yılı değişkenlerinin ise bu yapı üzerinde belirleyici olmadığını göstermektedir. Bu sonuçlar, fiziksel aktiviteyi yalnızca fizyolojik değil, aynı zamanda bilişsel ve duyuşsal kazanımlar bağlamında ele alan bütüncül yaklaşımları desteklemekte ve üniversite öğrencilerinde egzersiz temelli psikolojik iyilik hâli programlarının önemini vurgulamaktadır.

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An Examination of the Stadium Behavior of Sports Science Faculty Students in the Context of Broken Windows Theory

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Abstract: The primary objective of this study is to examine the behavior of students in the Faculty of Sports Sciences in the stands within the context of the Broken Windows Theory. The study sample consists of students in the Faculty of Sports Sciences with an average age of (22.17 ± 2.258). As part of the study, the "Personal Information Form" and the "Broken Windows Theory Scale" were used as data collection tools to obtain information regarding the participants' gender, marital status, educational level, sports history, current participation in sports, and income level. During the analysis of the collected data, normality tests (Shapiro-Wilk and Kolmogorov-Smirnov) were first applied, and it was determined that the results did not follow a normal distribution. Accordingly, the Mann-Whitney U test and the Kruskal-Wallis H test—nonparametric statistical analysis methods—were used. The findings of the study, when evaluated according to the gender variable, revealed that male students' Broken Windows Theory scores were statistically significantly higher than those of female students (p=0.01). The analyses revealed no significant differences in participants' scores in terms of marital status, educational status, sports history, or current participation in sports. The results of the Kruskal-Wallis test conducted on income level, however, showed that there was no statistically significant difference among the different income groups. In conclusion, while this study revealed that the perceptions of students at the Faculty of Sports Sciences regarding the "Broken Windows Theory" may be influenced by gender, it also showed that other demographic variables did not have a significant effect on these perceptions.

Keywords: Sports Sciences, Broken Windows Theory, Gender-Based Behaviors

Spor Bilimleri Fakültesi Öğrencilerinin Kırık Camlar Teorisi Bağlamında Tribün Davranışlarının İncelenmesi

Özet: Bu çalışmanın temel amacı, spor bilimleri fakültesi öğrencilerinin kırık camlar teorisi bağlamında tribün davranışlarını incelemektir. Araştırmanın örneklem grubunu, yaş ortalaması (22,17±2,258) olan Spor Bilimleri Fakültesi öğrencileri oluşturmaktadır. Araştırma kapsamında veri toplama aracı olarak katılımcıların cinsiyet, medeni durum, eğitim düzeyi, spor geçmişi, aktif spor yapma durumu ve gelir düzeyine ilişkin bilgileri elde etmek amacıyla "Kişisel Bilgi Formu" ile "Kırık Camlar Teorisi Ölçeği" kullanılmıştır. Toplanan verilerin analiz sürecinde öncelikli olarak normallik testleri (Shapiro-Wilk ve Kolmogorov-Smirnov) uygulanmış, sonuçların normal dağılım göstermediği belirlenmiştir. Bu doğrultuda parametrik olmayan istatistiksel analiz yöntemlerinden Mann-Whitney U testi ve Kruskal-Wallis H testi kullanılmıştır. Araştırmanın bulguları cinsiyet değişkenine göre yapılan değerlendirmede, erkek öğrencilerin Kırık Camlar Teorisi puanlarının kadın öğrencilere kıyasla istatistiksel olarak anlamlı biçimde daha yüksek olduğu saptanmıştır (p=0,01). Analizler sonucunda; medeni durum, eğitim durumu, spor geçmişi, aktif spor yapma durumu açısından, katılımcıların puanları arasında anlamlı bir farklılık bulunmamıştır. Gelir düzeyine yönelik yapılan Kruskal-Wallis testinin sonuçları ise farklı gelir grupları arasında istatistiksel açıdan anlamlı bir farklılık olmadığını göstermiştir. Sonuç olarak bu araştırma, Spor Bilimleri Fakültesi öğrencilerinin "Kırık Camlar Teorisi" bağlamındaki algılarının cinsiyet üzerinden etkilenebildiğini ortaya koyarken, diğer demografik değişkenlerin bu algıya belirgin bir etkisinin olmadığını göstermiştir.

Anahtar Kelimeler: Spor Bilimleri, Kırık Camlar Teorisi, Tribün Davranışları

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GİRİŞ

İnsanlık tarihinin ilk dönemlerinden bu yana bireyler arası ve toplum arasındaki gerilimler varlığını sürdürmüştür. Bu gerilimler, toplumsal alanda zaman zaman şiddet eylemleriyle görünür hâle gelmektedir. Antik çağlardan günümüze kadar toplum, bireylerin çıkarlarını hayata geçirmelerine olanak sağlayan bir araç niteliğinde değerlendirilmiştir (Ben-Amittay, 1983). Bu yaklaşım, bireylerin karşılaştıkları durumlar karşısında benmerkezci ya da faydacı eğilimlerle hareket edebileceğini göstermektedir. Toplumsal yaşam içerisinde ortaya çıkan norm ihlalleri ve çevresel düzensizlikler,

bireylerin davranışlarını etkileyerek saldırganlık ve şiddet eğilimlerinin ortaya çıkmasına zemin hazırlayabilmektedir. Bu bağlamda spor müsabakalarındaki tribünler, kalabalık yapısı ve grup etkileşiminin yoğunluğu sebebiyle şiddet ve saldırganlık davranışlarının gözlemlenebildiği önemli sosyal alanlardan biri olarak dikkat çekmektedir (Sakar ve Sarıkan, 2023).

Günümüz toplumlarında bireylerin günlük yaşamlarının önemli bir parçası haline gelmiş olan spor taraftarlığı, çoğunlukla serbest zaman etkinliği olarak değerlendirilmektedir. Ancak bazı durumlarda bu katılım biçimi, kontrolsüz öfke ve duygusal yoğunluk sebebiyle şiddet davranışlarına dönüşebilmektedir. Özellikle futbol başta olmak üzere sporun geçirdiği endüstriyel ve yapısal dönüşümlere rağmen şiddet olgusu varlığını sürdürmektedir (Kayaoğlu, 2004). Şiddet, bireyin fiziksel güç kullanarak karşısındaki kişiye zarar vermesi ya da özgürlüğünü kısıtlaması olarak tanımlanmaktadır (Back, 2004). Seyirci şiddeti ise oyunculara, hakemlere veya rakip takım taraftarlarına yönelik psikolojik ya da fiziksel zarar verici davranışlarına ek olarak kamusal mala zarar verme eylemlerini de kapsamaktadır (Coakley, 1998; Tenenbaum vd., 1997).

Seyirci şiddetini açıklamada kullanılan önemli yaklaşımlardan biri Kırık Camlar Teorisi'dir. Bu teori, bir ortamda ortaya çıkan küçük düzensizliklerin zamanla daha büyük sosyal sorunlara yol açabileceğini ileri sürmektedir (Wilson ve Kelling 1982). Philip Zimbardo'nun farklı sosyo-ekonomik bölgelerde terk edilen araçlar üzerinden gerçekleştirdiği deney, bu teorinin temelini oluşturmaktadır (Ece, 2023). Deneyde, bir aracın camının kırılmasıyla başlayan küçük bir tahribatın, sosyal denetim eksikliği algısı yaratarak kısa sürede vandalizme dönüştüğü gözlemlenmiştir (Welsh vd., 2015).

Spor organizasyonlarında düzenin zayıflaması ve kuralsızlık algısı, seyircilerin şiddet eğilimlerini artırabilmektedir. Yavuz Eroğlu vd. (2022), spor örgütlerinde kontrol mekanizmalarının zayıflaması durumunda küçük norm ihlallerinin zamanla büyüyerek daha ciddi davranış sorunlarına yol açabileceğini vurgulamaktadır. Tribünler, yüksek duygusal tepkilerin yaşandığı, topluluk aidiyetinin güçlü olduğu ve sosyal etkileşimin yoğunlaştığı dinamik ortamlardır. Bu ortamlarda hakaret içerikli tezahüratlar, sahaya yabancı madde atılması veya rakip taraftarlara yönelik aşağılayıcı davranışlar zamanla daha ciddi şiddet olaylarına dönüşebilmektedir.

Bu süreç, Kırık Camlar Teorisi'nin öngördüğü zincirleme etki mekanizmasıyla örtüşmektedir. Teori, düzensizliklerin göz ardı edilmesinin bireylerde kuralların uygulanmadığı algısını güçlendirdiğini ve norm ihlallerinin zamanla sıradanlaşmasına neden olduğunu belirtmektedir. Bu nedenle tribünlerde başlangıçta küçük görülen davranışlar, ilerleyen süreçte daha ciddi şiddet olaylarının ortaya çıkmasına zemin hazırlayabilmektedir. Bu durum, spor ortamlarında düzenin sağlanması ve kontrol mekanizmalarının güçlendirilmesinin önemini ortaya koymaktadır.

Bireylerin saldırgan davranışlarının nedenlerine ilişkin olarak literatürde biyolojik, psikolojik, çevresel ve sosyal etmenleri içeren farklı yaklaşımlar geliştirilmiştir (Aronson vd., 2012; Gergen ve Gergen, 1986). İlk dönem araştırmalar saldırganlığın büyük ölçüde doğuştan gelen özelliklerle ilişkili olduğunu savunurken, sonraki çalışmalar öğrenme süreçlerinin de bu davranışların oluşumunda önemli bir rol oynadığını ortaya koymuştur.

YÖNTEM

Araştırma, betimsel tarama modeline ile gerçekleştirilmiştir. Betimsel araştırmalar, mevcut durumu olduğu şekliyle analiz ederek ortaya koymayı amaçlayan araştırma yaklaşımlarındandır (Karasar, 2013). Araştırmanın örneklemini, 2025–2026 eğitim-öğretim yılında Muş Alparslan Üniversitesi Spor Bilimleri Fakültesi'nde öğrenim gören toplam 160 öğrenci (111 erkek ve 49 kadın) oluşturmaktadır. Katılımcıların belirlenmesi, kolayda örnekleme yöntemine dayalı olarak gerçekleştirilmiştir. Çalışma hakkında katılımcılara gerekli bilgiler ayrıntılı şekilde iletilmiş olup, bireylerden gönüllülük esasına dayalı olarak araştırmaya katılım sağlamaları talep edilmiştir.

Veri Toplama Araçları

Kişisel Bilgi Formu

Kişisel bilgi formu, araştırmacı tarafından hazırlanmış olup araştırma grubunu oluşturan bireyler hakkında bilgi toplamayı amaçlamıştır. Kişisel bilgi formunda yaş, cinsiyet, medeni durum, aylık gelir düzeyi, spor yapma geçmişi ve aktif olarak spor yapıyor musunuz sorulardan oluşan demografik bilgi formu kullanılmıştır.

Kırık Camlar Teorisi Bağlamında Tribün Davranışları Ölçeği

Bu çalışmada veri toplama aracı olarak "Kırık Camlar Teorisi Bağlamında Tribün Davranışları Ölçeği" (KCTBTDÖ) kullanılmıştır. Söz konusu ölçek, Yavuz-Eroğlu vd. 2025 tarafından geliştirilmiş olup, izleyici davranışlarını Kırık Camlar Teorisi perspektifinde değerlendirmeyi hedeflemektedir.

Ölçek, tek boyutlu bir yapıya sahip olup toplamda 13 maddeden oluşmaktadır. Ölçekte ters puanlanmış herhangi bir madde bulunmamaktadır. Katılımcılar, maddeleri 5'li Likert tipi bir derecelendirme sistemi (1 = Hiç Uygun Değil, 5 = Tamamen Uygun) üzerinden yanıtlamaktadır. Ölçekten elde edilen yüksek puanlar, bireylerin tribün bağlamında

sergilenen olumsuz davranışlara olan yatkınlıklarının arttığını göstermektedir.

Tablo 1. Katılımcıların demografik özellikleri

Değişkenler	Alt kategori	n	%	Ort.	SS
Yaş	-			22,17	2,258
Cinsiyet	Kadın	49	30,6		
	Erkek	111	69,4		
Medeni durum	Bekar	156	97,5		
	Evli	4	2,5		
Eğitim durumu	Lisans	142	88,8		
	Y. lisans	18	11,2		
Gelir durumu	10-20 bin	98	61,3		
	20.001-30 bin	39	24,4		
	30.001-40 bin	7	4,4		
	40.001 bin ve üzeri	16	10,0		
Spor geçmişi	Var	105	65,6		
	Yok	55	34,4		
Aktif spor	Evet	79	49,4		
	Hayır	81	50,6		

Araştırma çerçevesinde elde edilen verilerin istatistiksel analizi, IBM SPSS Statistics 27.0 paket programı kullanılarak gerçekleştirilmiştir. Analiz sırasında öncelikle, verilerin normal dağılım gösterip göstermediğini belirlemek amacıyla Kolmogorov-Smirnov ve Shapiro-Wilk normallik testleri uygulanmıştır. Yapılan değerlendirmeler sonucunda, verilerin normal dağılıma uygun olmadığı tespit edilmiştir. Bu durum göz önüne alınarak, çalışmada parametrik olmayan analiz yöntemlerinin tercih edilmesine karar verilmiştir. Katılımcıların demografik özellikleri ile ölçek puanları arasındaki farklılıkların incelenmesinde çeşitli testler uygulanmıştır. Cinsiyet, medeni durum, eğitim seviyesi, spor geçmişi ve aktif spor yapma durumu gibi iki kategorili bağımsız değişkenlerin analizinde Mann-Whitney U testi kullanılmıştır. Bunun yanı sıra dört veya daha fazla gruba ayrılmış olan aylık gelir durumu değişkeninin analizinde gruplar arasındaki farklılıkları belirlemek amacıyla Kruskal-Wallis H testi tercih edilmiştir.

BULGULAR

Tablo 2. Katılımcıların cinsiyetlerine göre kırık camlar teorisi puanlarının Mann-Whitney U testi sonuçları

Cinsiyet	N	Sıra Ort.	Sıra Top.	U	Z	P
Kadın	49	60,51	2.965	1.740	-3,63	,001*
Erkek	111	89,32	9.915			

Tablo 2'e göre, katılımcıların cinsiyeti ile Kırık Camlar Teorisi bağlamında tribün davranış puanları arasında istatistiksel açıdan anlamlı bir farklılık bulunmuştur ($p<0,05$). Sıra ortalamaları değerlendirildiğinde, erkek öğrencilerin sıra ortalaması (89,32), kadın öğrencilerin sıra ortalamasına (60,51) kıyasla belirgin şekilde daha yüksek çıkmıştır. Bu sonuç erkek öğrencilerin tribünlerdeki olumsuz çevresel işaretlerden etkilenme ve bu doğrultuda davranış gösterme eğilimlerinin kadın öğrencilere göre anlamlı ölçüde daha fazla olduğunu göstermektedir.

Tablo 3. Katılımcıların medeni durumuna göre kırık camlar teorisi puanlarının Mann-Whitney U testi sonuçları

Medeni durum	N	Sıra Ort.	Sıra Top.	U	Z	P
Bekar	156	79,66	12.426,5	180,500	-1,440	,150
Evli	4	113,38	453,5			

Tablo 3'te sunulan verilerin analizi sonucunda, katılımcıların medeni durumu ile Kırık Camlar Teorisi bağlamında tribün davranış puanları arasında istatistiksel açıdan anlamlı bir farklılık tespit edilmemiştir ($p>0,05$). Sıra ortalamalarına ilişkin değerlere bakıldığında, evli katılımcıların ortalama puanının (113,38), bekar katılımcılara kıyasla (79,66) daha yüksek olduğu gözlemlense de bu farkın istatistiksel olarak anlamlı olmadığı görülmüştür. Bu bulgu, medeni durumun, tribünlerdeki olumsuz çevresel uyarıcılardan etkilenme ya da bu doğrultuda davranış sergileme eğiliminde belirgin bir rol oynamadığını göstermektedir.

Tablo 4. Katılımcıların eğitim durumuna göre kırık camlar teorisi puanlarının Mann-Whitney U testi sonuçları

Eğitim durum	N	Sıra Ort.	Sıra Top.	U	Z	P
Lisans	142	78,37	11.128,0	975,00	-1,639	,101
Y. lisans	18	97,33	1.752			

Tablo 4 incelendiğinde, katılımcıların eğitim düzeyine göre (lisans ve yükseköğretim) Kırık Camlar Teorisi puanları arasında istatistiksel olarak anlamlı bir fark bulunamamıştır ($p>0,05$). Lisans mezunu katılımcıların sıra ortalaması 78,37 olarak hesaplanırken, yükseköğretim mezunu katılımcıların sıra ortalaması 97,33 olarak tespit edilmiştir. Her ne kadar yükseköğretim mezunlarının sıra ortalaması görece daha yüksek olsa da gerçekleştirilen analiz bu farklılığın istatistiksel anlamlılık düzeyine ulaşmadığını göstermiştir ($p=0,101$). Bu sonuç, katılımcılar arasında eğitim düzeyinin tribünlerdeki olumsuz fiziksel ve çevresel koşullara verilen tepkiler üzerinde belirleyici bir etkiye sahip olmadığını göstermektedir.

Tablo 5. Katılımcıların spor geçmişine göre kırık camlar teorisi puanlarının Mann-Whitney U testi sonuçları

Spor geçmişi	N	Sıra Ort.	Sıra Top.	U	Z	P
Var	105	79,51	8.349,0	2784,0	-,372	,710
Yok	55	82,38	4.531,0			

Tablo 5'te sunulan verilerin incelenmesi sonucunda, katılımcıların spor geçmişine sahip olup olmamalarının, Kırık Camlar Teorisi bağlamında tribün davranış puanları üzerinde istatistiksel olarak anlamlı bir farklılık yaratmadığı tespit edilmiştir ($p>0,05$). Sıra ortalamaları değerlendirildiğinde, spor geçmişi olmayan katılımcıların sıra ortalamasının (82,38), spor geçmişine sahip katılımcıların sıra ortalamasına (79,51) oldukça yakın olduğu gözlemlenmiştir. Bu durum, Mann-

Whitney U testi ile elde edilen anlamlılık değeri (p=0,710) ile de desteklenmektedir. Elde edilen bulgular, spor geçmişine sahip olmanın tribünlerdeki olumsuz fiziksel çevreye ilişkin algı ve davranışlar üzerinde belirgin bir etkiye sahip olmadığını göstermektedir.

Tablo 6. Katılımcıların spor yapma durumuna göre kırık camlar teorisi puanlarının Mann-Whitney U testi sonuçları

Spor yapma durumu	N	Sıra Ort.	Sıra Top.	U	Z	P
Evet	79	83,59	6.604,0	2955,00	-,836	,403
Hayır	81	77,48	6.276,0			

Tablo 6'da yer alan verilerin analizi, katılımcıların aktif olarak spor yapma durumları ile Kırık Camlar Teorisi temelinde değerlendirilmiş tribün davranış puanları arasında istatistiksel açıdan anlamlı bir fark olmadığını ortaya koymaktadır (p>0,05). Sıra ortalamalarına bakıldığında, aktif spor yapan katılımcıların sıra ortalamasının 83,59, spor yapmayanların ise 77,48 olduğu tespit edilmiştir. Aktif spor yapanların puan ortalaması bir miktar daha yüksek görünmekle birlikte, bu farkın istatistiksel açıdan anlamlı olmadığı sonucuna varılmıştır (p=0,403). Bu bulgular, bireylerin aktif olarak spor yapma durumlarının, tribünlerdeki fiziksel bozulma ve düzensizlik algısına karşı sergiledikleri tutum ve davranışlar üzerinde belirgin bir etkisi olmadığını göstermektedir.

Tablo 7. Katılımcıların gelir durumlarına göre kırık camlar teorisi puanlarının Kruskal-Wallis H testi sonuçları

Gelir durumu	N	Sıra Ort.	χ^2	sd	P
10-20 bin	98	74,51	4,768	3	,190
20.001-30 bin	39	90,64			
30.001-40 bin	7	78,57			
40.001 ve üzeri	16	93,34			

Tablo 7'deki Kruskal-Wallis H testi sonuçlarının incelenmesi neticesinde, katılımcıların aylık gelir düzeyleri ile Kırık Camlar Teorisi çerçevesinde tribün davranış puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > 0,05). Grupların sıra ortalamalarına bakıldığında, en yüksek sıra ortalaması "40.001 TL ve üzeri" gelir grubunda (93,34), en düşük sıra ortalaması ise "10-20 bin TL" gelir grubunda (74,51) olarak tespit edilmiştir. Ancak p değerinin (p=0,190) bu seviyede olması, gelir grupları arasındaki farklılıkların tribünlerdeki olumsuz çevresel ve fiziksel işaretlere yönelik algı veya davranışlar üzerinde istatistiksel açıdan anlamlı bir etkisinin olmadığını ortaya koymaktadır.

TARTIŞMA VE SONUÇ

Bu çalışmada, Spor Bilimleri Fakültesi öğrencilerinin tribün davranışları, Kırık Camlar Teorisi bağlamında çeşitli demografik değişkenler açısından incelenmiştir. Araştırma bulguları, sadece cinsiyet değişkeni açısından anlamlı farklılıklar olduğunu ortaya koyarken, diğer demografik değişkenlerin tribün davranışları üzerinde istatistiksel olarak anlamlı bir etki olmadığı bulgulanmıştır.

Literatürde bu konuyla ilgili önceki çalışmalar incelendiğinde, rekreatif ve fiziksel aktivitelerin tribün şiddeti ile olan ilişkisini ele alan bir çalışmada; şiddet, saldırganlık, taraftarlık, takım kimliği ve sosyal medya gibi unsurların tribün şiddeti ile doğrudan bağlantılı olduğu ortaya konulmuştur (Aydın ve Dertli, 2025). Bu bulgular, tribün davranışlarının çok boyutlu bir yapıya sahip olduğunu, bireysel faktörlerin yanı sıra sosyo-kültürel ve psikolojik etkenlerle de şekillendiğini göstermektedir.

Spor örgütlerinde Kırık Camlar Teorisi bağlamında gerçekleştirilen bir çalışmada, iş görenlerin kırık camlar algılarının belirli demografik değişkenlere göre farklılık gösterdiği ortaya konulmuştur. Araştırmanın bulguları, yönetsel düzlemde, farklı bölüm mezunları ile daha önce başka kurumlarda deneyim kazanmış bireyler lehine anlamlı farklılıklara işaret etmektedir. Buna karşılık, cinsiyet, yaş ve hizmet yılı gibi değişkenlerle kırık camlar algısı arasında istatistiksel olarak anlamlı bir ilişki tespit edilememiştir. Bu sonuçlar, kırık camlar algısının her zaman temel demografik faktörlerden etkilenmeyebileceğini vurgulaması bakımından, mevcut araştırmaların literatürdeki bulgularıyla uyum göstermektedir (Yavuz Eroğlu vd., 2022).

Çalışmada elde edilen cinsiyet değişkeni ile ilgili veriler, erkek öğrencilerin Kırık Camlar Teorisi puanlarının kadın öğrencilere kıyasla daha yüksek olduğunu ortaya koymuştur. Bu sonuç, Daniel L. Wann'ın (2006) takım özdeşleşme düzeyinin artmasıyla agresif davranış eğilimlerinin de artabileceğini ileri süren bulgularıyla uyumludur. Benzer şekilde, Gordon W. Russell (2004), spor ortamlarında erkek bireylerin şiddet içerikli davranışlara daha meyilli olduğunu belirtmiştir. Bu bağlamda, erkek öğrencilerde gözlemlenen yüksek puanlar bireysel kimlik dinamikleri ve sosyal etkileşim süreçlerinin bir sonucu olarak değerlendirilebilir.

Futbol karşılaşmalarının toplumsal şiddet üzerindeki etkilerini inceleyen Andres vd. (2023) tarihli çalışmasında ise maç günlerinde şiddet suçlarının anlamlı bir artış gösterdiği ve bu artışın özellikle genç erkek bireylerde yoğunlaştığı belirtilmiştir. Bu bulgular, tribün ortamındaki erkek bireylerin şiddete olan eğilimlerinin daha belirgin olabileceğine dair güçlü kanıtlar sunmaktadır.

Teorik çerçevede değerlendirildiğinde, Sembolik Etkileşimcilik anlayışı, bireylerin sosyal etkileşim yoluyla birbirlerinin davranışlarını etkilediğini ileri sürerken, Kırık Camlar Teorisi küçük norm ihlallerinin zamanla daha büyük davranış bozukluklarına dönüşebileceğini ifade etmektedir (Şakar ve Sarıkan, 2023). Bu perspektiften bakıldığında, tribünlerde gözlemlenen şiddet içerikli davranışlar hem çevresel koşullar hem de sosyal etkileşim süreçleri üzerinden açıklanabilir.

Öte yandan medeni durum değişkenine ilişkin analizler, anlamlı bir farklılık bulunmadığını göstermektedir. Benzer şekilde eğitim düzeyi, spor geçmişi, aktif spor yapma durumu ve gelir düzeyi gibi demografik unsurların da tribün davranışları üzerinde istatistiksel olarak anlamlı bir etkisinin bulunmadığı tespit edilmiştir. Bu durum, tribün davranışlarının daha çok bireysel eğilimler ve mevcut sosyal bağlamdan etkilendiğini göstermektedir.

Genel bir değerlendirme yapıldığında, bu araştırma sonuçları tribün davranışlarında cinsiyetin belirleyici bir etken olduğunu, buna karşın diğer demografik değişkenlerin sınırlı bir etkiye sahip olduğunu ortaya koymaktadır. Bu bulgular, tribün ortamındaki davranışların oluşumunda sosyal etkileşim mekanizmaları ve çevresel unsurların önemine dikkat çekmektedir.

SONUÇ

Bu çalışmada elde edilen bulgular sonucunda, taraftar davranışlarının karmaşık ve çok yönlü bir yapıya sahip olduğunu ortaya koymakta, bireysel, psikolojik ve sosyo-kültürel etkenlerin bu davranışların gelişiminde önemli bir rol oynadığını bulgulanmıştır. Özellikle cinsiyetin, taraftar davranışları üzerindeki etkisinin belirgin bir şekilde ortaya çıkması, bu etkenin taraftar şiddeti ve saldırgan davranış eğilimlerini açıklamada önemli bir unsur olduğunu vurgulamaktadır. Erkek öğrencilerin kırık camlar teorisine dayanan yüksek puanları, literatürde erkeklerin spor bağlamında daha fazla saldırganlık sergilediğini gösteren bulgularla örtüşmektedir. Bu durum spor müsabakalarında erkek bireylere yönelik sosyo-psikolojik değerlendirmelerin önemini ortaya koymaktadır. Diğer yandan medeni durumu, eğitim durumu, spor geçmişi, aktif spor yapma durumunu ve gelir düzeyini içeren değişkenlerin ise taraftar davranışları üzerinde anlamlı bir etkisi olmadığı belirlenmiştir. Bu sonuçlar, bireyin toplumsal yapı veya genel demografik özelliklerinden ziyade, anlık sosyal çevre ve bireyin kişisel eğilimlerinin taraftar davranışlarını belirlemede daha etkili olduğunu göstermektedir. Bu çalışma, spor ortamındaki davranışların açıklanmasında hem bireysel hem de çevresel unsurların dikkate alınması gerektiğini ve davranışların sadece tek bir sebebe indirgenerek değerlendirilemeyeceğini vurgulamaktadır. Özellikle Kırık Camlar Teorisi'nin spor sosyolojisi çerçevesinde taraftar şiddetini açıklamada geçerli bir perspektif sunduğu görülmüştür. Bunun yanı sıra bu alandaki araştırmalarda gelecekte daha geniş ve çeşitli örneklem gruplarının kullanılması, farklı değişkenlerin etkilerini incelemek açısından önemli katkılar sağlayacaktır. Ayrıca, elde edilen bulguların taraftarlar arasındaki şiddeti azaltmaya yönelik politikaların geliştirilmesine katkıda bulunabileceği düşünülmektedir. Özellikle cinsiyet farklılıklarını dikkate alan stratejilerin oluşturulması, taraftar davranışları üzerindeki olumsuz etkileri azaltmada etkili olabilir. Araştırmanın sınırlılıkları göz önüne alındığında, gelecekte yapılacak çalışmaların daha kapsamlı modeller geliştirerek bu alandaki literatürü zenginleştirmesi beklenmektedir.

ÖNERİLER

Bu araştırmanın sonuçları, tribün tutumlarının çeşitli boyutlara sahip olduğunu ve cinsiyetin önemli bir faktör olduğunu göstermektedir. Ancak diğer demografik faktörlerin kayda değer bir etkisi olmaması, tribün şiddetinin daha karmaşık toplumsal ve bireysel dinamiklerle şekillendiğini işaret etmektedir. Bu doğrultu da gerçekleştirilecek akademik araştırmalar için bazı öneriler şu şekilde sıralanabilir:

1. Sosyal medya ile taraftar davranışlarının etkileşimi: Gençler arasında yaygın bir şekilde görülen sosyal medya kullanımının, taraftarlık anlayışı ve stadyumda yaşanan şiddet olayları üzerindeki etkilerini daha ayrıntılı bir şekilde incelemek önemli bir araştırma konusu olabilir.

2. Psikolojik mekanizmaların incelemesi: Takım bağlılığı, aidiyet hissi, özdeşleşme durumu ve bireylerin rekabet algılarının stadyumda meydana gelen şiddetle nasıl bağlantılı olduğunu derinlemesine araştırmak mümkün. Özellikle grup davranışlarının psikolojik alt yapısını inceleyen araştırmalar bu alanda değerli katkılar sunabilir.

3. Toplumsal normların ve değerlerin etkisi: Farklı kültürel ve toplumsal bağlamlarda tribün davranışlarını etkileyen normlar ve değerler arasındaki farklılıkların karşılaştırmalı olarak incelenmesi, bu alanda daha genel bir kavrayış sağlamaya katkıda bulunabilir.

4. Tribünlerdeki kadın taraftar davranışları: Kadın taraftarların stadyumda sergiledikleri tutumlar, toplumsal cinsiyet rollerinin bu alandaki etkilerini anlamamıza yardımcı olabilir. Bu bağlamda, kadınların tribünlerdeki şiddet algıları ve etkileşimlerinin araştırılması önem taşımaktadır.

5. Spor geçmişi ve şiddete eğilim arasındaki ilişki: Spor deneyimi olan kişilerin taraftarlık tutumlarıyla tribün davranışları arasındaki ilişki incelenebilir. Özellikle takım sporlarıyla ilgili olan kişiler üzerinde detaylı bir araştırma yapılması kayda değerdir.

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PALLIATIVE CARE STANDARDS FOR PATIENTS WITH AMYOTROPHIC LATERAL SCLEROSIS

ERIND THARTORI [1]

Abstract: Amyotrophic Lateral Sclerosis is a progressive degenerative disease characterized by the degeneration of motor neurons, leading to muscle weakness, functional disability and ultimately respiratory failure. Despite recent developments in contemporary medicine, pharmacological treatments such as Riluzole and Edaravone only slow the progression of the disease but do not cure it. For this reason, an early and structured approach to palliative care has a central role in improving the quality of life of patients and their families. Palliative care for patients with ALS is not limited to the terminal phase but is recommended to be integrated from the moment of diagnosis by addressing complex physical, psychological, social and existential needs. International standards developed by organizations such as the European Academy of Neurology (EAN), the American Academy of Neurology (AAN) and the European Association for Palliative Care (EAPC), emphasize the importance of a multidisciplinary approach, where neurologists, nurses, physiotherapists, speech therapists, nutritionists, psychologists and social workers work together to provide comprehensive care.

For the realization of this material, the method of research and data collection from reliable scientific and professional sources was used. From the review of scientific literature, international guidelines and standards, as well as additional sources.

Palliative care for patients with ALS is an essential component of treatment and should begin at the moment of diagnosis. International standards emphasize that an early and integrated palliative approach helps in managing complex symptoms, improving quality of life and alleviating emotional and social burden for both the patient and the family. In conclusion, the implementation of palliative care standards not only improves the treatment of patients with ALS but also strengthens the role of health professionals, especially nurses, in providing comprehensive and humane care. This approach contributes to an advanced model of health care where the focus is not only on prolonging life but above all on its quality and dignity.

Based on the review of the literature and international guidelines on palliative care standards in patients with ALS, the focus is placed on the early integration of palliative care into national protocols, the creation of multidisciplinary centers for a coordinated service, the development of national guidelines based on EAN, AAN and EAPC standards, as well as ensuring equal access to assistive devices (non-invasive ventilation, alternative communication, enteral nutrition for all patients. Staff training should also be developed and the role of nurses strengthened.

Keywords: Amyotrophic lateral sclerosis, palliative care, nursing care, health professionals, quality of life

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INTRODUCTION

Palliative care for patients with ALS is not limited to the terminal phase but is recommended to be integrated from the moment of diagnosis by addressing complex physical, psychological, social and existential needs. International standards developed by organizations such as the European Academy of Neurology (EAN), the American Academy of Neurology (AAN) and the European Association for Palliative Care (EAPC), emphasize the importance of a multidisciplinary approach, where neurologists, nurses, physiotherapists, speech therapists, nutritionists, psychologists and social workers

work together to provide comprehensive care. Standards of care for ALS are known to vary between countries and even within them. Early initiation of palliative care.Palliative care should begin in the early stages of the disease and not only when the disease is in the terminal stage. Virtual consultations or the use of community palliative care teams are possible and useful. It is important as this neurodegenerative disease progresses continuously and leads to the gradual loss of motor functions, with a major impact on quality of life[1,2]. The benefits of early initiation of palliative care include reducing anxiety of patients and families and strengthening trust between the patient, family and health team[1]

Multidisciplinary approach: The team should include neurologists, palliative care physicians, speech therapists, nutritionists, psychologists/sociologists, and family or close caregivers.

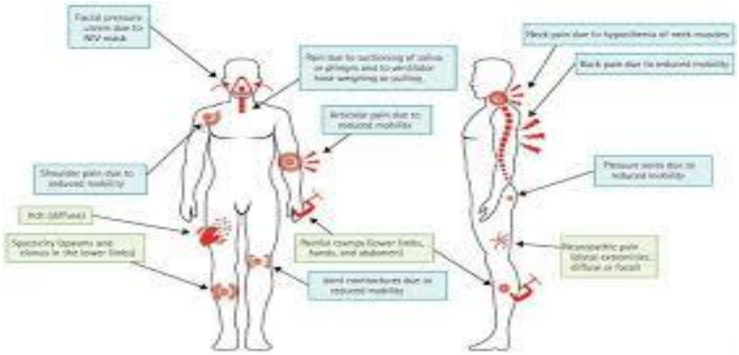

Figure no. 1 Amyotrophic Lateral Sclerosis

SYMPTOMATIC TREATMENT

Symptomatic treatment such as dysphagia (difficulty swallowing), sialorrhea (excessive salivation), thick secretions, spasms, spasticity, pain, difficulty breathing. Non-invasive ventilation where appropriate as it improves quality of life and may prolong it. Implementation of a gastrostomy tube for external nutrition (PEG) improves nutritional status and quality of life, especially before respiratory failure occurs[2,3]. Discuss the goals of care from diagnosis, what the patient wants for functional living for the use of ventilation, artificial nutrition, etc. Documentation of patient preferences (advance directives), taking into account culture, beliefs and family situation[4]. The patient and family need support to cope with the gradual loss of function, communication, autonomy and the fact that the disease is progressive and fatal. Watch for signs of depression, anxiety and stress, including psychological or psychiatric consultation[4,5]. Monitoring of respiratory function, discussion of non-invasive ventilation and, in appropriate cases, invasive ventilation. When ventilation is used, there should be a plan for its withdrawal if the patient wishes or the conditions become incurable and this should be done with symptom control, with sedatives, benzodiazepines, opioids, etc[5]. Regular assessment of nutritional status (weight, hydration status). Placement of PEG before respiratory status deteriorates further. Maintaining communication and other functions. Maintaining the ability to communicate, currently through speech techniques, assistive devices, devices that allow communication when movements or voice are reduced. Care for the last symptoms such as pain, dyspnea, increased secretions, spiritual concerns. Setting the preferred place of death, respecting the patient's preferences. Care for the family after death, support for pain and following various rituals. Respect for the patient's autonomy to decide whether to have treatments or not. Ethical discussion about invasive treatments, termination of treatments, termination of ventilation, etc. Some models such as integration of care in Amyotrophic Lateral Sclerosis clinics, special palliative teams, home-based care, use of telemedicine and family care. Coordination through outpatient care and community care[5,6]

Caregivers need information, support, rest and involvement in planning. Be aware of the stress and psychological consequences of caregiving.

METHODOLOGIA AND MATERIALS

For the realization of this material, the method of research and data collection from reliable scientific and professional sources was used. From the review of scientific literature, international guidelines and standards, as well as additional sources.

New EAN Guideline for ALS in collaboration with ERN Euro-NMD (2024). This guideline includes not only disease-modifying treatments but also non-pharmacological treatments, complementary care and psychological support, symptomatic treatment and end-of-life care. The importance of multidisciplinary care is emphasized, which means that neurologists, physiotherapists, speech therapists, psychologists, etc., work together from the early stages. American Academy of Neurology (AAN)-Position statement. It is recommended that neurologists provide palliative care not only in the terminal stages but throughout all phases of the disease for symptom management and for advance treatment planning[5]

CONCLUSION

Palliative care for patients with ALS is an essential component of treatment and should begin at the moment of diagnosis. International standards emphasize that an early and integrated palliative approach helps in managing complex symptoms, improving quality of life and alleviating emotional and social burden for both the patient and the family. In conclusion, the implementation of palliative care standards not only improves the treatment of patients with ALS but also strengthens the role of health professionals, especially nurses, in providing comprehensive and humane care. This approach contributes to an advanced model of health care where the focus is not only on prolonging life but above all on its quality and dignity.

RECOMMENDATIONS

Based on the review of the literature and international guidelines on palliative care standards in patients with ALS, the focus is placed on the early integration of palliative care into national protocols, the creation of multidisciplinary centers for a coordinated service, the development of national guidelines based on EAN, AAN and EAPC standards, as well as ensuring equal access to assistive devices (non-invasive ventilation, alternative communication, enteral nutrition for all patients. Staff training should also be developed and the role of nurses strengthened.

Acknowledgment

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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The Role of Nursing Staff in Reducing Preoperative Anxiety, Review Literature

EVIS ALLUSHI[1], OREIDA ELEZAJ[1], ROSELA ALLUSHI[2], VASILIKA PRIFTI[1], SONILA NIKA[1]

Abstract: Patients before undergoing a surgical intervention might have a state of anxiety, a condition that is common and found almost in everyone. This condition must be kept under control as it has negative consequences on post-operative recovery as well as on cooperation with the nurse. Preoperative anxiety appears from the date of the initial surgical planning and worsens until the application of anesthesia. High levels of anxiety are problematic for surgical patients, as they can contribute to poor health outcomes such as greater pain experience, prolonged hospital stay, and delayed wound healing Nursing care is very important in the assessment and management of anxiety or even fear in the pre-operative phase. The purpose of this study is to assess the importance of nursing care in keeping the anxiety state under control before a surgical intervention and improving the patient's experience.

Keywords:

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***Corresponding author:** surgical intervention, nursing care, preoperative care, anxiety

INTRODUCTION

In the preoperative phase, the nurse, as part of the medical team, plays a crucial role in the health and well-being of the patient. Preparing for surgery often seems complicated. Surgery is not only a simple surgical process (a physical intervention) but it is also a psychological intervention for the patient. Preoperative care is an integral part of nursing practice (1).

Starting with a more detailed overview of the surgical procedure, the nurse can provide a complete guide to the patient, including the time of preparation before surgery, the steps of the follow-up in the operating room and the recovery process after surgery. Emotional interaction is another important aspect of the nurse's role. Through a caring approach, the nurse can provide a sense of security and support for the patient, helping them feel more relaxed and ready for surgery (2). By using their communication skills and empathy, nurses can create a strong connection with the patient and ensure that they feel heard and understood at this important moment.

Why information is so important?

Knowledge and understanding of what is happening is very important, and promotes feelings of a sense of control and also helps to calm any anxiety. The information may also need to be repeated from time to time (3).

Preoperative education is not only important in reducing the risk of postoperative complications, but it also allows the individual to take an active role in their recovery and can help them gain a sense of control during a time when they may feel that events are beyond their control (3).

Most patients awaiting surgery experience varying levels of preoperative anxiety, as surgery is usually a stressful event in their lives. Preoperative anxiety appears from the date of the initial surgical planning and worsens until the application of anesthesia. High levels of anxiety are problematic for surgical patients, as they can contribute to poor health outcomes such as greater pain experience, prolonged hospital stay, and delayed wound healing (4).

MATERIAL AND METHOD

2.1 Purpose

The purpose of this study is to to evaluate the essential role that nurses play in managing patients' fear during the preoperative phase.

2.2 Objectives

The objective of this research was the review of the literature in relation with the management of fear in preoperative patients. The research included the electronic data base of the libraries Ovid, PubMed, Cochrane Library, NLM Tools.

The inclusion criteria were the published studies on the theme of fear in preoperative patients. More than 30 potential articles were identified, but we reviewed the results of seven articles related to the theme of interest Identifying the knowledge that nurses possess about the preoperative phase.

RESULTS AND DISCUSSION

If we compare the results of studies conducted by professionals from different countries around the world, we would see very interesting findings.

The findings of Molina.C & Villegas.V (2023) , (5), showed us that preparing children for the surgical procedure can include practices such as reducing anxiety, age-appropriate games that explain the procedure in a clear and understandable way, and pre-operative visits to the hospital to familiarize them with the environment and medical staff.

Stucky. Ch and Vortman. R (2022) , (4), have identified the symptoms that individuals experience in the preoperative phase. Most patients awaiting surgery experience varying levels of preoperative anxiety, as surgery is usually a stressful event in their lives. Preoperative anxiety appears from the date of the first surgical planning and worsens until the application of anesthesia. High levels of anxiety are problematic for surgical patients, as they can contribute to poor health outcomes such as greater pain experience, prolonged hospital stay, delayed wound healing.

Researchers have identified that emotional preparation is important to minimize negative emotions related to surgery. Ideally, this should begin three weeks before surgery. Surgical intervention is an explosion and stimulus that affects the emotional dimension of the person and can bring unpleasant consequences that can lead to preoperative trauma. For some patients, surgery can cause worry and anxiety during the perioperative process, partly due to a lack of experience with surgical procedures. Anxiety can also be based on the fear of pain and anesthesia. According to researchers, the lack of information, not only about the surgical procedure, but also about anesthesia and its complications, fear of side effects and the potential risk of death are aspects that can cause anxiety.

Kostak.M & Kutman.G (2021) (10) found that the use of therapeutic interventions in the preoperative period reduces fear in children by strengthening the relationship between the child, parent, and nurse.

A study conducted by Harms.E (2020) (11) has shown that anxiety can negatively affect patients during the surgical period. According to the findings, nurses have limited time to deal with patient education.

According to Koutoukidis, Stainton and Hughson (2017), (3): Preoperative education is not only important to reduce the risk of postoperative complications, but it also allows the individual to take an active role in their recovery and can help them gain a sense of control during a time when they may feel that events are beyond their control. Knowledge and understanding of what is happening and why, fosters feelings of a sense of control and also helps to calm any anxiety. Information may also need to be repeated from time to time. Because as you may know, anxiety can result in the individual having difficulty retaining information. The individual should also be assessed on their prior knowledge so that the information we give them is appropriate and it should also be presented to the individual in language that they understand. Sometimes written information can be used which will also help the individual retain information

Unlike other researchers, Mitchell (2016), (6) highlighted the importance of educating nursing staff. They need training in order to improve the quality of their work. Mitchell suggests that training nurses can help them to ease their workload and increase patient satisfaction.

According to Messina et al. (2014), (7), “play, learn, and have fun” techniques during surgery preparation can prevent preoperative anxiety for pediatric patients. They claim that video storytelling can also be a useful tool to calm children before surgery.

Farrell and Dempsey (2013) (8), highlight not only the importance of sharing information to manage fear but also the timing of when this information is delivered. They argue that any preoperative teaching should occur over an extended period of time in order to give the patient the opportunity to ask questions and ensure that the information is assimilated. Therefore, ideally this teaching and education is not done on the day of surgery, but is an ongoing process that begins during their pre-admission visit.

According to Branchs and Lerman (2013) (9), it is essential to provide person-centered care, as anxiety can depend on a number of factors unique to the individual, such as family history, personality, socioeconomic status, etc.

CONCLUSIONS

The role of the nurse in managing patients' fears before surgery is important for several reasons:

Priority of patient care: Nurses are known for their caring attitude and concern for patients. They play a crucial role in providing appropriate care and emotional support to patients before surgery.

Minimization of anxiety: Patients awaiting surgery often experience high levels of anxiety. Nurses have the opportunity to intervene and provide emotional support and information to reduce patients' anxiety and make them more prepared for the procedure.

Information content: Nurses have in-depth knowledge of surgical procedures and the process of preparing patients before surgery. They can provide important and up-to-date information to patients about what to expect during surgery and during the recovery period.

The advantage of individualized care: Every patient is unique and has different needs. Nurses are in the ideal position to understand the needs of individuals and to provide individualized care that effectively meets those needs.

Providing a calm and supportive environment: Nurses have the ability to create a comfortable and supportive environment for patients before surgery. This includes ensuring open and good communication, as well as providing relaxation techniques and emotional support to reduce patients' fears and stress.

Determining patient needs: Nurses are the most direct relatives of patients before surgery and have the opportunity to intervene to identify and address their specific needs. Through open and caring conversations with patients, they can obtain important information regarding their fears, concerns, and expectations, thus becoming better able to provide personalized support.

Trust: Nurses have the ability to establish a strong, trusting bond with patients before surgery. This close bond can help reduce the patient's fear and anxiety, allowing them to feel more comfortable and supported during this difficult time.

Providing Emotional Support: Through empathetic and caring care, nurses can provide a line of help and emotional support to patients before surgery. By actively listening and showing concern for their needs and concerns, they can help ease the patient's stress and fear.

Effective Communication with Patients and Families: Nurses have excellent interpersonal communication skills, which they use to create a safe and supportive environment for patients and their families before surgery. Clear and authentic communication can help reduce fear and increase trust in the healthcare team.

RECOMMENDATIONS

Training undertaken by health organizations and educational institutions should provide more in-depth and specialized courses for nurses in managing preoperative anxiety. These courses may include advanced relaxation techniques, effective communication with patients to address their needs and concerns, and stress management strategies for nurses themselves.

Creating a calm work environment as well as support from colleagues and managers can be an important factor in improving nurses' anxiety management skills. An environment where nurses feel supported and have the opportunity to share their knowledge and experience can help increase their self-confidence and effectiveness in caring for patients.

Developing and implementing protocols for managing preoperative anxiety can provide a common and consistent approach to nursing practice. These protocols can include detailed steps for assessing patients' anxiety levels, identifying their specific needs, and planning appropriate strategies to reduce anxiety and improve the patient's preoperative experience.

Regular assessment and review of the effectiveness of anxiety management strategies is important to identify any needs and ensure that nurses are able to use the most effective ways to help their patients. This includes monitoring patient outcomes and adjusting practice according to identified needs.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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The Impact of Digital Education and Social Networks on The Integration of Theory and Practice in Nursing

EVIS ALLUSHI[1], VARJOLA KACABUMI[2], ROSELA ALLUSHI[3], VASILIKA PRIFTI[1]

Abstract: The way nursing students learn has evolved significantly, moving from traditional lectures or even computer use to more advanced systems.
Platforms such as YouTube, Facebook, and Twitter have further expanded opportunities for students to learn new information, collaborate with colleagues, and share knowledge. More recently, mobile-based virtual reality learning platforms have increased flexibility, engagement, and interaction among nursing students. This study highlights how digital education and social networks have influenced nursing students in Health Faculty of Vlora university to obtain new information in their field, but also to combine theory with nursing practice.
Methods: The students of the Faculty of Health included in the study were from all three academic years of bachelor and master, and numbered 220. This study was conducted during the period January-March 2025. The students completed questionnaires voluntarily, indicating the use of social networks to obtain information in the field of nursing and the impact they have on their knowledge.
Results: The number of students that completed the questionnaire was 220. 13.2% first year, 25,4 % in second year, 41.2% in year three and 20.2% in masters. The recommendation of using of this platforms in 50.5% of students is from their professors, 46.2% used them themselves and 3.3% from family members. The results show that Pinterest is the most preferred platform by students (33.2%), followed by YouTube (25.2%), Instagram (23.6%) and WhatsApp (18%). An important part of the study focuses on the impact of social media on the formation of students' careers. The findings show that 43,5% of students have applied the knowledge gained from social media in their career fields, while 26.8 % strongly agree with this statement.
Conclusion: The study shows that social media and digital education are widely used and perceived as useful not only for academic achievement but also for professional preparation. While lecturers play an important role in recommending these tools, students also show a high awareness of their benefits, using them independently to improve their knowledge and practical skills.

Keywords: digital education, social networks, nursing, practical skills

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INTRODUCTION

The way nursing students learn has evolved significantly, moving from traditional lectures or even computer use to more advanced systems [1]. Platforms such as YouTube, Facebook, and Twitter have further expanded opportunities for students to learn new information, collaborate with colleagues, and share knowledge. More recently, mobile-based virtual reality learning platforms have increased flexibility, engagement, and interaction among nursing students [2]. Social media has been defined as "a set of online applications that allow the creation and sharing of user-generated content" [3] and can be categorized into five groups: (1) collaborative projects (e.g., Wikipedia), (2) blogs or microblogs (e.g., Blogger or Twitter), (3) content communities (e.g., YouTube), (4) social networking sites (SNSs; e.g., Facebook), and (5) virtual gaming or social worlds (e.g., Second Life) [4]. Social networking sites, e.g., Facebook, are "applications that allow users to connect by creating profiles with personal information, inviting friends and colleagues to access those profiles, and sending e-mails and instant messages to each other" [4]. There is much confusion between the terms social media and social networks, with social media being a newer and much broader term that also includes social networks. While we witness the evolution of social media use worldwide among the general population, the popularity of the media has also been embraced by healthcare professionals [5]. This is further reflected as a significant increase in research on the use of social media in health and medicine [6], mainly focusing on the roles of media or networks in connecting patients and HCPs [7-9] or the use of social media or networks for communication among healthcare professionals [10].

MATERIAL AND METHOD

2.1 Purpose

The purpose of this study is to identify the role that the use of social media plays in the learning progress of nursing students.

2.2 Objectives

¬ To identify whether nursing students use social media.

¬ To identify the type of social media that are most used.

¬ To identify who recommends nursing students to use social media.

¬ To assess the quality and usefulness of the use of social media.

¬ To provide appropriate recommendations.

2.3 Hypothesis

Hypothesis 1=> The more satisfactory the experience of using social media, the more useful their role is seen.

Hypothesis 2 => The more often social media is used, the more qualitative their role in the learning progress of students

2.4 Population in the study

To carry out this study, a sample of 220 students who were part of the Faculty of Health was selected. 13.2% of the sample were in the first year. 25.4% in the second year while the majority of them are in the third year, respectively 41.2% and 20.2% in the master's degree.

2.5 Instrument

The instrument used for this study is a simple self-administered questionnaire which consists of two parts. In the first part: it initially contains a set of data regarding some universal variables such as year of study and gender.

The second part: of the questionnaire contains some questions where students answered with yes/no or with multiple answers, or with a Likert scale.

RESULTS AND DISCUSSION

The study conducted on a sample of 220 students from the Faculty of Health aims to assess the impact of social media on the learning process, with a particular focus on nursing students. The discussion of the results of this study includes several key aspects that illustrate the use and benefits of these media, as well as students' perceptions regarding the potential benefits in their education and future careers.

Year of Study

We have an even distribution across years, with third-year students making up the largest proportion (41.2%), followed by second-year students (25.4%) and master’s students (20.2%). This indicates that the sample well represents all stages of nursing study, including both those at the beginning of their studies and those completing them. This distribution is important to assess how social media use varies depending on the level of academic preparation. This result is in line with the results found by Cathala et al in 2021 where the group studied social media use across the 4 years of the nursing program, with no major differences between years, indicating that in general nursing students use social media extensively in the learning process [11].

Gender

In terms of gender, a clear dominance of females (87.9%) was observed, compared to males (12.1%). This is a typical distribution for nursing students, where females often represent the majority. Meanwhile, a study conducted by Alnjadat et al in 2019 concluded that out of 328 students interviewed, males were more social media users than females, but the academic performance of females was higher among females than among males [12].

Social Media Use

One of the most important findings of this study is the use of social media for the learning process. The results show that all students in the sample use social media for educational reasons, which reflects a wide acceptance of these tools as an important resource for education. Professors play an important role in this regard, as 50.5% of students say that they have been recommended by teachers to use social media. However, a significant percentage (46.2%) say that they have chosen to use these platforms themselves, which indicates a growing awareness of the role of social media in the independent learning process. Meanwhile, students in a university college of nursing in Canada have claimed to use social media for online assignments and parts of their exams during the semesters [13].

Most Used Social Media

The results show that Pinterest is the most preferred platform by students (33.2%), followed by YouTube (25.2%), Instagram (23.6%) and WhatsApp (18%). These platforms offer a variety of content that can be used for learning, such as video tutorials on YouTube or educational resources on Pinterest. This diversity in usage reflects the different needs of students and the way different platforms meet these needs. Kathala et al found that WhatsApp was the most used application for viewing videos and articles [11].

Frequency of Use

34.5% of students use social media several times a day for academic reasons, while 29.3% use it once a day. This frequent use shows that social media has become an integral part of students' academic lives. Females seem to be more active in daily use of social media, while males tend to be more sporadic, using it several times a week. The same results are also from the study by Ogbuiyi et al in 2021 where 68.8% of nursing students use social media several times a day. Messages are sent every hour, via WhatsApp, and YouTube use is frequent [14].

Satisfaction and Benefits from Social Media Use

One of the most interesting findings of the study is the relationship between satisfaction with the use of social media and their benefit in the learning process. The correlation table shows a strong positive relationship ($r=0.69$) between these two variables. This suggests that the more satisfactory the experience of using social media, the more beneficial their role in education is perceived. Furthermore, 48.3% of students declare that social media is very useful in their learning process, underlining their importance in improving academic results. The aforementioned study by Ogbuiyi et al found no statistically significant data between the use of social networks and study habits [14].

The Role of Social Media in Career

An important part of the study focuses on the impact of social media on the formation of students' careers. The findings show that 39.7% of students have applied the knowledge gained from social media in their career fields, while 24.1% strongly agree with this statement. This shows that social platforms not only help in theoretical education, but also have a practical impact on students' future skills and careers.

While Chu J. concluded that social media platforms have played an important role in having high professional standards, both for themselves and for their careers [15].

CONCLUSIONS

The study shows that social media have a significant impact on the learning process of nursing students. They are widely used and perceived as useful not only for academic achievement but also for professional preparation. While lecturers play an important role in recommending these tools, students also show a high awareness of their benefits, using them independently to improve their knowledge and practical skills.

RECOMMENDATIONS

Nursing students should use social media that is reliable in the medical field.

They should check the information received on them.

Educators, better aware of the preferences of generations and technology, should provide recommendations on which media to use more and for what purposes.

Educational institutions should invest in meeting students' needs for access to medically based social media that can help students achieve their goals during the learning process.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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The Relationship Between Self-Leadership and Academic Motivation: A Study on Sport Sciences Students

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Abstract: The aim of this study was to examine the relationship between self-leadership levels and academic motivation among students enrolled in a Faculty of Sport Sciences. The study was conducted using a correlational survey model, one of the quantitative research methods. The study group consisted of a total of 266 undergraduate students, including 170 female and 96 male students, enrolled in the Departments of Coaching Education, Sport Management, and Recreation at Yalova University Faculty of Sport Sciences. Data were collected using a Personal Information Form, the Abbreviated Self-Leadership Questionnaire, and the Academic Motivation Scale. The findings revealed a positive, moderate, and statistically significant relationship between self-leadership and academic motivation ($r = .490$, $p < .01$). No statistically significant relationship was found between amotivation and self-leadership. In addition, students who regularly participated in sports had significantly higher task motivation and total self-leadership scores than those who did not participate in sports. In conclusion, self-leadership skills appear to be an important individual characteristic that supports academic motivation among sport sciences students, and practices aimed at developing these skills may contribute positively to their educational processes.
Keywords: Self-leadership, academic motivation, sport sciences students.

Kendi Kendine Liderlik ile Akademik Motivasyon Arasındaki İlişki: Spor Bilimleri Öğrencileri Üzerine Bir Araştırma

Özet: Bu araştırmanın amacı, spor bilimleri fakültesinde öğrenim gören öğrencilerin kendi kendine liderlik düzeyleri ile akademik motivasyonları arasındaki ilişkiyi incelemektir. Araştırma nicel araştırma yöntemlerinden ilişkisel tarama modeli kullanılarak gerçekleştirilmiştir. Çalışma grubunu Yalova Üniversitesi Spor Bilimleri Fakültesinin Antrenörlük Eğitimi, Spor Yöneticiliği ve Rekreasyon bölümlerinde öğrenim gören 170 kadın ve 96 erkek olmak üzere toplam 266 lisans öğrencisi oluşturmaktadır. Verilerin toplanmasında Kişisel Bilgi Formu, Kendi Kendine Liderlik Ölçeği Kısa Formu ve Akademik Motivasyon Ölçeği kullanılmıştır. Bulgular, kendi kendine liderlik ile akademik motivasyon arasında pozitif yönlü ve orta düzeyde anlamlı bir ilişki bulunduğunu göstermiştir ($r=,490$; $p<,01$). Motivasyonsuzluk ile kendi kendine liderlik arasında ise anlamlı bir ilişki belirlenmemiştir. Ayrıca düzenli spor yapan öğrencilerin görev motivasyonu ve toplam kendi kendine liderlik puanlarının spor yapmayan öğrencilere göre anlamlı düzeyde daha yüksek olduğu saptanmıştır. Sonuç olarak, kendi kendine liderlik becerilerinin spor bilimleri öğrencilerinin akademik motivasyonlarını destekleyen önemli bir bireysel özellik olduğu ve bu becerilerin geliştirilmesine yönelik uygulamaların eğitim süreçlerine katkı sağlayabileceği değerlendirilmektedir.
Anahtar Kelimeler: Öz liderlik, akademik motivasyon, spor bilimleri öğrencileri

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1. GİRİŞ

Kendi kendine liderlik, bireyin kendi davranışlarını, düşüncelerini ve motivasyon süreçlerini bilinçli bir şekilde yönlendirmesini ifade eden önemli bir öz yönetim yaklaşımıdır. Kavram ilk kez Manz tarafından 1983 yılında yayımlanan *The Art of Self-Leadership: Strategies for Personal Effectiveness in Your Life and Work* adlı eserle ortaya konulmuş, daha sonra 1986 yılında geliştirilen öz-etkileme süreci kuramıyla kuramsal açıdan daha kapsamlı bir yapıya kavuşturulmuştur (Neck & Houghton, 2006). Özellikle 1990'lı yıllardan itibaren kendi kendine liderlik yaklaşımı; kendi kendini yöneten ekipler ve güçlendirici liderlik anlayışı çerçevesinde örgütsel davranış, eğitim ve psikoloji gibi farklı disiplinlerde yaygın olarak ele alınmaya başlanmıştır (Neck & Houghton, 2006). Kendi Kendine liderlik kavramı davranış odaklı stratejiler, doğal ödül stratejileri ve yapıcı düşünce stratejileri olmak üzere üç temel boyutta incelenmektedir. Davranış odaklı stratejiler bireyin kendi davranışlarını gözlemlemesi ve kontrol etmesini içerirken, doğal ödül stratejileri bireyin yaptığı faaliyetlerden içsel tatmin elde etmesini sağlamaktadır. Yapıcı düşünce stratejileri ise bireyin olumlu düşünme ve zihinsel canlandırma yoluyla performansını artırmasını ifade etmektedir (Neck ve Houghton, 2006). Öz liderlik kavramı bireyin

kendi davranışlarını kontrol etmesi, kendi hedeflerini belirlemesi ve bu hedeflere ulaşmak için kendisini yönlendirmesi süreci olarak tanımlanmaktadır. Öz liderlik, bireyin kendi kendini motive etmesi, kendi performansını değerlendirmesi ve kişisel gelişimini yönetmesi açısından önemli bir kavramdır. Özellikle eğitim ortamlarında öğrencilerin öz liderlik becerileri geliştikçe akademik başarılarının ve motivasyonlarının arttığı görülmektedir. Öz liderlik bireyin kendisini yönlendirme ve davranışlarını bilinçli olarak düzenleme sürecini içermektedir (Manz, 1986; Stewart, Courtright & Manz, 2011). Liderlik kavramı tarih boyunca bireyleri ortak amaçlar doğrultusunda etkileyebilme ve yönlendirebilme becerisi olarak ele alınmıştır. Akademik yazında özellikle 19. yüzyıldan itibaren sistematik biçimde incelenen liderlik, günümüzde yalnızca başkalarını yönlendirme değil, bireyin öncelikle kendisini yönetebilme becerisini de içeren bir anlayışa dönüşmüştür (Şişman, 2002). Belirli hedeflere ulaşabilmek amacıyla bireyleri harekete geçirmek etkili iletişim, planlama ve ikna becerilerini gerektirirken (Kul, 2010), bu becerilerin temelinde bireyin kendi davranışlarını yönetebilmesi yer almaktadır. Bu nedenle eğitim ortamları, bireylerin kendi kendine liderlik becerilerini geliştirebilecekleri önemli öğrenme alanları olarak değerlendirilmektedir (Fidan, 2012). Spor bilimleri eğitimi, bireylerin yalnızca akademik bilgi edinmelerini değil, aynı zamanda disiplin, öz güven, sorumluluk, takım çalışması ve liderlik gibi kişisel özelliklerini geliştirmelerini de destekleyen çok yönlü bir eğitim alanıdır. Spor; bireyin fiziksel ve zihinsel gelişimine katkı sağlamasının yanında sosyal uyumu, iletişim becerilerini ve kişisel gelişimini desteklemektedir (Armağan, 1982; Coşkuntürk vd., 2023). Ayrıca spor, bireylerin farklı çevrelerle etkileşim kurmalarına ve sosyal deneyimlerini zenginleştirmelerine olanak tanımaktadır (Gönen vd., 2022). Düzenli sportif etkinliklere katılımın motivasyonu artırdığı, stres düzeyini azalttığı, öz güveni geliştirdiği ve yaşam kalitesini olumlu yönde etkilediği belirtilmektedir (Karabulut & Altun, 2018). Bu yönüyle spor ortamları, bireylerin kendi kendine liderlik davranışlarını geliştirebilecekleri önemli yaşam alanlarından biri olarak değerlendirilmektedir.

Akademik motivasyon ise öğrencilerin öğrenme sürecini başlatan, yönlendiren ve sürdüren temel psikolojik süreçlerden biridir (Pintrich & Zusho, 2002). İçsel ve dışsal güdülerden beslenen akademik motivasyon, öğrencilerin öğrenmeye yönelik ilgilerini, çabalarını ve akademik hedeflerine ulaşma isteklerini belirleyen önemli bir değişkendir (Ryan & Deci, 2000). Akademik motivasyonu yüksek olan öğrenciler derslere daha aktif katılmakta, öğrenmeye daha fazla zaman ayırmakta, karşılaştıkları güçlükler karşısında daha fazla çaba göstermekte ve akademik başarı açısından daha yüksek performans sergilemektedirler (Bozanoğlu, 2004). Buna karşılık motivasyon düzeyi düşük olan öğrenciler öğrenme etkinliklerinden kaçınma, düşük çaba gösterme ve zamanla akademik süreçten uzaklaşma eğilimi gösterebilmektedir (Peker & Kağızmanlı, 2018). Öğrenmeye yönelik motivasyonun akademik başarının en önemli belirleyicilerinden biri olduğu; motive olmuş öğrencilerin öğrenme davranışlarını hedeflerine ulaşacak şekilde düzenledikleri ve akademik performanslarının daha yüksek olduğu ifade edilmektedir (Alderman, 2004; Slavin, 2006; Sternberg & Williams, 2009). Öğrencilerin akademik başarılarında motivasyon önemli bir faktör olarak görülmektedir. İçsel motivasyon, bireyin öğrenme faaliyetlerini dışsal ödüller olmaksızın gerçekleştirmesi ve öğrenme sürecinden keyif alması anlamına gelmektedir. Bu durum öğrencilerin akademik hedeflerine ulaşmalarında önemli bir etkiye sahiptir (Deci ve Ryan, 1985). Literatürde öz liderlik davranışları ile akademik motivasyon arasında güçlü bir ilişki olduğu görülmektedir. Öz liderlik becerileri gelişmiş olan öğrenciler hedef belirleme, zaman yönetimi ve öz değerlendirme gibi becerileri daha etkili kullanabilmektedir. Bu durum öğrencilerin akademik motivasyonlarını artırarak eğitim süreçlerinde daha başarılı olmalarını sağlamaktadır (Sitzmann & Ely, 2011). Spor bilimleri öğrencileri, eğitim süreçleri boyunca akademik çalışmaların yanı sıra uygulamalı dersler, antrenman programları ve performans odaklı etkinlikleri de birlikte yürütmektedir. Bu durum öğrencilerin zaman yönetimi, öz disiplin, hedef belirleme ve öz düzenleme becerilerine diğer birçok öğrenci grubuna göre daha fazla ihtiyaç duymalarına neden olmaktadır. Ayrıca spor ortamlarının iletişim becerileri, liderlik özellikleri ve motivasyon üzerinde olumlu etkiler oluşturduğu çeşitli araştırmalar tarafından ortaya konulmuştur (Sánchez-García et al., 2024). Bu nedenle kendi kendine liderlik becerilerinin spor bilimleri öğrencilerinin akademik yaşamlarında önemli bir rol oynayabileceği düşünülmektedir.

Spor bilimleri alanında eğitim gören öğrenciler hem akademik hem de fiziksel performans gerektiren bir eğitim sürecinden geçmektedir. Bu nedenle öz liderlik becerileri spor bilimleri öğrencileri için oldukça önemli bir kavramdır. Kendi kendine yani öz liderlik becerileri gelişmiş öğrenciler antrenman planlaması, disiplin ve performans değerlendirme konularında daha başarılı olmaktadır (Furtner, Rauthmann ve Sachse, 2011). Son yıllarda yapılan çalışmalar kendi kendine liderliğin üniversite öğrencilerinin kariyer uyumu, akademik öz yeterlik ve motivasyon gibi değişkenlerle ilişkili olduğunu göstermektedir. Öz liderlik stratejileri kullanan öğrencilerin akademik süreçlerini daha iyi yönetebildikleri ve öğrenme süreçlerine daha fazla katılım gösterdikleri belirtilmektedir (Shin, Choi, & Jo, 2025). Ayrıca kendi kendine liderliğin öğrencilerin akademik öz yeterlikleri ve kariyer gelişimleri üzerinde önemli bir aracı rol oynadığı da vurgulanmaktadır. Spor bilimleri öğrencileri üzerinde yapılan araştırmalar, akademik motivasyonun öğrencilerin kariyer kararları, psikolojik dayanıklılıkları ve spor kimlikleri ile ilişkili olduğunu göstermektedir. Ayrıca sporla aktif olarak ilgilenen öğrencilerin akademik motivasyon düzeylerinin psikolojik faktörlerden ve eğitim ortamından etkilendiği belirlenmiştir (Uygun & Tepeköylü Öztürk, 2023). Bununla birlikte literatür incelendiğinde kendi kendine liderlik ile akademik motivasyon arasındaki ilişkinin farklı örneklemlerde ele alınmasına rağmen, spor bilimleri öğrencileri üzerinde gerçekleştirilen çalışmaların sınırlı olduğu görülmektedir. Literatürde öz liderlik ve akademik motivasyon ilişkisini inceleyen çalışmalar bulunmasına rağmen bu ilişkinin spor bilimleri öğrencileri üzerinde örnekleminde sınırlı sayıda araştırıldığı görülmektedir. Özellikle Türkiye'de bu iki değişkeni birlikte inceleyen araştırmaların yeterli düzeyde olmaması, konunun farklı örneklemler üzerinde yeniden değerlendirilmesini gerekli

kılmaktadır. Bu doğrultuda mevcut araştırmanın amacı, spor bilimleri fakültesinde öğrenim gören öğrencilerin kendi kendine liderlik düzeyleri ile akademik motivasyonları arasındaki ilişkiyi incelemek ve elde edilen bulgular doğrultusunda ilgili literatüre katkı sağlamaktır.

2. MATERYAL VE YÖNTEM

Çalışma modeli

Bu araştırma nicel araştırma yöntemlerinden betimsel tarama modeli ile yapılmıştır.

Çalışma Grubu

Araştırmanın çalışma grubunu, 2025–2026 eğitim-öğretim yılında Yalova Üniversitesi Spor Bilimleri Fakültesinin Antrenörlük Eğitimi, Spor Yöneticiliği ve Rekreasyon bölümlerinde öğrenim gören ve araştırmaya gönüllü olarak katılan toplam 266 lisans öğrencisi oluşturmaktadır. Katılımcıların 170'i kadın, 96'sı erkek öğrencidir. Araştırmaya dâhil edilme kriterleri; Yalova Üniversitesi Spor Bilimleri Fakültesinde öğrenim görüyor olmak, 18 yaş ve üzerinde olmak, araştırmaya gönüllü olarak katılmayı kabul etmek ve aydınlatılmış onam formunu onaylamış olmaktır. Katılım tamamen gönüllülük esasına dayanmakta olup katılımcılar istedikleri zaman herhangi bir gerekçe göstermeksizin araştırmadan ayrılabilmektedir.

Veri Toplama Aracı

Araştırma verileri üç bölümden oluşan bir veri toplama formu aracılığıyla toplanmıştır. Veri toplama formunda sırasıyla Kişisel Bilgi Formu, Kendi Kendine Liderlik Ölçeği Kısa Formu ve Akademik Motivasyon Ölçeği yer almaktadır. Kişisel bilgi formunda katılımcıların demografik özelliklerini belirlemeye yönelik sorular bulunmaktadır. Formda yaş, cinsiyet, öğrenim görülen bölüm, sınıf düzeyi, spor yapma durumu ve spor geçmişi gibi değişkenlere ilişkin bilgiler yer almaktadır. Katılımcıların kendi kendine liderlik düzeylerini belirlemek amacıyla Houghton ve arkadaşları (2012) tarafından geliştirilen, Şahin (2015) tarafından Türkçeye uyarlanan Kendi Kendine Liderlik Ölçeği Kısa Formu kullanılmıştır.

Ölçek toplam 9 maddeden ve üç alt boyuttan oluşmaktadır. Birinci alt boyut olan Davranışsal Farkındalık ve İrade 1., 4. ve 7. maddelerden; ikinci alt boyut olan Görev Motivasyonu 2., 5. ve 8. maddelerden; üçüncü alt boyut olan Yapıcı Düşünce ise 3., 6. ve 9. maddelerden oluşmaktadır. Ölçek 5'li Likert tipinde derecelendirilmiştir. Katılımcıların akademik motivasyon düzeylerini belirlemek amacıyla Vallerand ve arkadaşları (1992) tarafından geliştirilen ve Karagüven (2012) tarafından Türkçeye uyarlanan Akademik Motivasyon Ölçeği kullanılmıştır.

Ölçek toplam 28 maddeden ve 7 alt boyuttan oluşmaktadır. Katılımcılar maddeleri 5'li Likert tipi derecelendirme üzerinden yanıtlamaktadır. Ölçek, bireylerin akademik motivasyon düzeylerini farklı motivasyon boyutları açısından değerlendirmektedir. Ölçeklerin Türkçe geçerlik ve güvenirlik çalışmaları yapılmış olup, ilgili çalışmalarda Cronbach alfa değerlerinin kabul edilebilir düzeyde olduğu bildirilmiştir.

Verilerin İstatistiksel Analizi

Araştırmadan elde edilen verilerin istatistiksel analizi SPSS Statistics (Statistical Package for the Social Sciences) paket programı kullanılarak gerçekleştirilmiştir. Analiz öncesinde veri seti eksik veri, aykırı değer ve hatalı veri girişleri açısından incelenmiş, sürekli değişkenlerin normal dağılıma uygunluğu Kolmogorov-Smirnov testi ile değerlendirilmiştir. Katılımcıların demografik özelliklerine ilişkin tanımlayıcı istatistikler frekans, yüzde, aritmetik ortalama ve standart sapma değerleri ile sunulmuştur. Araştırmada kullanılan ölçeklerin iç tutarlılığı Cronbach Alfa katsayısı ile değerlendirilmiştir. Demografik değişkenlere göre iki grup karşılaştırmalarında Bağımsız Örneklem t-testi, ikiden fazla grup karşılaştırmalarında ise Tek Yönlü Varyans Analizi (ANOVA) kullanılmıştır. Kendi kendine liderlik ile akademik motivasyon arasındaki ilişkinin belirlenmesinde Pearson Momentler Çarpımı Korelasyon Analizi uygulanmıştır. Tüm istatistiksel analizlerde anlamlılık düzeyi $p < .05$ olarak kabul edilmiştir.

3.BULGULAR

Tablo1. Cinsiyete Göre Kendi Kendine Liderlik

Kendi Kendine Liderlik	Cinsiyet	N	Ort.Std.Sp	sd	t	p
Davranışsal Farkındalık ve İrade	Erkek	96	3,72±,998	264	-,776	,439
	Kadın	170	3,82±,803			
Görev Motivasyonu	Erkek	96	3,74±,963	264	-1,109	,268
	Kadın	170	3,87±,886			
Yapıcı Düşünce	Erkek	96	3,66±,997	264	-,559	,577
	Kadın	170	3,73±,811			
Toplam	Erkek	96	3,71±,930	264	-,858	,392
	Kadın	170	3,80±,775			

Tablo 1 incelendiğinde, katılımcıların cinsiyetlerine göre kendi kendine liderlik alt boyutları ile toplam kendi kendine liderlik puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > .05).

Tablo2. Cinsiyete Göre Akademik Motivasyon

Akademik Motivasyon	Cinsiyet	N	Ort.Std.Sp	Sd	t	p
Bilmeye Yönelik İçsel Motivasyon	Erkek	96	3,29±1,00	264	-2,640	,009
	Kadın	170	3,60±,784			
Başarıya Yönelik İçsel Motivasyon	Erkek	96	3,19±1,00	264	-,256	,799
	Kadın	170	3,22±,786			
Uyarım Yaşamaya Yönelik İçsel Motivasyon	Erkek	96	3,14±,948	264	-,315	,740
	Kadın	170	3,17±,781			
Belirlenmiş Dışsal Motivasyon	Erkek	96	3,44±,967	264	-1,836	,067
	Kadın	170	3,64±,800			
İçe Yansıyan Dışsal Motivasyon	Erkek	96	3,15±1,02	264	-1,044	,298
	Kadın	170	3,27±,809			
Dışsal Motivasyon Dış Düzenleme	Erkek	96	3,39±1,03	264	-2,362	,019
	Kadın	170	3,66±,837			
Motivasyonsuzluk	Erkek	96	2,94±1,08	264	2,156	,032
	Kadın	170	2,64±1,07			
Toplam	Erkek	96	3,26±,899	264	-1,570	,118
	Kadın	170	3,43±,653			

Tablo 2 incelendiğinde, katılımcıların cinsiyetlerine göre Bilmeye Yönelik İçsel Motivasyon, Dışsal Motivasyon/Dış Düzenleme ve Motivasyonsuzluk alt boyutlarında istatistiksel olarak anlamlı farklılık bulunmuştur (p < .05). Akademik motivasyonun diğer alt boyutları ile toplam puanında ise cinsiyete göre istatistiksel olarak anlamlı bir farklılık tespit edilmemiştir (p > .05).

Tablo3. Yaşa Göre Kendi Kendine Liderlik

Kendi Kendine Liderlik	Yaş Grubu	N	Ort/Std.Sp	sd	F	p
Davranışsal Farkındalık Ve İrade	18-20 Yaş	86	3,71±,933	2	,684	,505
	21-23 Yaş	134	3,79±,796			
	24 yaş ve üstü	46	3,89±,998			
Görev Motivasyonu	18-20 Yaş	86	3,75±1,00	2	,344	,709
	21-23 Yaş	134	3,85±,797			
	24 yaş ve üstü	46	3,87±1,05			
Yapıcı Düşünce	18-20 Yaş	86	3,70±,895	2	,726	,485
	21-23 Yaş	134	3,66±,808			
	24 yaş ve üstü	46	3,84±1,05			
Toplam	18-20 Yaş	86	3,72±,882	2	,481	,619
	21-23 Yaş	134	3,77±,734			
	24 yaş ve üstü	46	3,87±1,00			

Tablo 3 incelendiğinde, katılımcıların yaş gruplarına göre kendi kendine liderlik alt boyutları ile toplam kendi kendine liderlik puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > .05).

Tablo4. Yaşa Göre Akademik Motivasyon

Akademik Motivasyon	Yaş Grubu	N	Ort/Stds.p	sd	F	p
Bilmeye Yönelik İçsel Motivasyon	18-20 Yaş	86	3,54±,898	2	,465	,629
	21-23 Yaş	134	3,49±,817			
	24 yaş ve üstü	46	3,38±1,03			
Başarıya Yönelik İçsel Motivasyon	18-20 Yaş	86	3,30±,927	2	,766	,466
	21-23 Yaş	134	3,16±,818			
	24 yaş ve üstü	46	3,15±,916			
Uyarım Yaşamaya Yönelik İçsel Motivasyon	18-20 Yaş	86	3,27±,854	2	1,143	,320
	21-23 Yaş	134	3,10±,782			
	24 yaş ve üstü	46	3,12±,985			
Belirlenmiş Dışsal Motivasyon	18-20 Yaş	86	3,69±,813	2	1,633	,197
	21-23 Yaş	134	3,53±,849			
	24 yaş ve üstü	46	3,42±,998			
İçe Yansıyan Dışsal Motivasyon	18-20 Yaş	86	3,31±,927	2	,741	,478
	21-23 Yaş	134	3,21±,821			
	24 yaş ve üstü	46	3,11±1,02			
Dışsal Motivasyon / Dış Düzenleme	18-20 Yaş	86	3,63±,904	2	1,014	,364
	21-23 Yaş	134	3,58±,876			
	24 yaş ve üstü	46	3,39±1,07			
Motivasyonsuzluk	18-20 Yaş	86	2,85±1,11	2	1,420	,244
	21-23 Yaş	134	2,64±1,05			
	24 yaş ve üstü	46	2,89±1,10			
Toplam	18-20 Yaş	86	3,46±,742	2	1,074	,343
	21-23 Yaş	134	3,35±,698			
	24 yaş ve üstü	46	3,26±,916			

Tablo 4 incelendiğinde, katılımcıların yaş gruplarına göre kendi kendine liderlik alt boyutları ile toplam kendi kendine liderlik puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > .05).

Tablo 5. Okuduğu Bölüme Göre Kendi Kendine Liderlik

Kendi Kendine Liderlik	Okuduğu Bölüm	N	Ort/Std.Sp	sd	F	p
Davranışsal Farkındalık Ve İrade	Spor Yöneticiliği	120	3,70±,868	2	1,056	,349
	Rekreasyon	70	3,84±,998			
	Antrenörlük	76	3,87±,767			
Görev Motivasyonu	Spor Yöneticiliği	120	3,70±,910	2	2,154	,118
	Rekreasyon	70	3,90±1,05			
	Antrenörlük	76	3,95±,749			
Yapıcı Düşünce	Spor Yöneticiliği	120	3,65±,854	2	,404	,668
	Rekreasyon	70	3,75±1,01			
	Antrenörlük	76	3,75±,793			
Toplam	Spor Yöneticiliği	120	3,68±,828	2	1,251	,288
	Rekreasyon	70	3,83±,963			
	Antrenörlük	76	3,86±,702			

Tablo 5 incelendiğinde, katılımcıların öğrenim gördükleri bölümlere göre kendi kendine liderlik alt boyutları ile toplam kendi kendine liderlik puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > .05).

Tablo 6. Okuduğu Bölüme Göre Akademik Motivasyon

Akademik Motivasyon	Okuduğu Bölüm	N	Ort/Std.Sp	Sd	F	p
Bilmeye Yönelik İçsel Motivasyon	Spor Yöneticiliği	120	3,52±,770			
	Rekreasyon	70	3,49±1,01	2	,160	,852
	Antrenörlük	76	3,44±,922			
Başarıya Yönelik İçsel Motivasyon	Spor Yöneticiliği	120	3,23±,792			
	Rekreasyon	70	3,25±1,04	2	,437	,647
	Antrenörlük	76	3,13±,821			
Uyarım Yaşamaya Yönelik İçsel Motivasyon	Spor Yöneticiliği	120	3,23±,749			
	Rekreasyon	70	3,11±1,02	2	,914	,402
	Antrenörlük	76	3,08±,801			
Belirlenmiş Dışsal Motivasyon	Spor Yöneticiliği	120	3,58±,740			
	Rekreasyon	70	3,67±,995	2	1,218	,298
	Antrenörlük	76	3,45±,924			
İçe Yansıyan Dışsal Motivasyon	Spor Yöneticiliği	120	3,21±,768			
	Rekreasyon	70	3,33±1,07	2	,682	,506
	Antrenörlük	76	3,17±,902			
Dışsal Motivasyon/ Dış Düzenleme	Spor Yöneticiliği	120	3,51±,807			
	Rekreasyon	70	3,61±1,06	2	,305	,737
	Antrenörlük	76	3,59±,962			
Motivasyonsuzluk	Spor Yöneticiliği	120	2,92±1,00			
	Rekreasyon	70	2,67±1,28	2	2,741	,066
	Antrenörlük	76	2,56±,978			
Toplam	Spor Yöneticiliği	120	3,38±,629			
	Rekreasyon	70	3,41±,898	2	,356	,701
	Antrenörlük	76	3,31±,795			

Tablo6incelendiğinde, katılımcıların öğrenim gördükleri bölümlere göre akademik motivasyonun alt boyutları ile toplam akademik motivasyon puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > .05).

Tablo 7. Spor Yapma Durumuna Göre Kendi Kendine Liderlik

Kendi Kendine Liderlik	Spor Yapma Durumu	N	Ort/Std.Sp	sd	t	p
Davranışsal Farkındalık ve İrade	Evet	232	3,82±,890	264	1,636	,103
	Hayır	34	3,55±,759			
Görev Motivasyonu	Evet	232	3,87±,911	264	2,516	,012
	Hayır	34	3,46±,864			
Yapıcı Düşünce	Evet	232	3,74±,890	264	1,696	,091
	Hayır	34	3,47±,791			
Toplam	Evet	232	3,81±,842	264	2,092	,037
	Hayır	34	3,49±,727			

Tablo 7 incelendiğinde, spor yapma durumuna göre Görev Motivasyonu alt boyutu ile Toplam Kendi Kendine Liderlik puanlarında istatistiksel olarak anlamlı farklılık bulunmuştur (p < .05). Buna karşılık Davranışsal Farkındalık ve İrade ile Yapıcı Düşünce alt boyutlarında istatistiksel olarak anlamlı bir farklılık tespit edilmemiştir (p > .05).

Tablo 8. Spor Yapma Durumuna Göre Akademik Motivasyon

Akademik Motivasyon	Spor Yapma Durumu	N	Ort/Std.Sp	sd	t	p
Bilmeye Yönelik İçsel Motivasyon	Evet	232	3,51±,887	264	1,040	,299
	Hayır	34	3,34±,843			
Başarıya Yönelik İçsel Motivasyon	Evet	232	3,21±,875	264	,184	,854
	Hayır	34	3,18±,853			
Uyarım Yaşamaya Yönelik İçsel Motivasyon	Evet	232	3,17±,843	264	,448	,655
	Hayır	34	3,10±,859			
Belirlenmiş Dışsal Motivasyon	Evet	232	3,58±,880	264	,764	,445
	Hayır	34	3,46±,781			
İçe Yansıyan Dışsal Motivasyon	Evet	232	3,21±,904	264	-,844	,400
	Hayır	34	3,35±,812			
Dışsal Motivasyon/Dış Düzenleme	Evet	232	3,58±,929	264	,651	,516
	Hayır	34	3,47±,876			
Motivasyonsuzluk	Evet	232	2,74±,094	264	-,601	,548
	Hayır	34	2,86±,032			
Toplam	Evet	232	3,38±,759	264	,434	,665
	Hayır	34	3,31±,726			

Tablo 8 incelendiğinde, katılımcıların spor yapma durumuna göre akademik motivasyonun alt boyutları ile toplam akademik motivasyon puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > .05).

Tablo 9. Millilik Durumuna Göre Kendi Kendine Liderlik

Kendi Kendine Liderlik	Millilik	N	Ort/Std.Sp	sd	t	p
Davranışsal Farkındalık ve İrade	Evet	51	3,62±1,08	264	-1,225	,225
	Hayır	215	3,82±,818			
Görev Motivasyonu	Evet	51	3,64±1,07	264	-1,422	,160
	Hayır	215	3,86±,871			
Yapıcı Düşünce	Evet	51	3,55±1,16	264	-1,104	,274
	Hayır	215	3,74±,798			
Toplam	Evet	51	3,60±1,05	264	-1,312	,194
	Hayır	215	3,81±,769			

Tablo 9 incelendiğinde, katılımcıların millilik durumuna göre kendi kendine liderlik alt boyutları ile toplam puanları arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır (p > .05).

Tablo 10. Millilik Durumuna Göre Akademik Motivasyon

Akademik Motivasyon	Millilik	N	Ort/Std.Sp	sd	t	p
Bilmeye Yönelik İçsel Motivasyon	Evet	51	3,22±1,00	264	-2,426	,016
	Hayır	215	3,55±,839			
Başarıya Yönelik İçsel Motivasyon	Evet	51	3,18±,948	264	-,212	,832
	Hayır	215	3,21±,854			
Uyarım Yaşamaya Yönelik İçsel Motivasyon	Evet	51	3,18±,919	264	,168	,867
	Hayır	215	3,15±,827			
Belirlenmiş Dışsal Motivasyon	Evet	51	3,36±,860	264	-1,857	,064
	Hayır	215	3,61±,864			
İçe Yansıyan Dışsal Motivasyon	Evet	51	3,11±,987	264	-1,018	,310
	Hayır	215	3,25±,869			
Dışsal Motivasyon /Dış Düzenleme	Evet	51	3,31±,991	264	-2,196	,029
	Hayır	215	3,62±,896			
Motivasyonsuzluk	Evet	51	2,99±1,04	264	1,723	,086
	Hayır	215	2,70±1,08			
Toplam	Evet	51	3,23±,847	264	-1,481	,140
	Hayır	215	3,40±,728			

Tablo 10 incelendiğinde, millilik durumuna göre Bilmeye Yönelik İçsel Motivasyon ve Dışsal Motivasyon/Dış Düzenleme alt boyutlarında istatistiksel olarak anlamlı farklılık bulunmuştur (p < .05). Akademik motivasyonun diğer alt boyutları ile toplam puanında ise istatistiksel olarak anlamlı bir farklılık tespit edilmemiştir (p > .05).

Tablo 11. Akademik Motivasyon ve Kendi Kendine Liderlik Korelasyon

KENDİ KENDİNE LİDERLİK			Davranışsal Farkındalık ve İrade	Görev Motivasyonu	Yapıcı Düşünce	Toplam
AKADEMİK MOTİVASYON	Bilmeye Yönelik İçsel Motivasyon	r	,480**	,497**	,482**	,520**
		p	,000	,000	,000	,000
	Başarıya Yönelik İçsel Motivasyon	r	,311**	,336**	,317**	,344**
		p	,000	,000	,000	,000
	Uyarım Yaşamaya Yönelik İçsel Motivasyon	r	,265**	,303**	,320**	,316**
		p	,000	,000	,000	,000
	Belirlenmiş Dışsal Motivasyon	r	,468**	,495**	,433**	,498**
		p	,000	,000	,000	,000
	İçe Yansıyan Dışsal Motivasyon	r	,324**	,296**	,301**	,328**
		p	,000	,000	,000	,000
	Dışsal Motivasyon/Dış Düzenleme	r	,474**	,511**	,433**	,506**
		p	,000	,000	,000	,000
	Motivasyonsuzluk	r	-,017	-,009	,044	,007
		p	,780	,890	,470	,916
	Toplam	r	,453**	,475**	,445**	,490**
		p	,000	,000	,000	,000

N=266, **p<0.01, *p<0.05

Tablo 11 incelendiğinde, akademik motivasyonun olumlu alt boyutları ile kendi kendine liderliğin tüm alt boyutları arasında pozitif yönlü, orta düzeyde ve istatistiksel olarak anlamlı ilişkiler olduğu belirlenmiştir (p < .01). En yüksek ilişki, toplam akademik motivasyon ile toplam kendi kendine liderlik arasında saptanmıştır (r = .490). Buna karşın, motivasyonsuzluk ile kendi kendine liderlik arasında istatistiksel olarak anlamlı bir ilişki bulunmamıştır (p > .05).

4.TARTIŞMA VE SONUÇ

Bu araştırmada spor bilimleri fakültesi öğrencilerinin kendi kendine liderlik düzeyleri ile akademik motivasyonları arasındaki ilişki incelenmiş ve elde edilen bulgular, kendi kendine liderlik ile akademik motivasyon arasında pozitif yönlü ve orta düzeyde anlamlı bir ilişki bulunduğunu göstermiştir. Ayrıca akademik motivasyonun olumlu tüm alt boyutları ile kendi kendine liderliğin alt boyutları arasında pozitif ilişkiler belirlenirken, motivasyonsuzluk ile kendi kendine liderlik arasında anlamlı bir ilişki saptanmamıştır. Bu bulgu, öz liderlik becerileri gelişmiş öğrencilerin öğrenme süreçlerini daha planlı yönettiklerini, akademik sorumluluk aldıklarını ve hedeflerine ulaşma konusunda daha istekli olduklarını göstermektedir. Öz liderlik; hedef belirleme, öz değerlendirme, davranışları düzenleme ve içsel motivasyonu sürdürebilme becerilerini kapsayan bir yapı olduğundan, akademik motivasyon üzerindeki olumlu etkisi kuramsal olarak beklenen bir sonuçtur. Nitekim Sitzmann ve Ely (2011), öz liderlik stratejilerini etkili kullanan bireylerin öğrenme süreçlerine daha aktif katıldıklarını belirtirken; Furtner ve arkadaşları (2011) ile Shin ve arkadaşları (2025), öz liderliğin akademik öz yeterlik, kariyer gelişimi ve motivasyon üzerinde olumlu etkiler oluşturduğunu ortaya koymuştur. Benzer şekilde Uslu (2018), liderlik özellikleri ile akademik öz yeterlik arasında orta düzeyde pozitif ve anlamlı bir ilişki bulunduğunu ve liderlik özelliklerinin akademik öz yeterliği anlamlı biçimde yordadığını bildirmiştir. Akademik öz yeterlik ve akademik motivasyon farklı yapılar olmakla birlikte, her iki kavramın da öğrencilerin öğrenme süreçlerine aktif katılımını destekleyen psikolojik özellikler olduğu dikkate alındığında, bu bulgular mevcut araştırma sonuçlarını desteklemektedir. Ayrıca Çetinkaya (2020), akademik personel üzerinde yürüttüğü araştırmada demokratik, dönüşümcü ve etkileşimci liderlik tarzlarının öğrenme motivasyonu ile pozitif; otokratik liderlik tarzının ise negatif ilişkili olduğunu belirlemiştir. Araştırmada öz liderlik yerine örgütsel liderlik incelenmiş olsa da, liderlik süreçlerinin motivasyonu desteklediğini göstermesi bakımından mevcut araştırmanın bulgularıyla kuramsal açıdan benzerlik göstermektedir.

Araştırmada cinsiyet değişkeni açısından kendi kendine liderlik düzeylerinde anlamlı bir farklılık bulunmamasına rağmen, akademik motivasyonun bilmeye yönelik içsel motivasyon ve dışsal motivasyonun dış düzenleme alt boyutlarında kadın öğrencilerin erkek öğrencilere göre daha yüksek puanlara sahip olduğu, motivasyonsuzluk puanlarının

ise erkek öğrencilerde daha yüksek olduğu belirlenmiştir. Buna karşın toplam akademik motivasyon puanında anlamlı farklılık bulunmamıştır. Kendi kendine liderlik açısından elde edilen bu sonuç, Bozyiğit ve Duğan'ın (2018) cinsiyete göre anlamlı farklılık bulmayan araştırmasıyla paralellik göstermektedir. Ancak Özdemir ve arkadaşları (2017), kadın öğrencilerin kendi kendine liderlik eğilimlerinin erkek öğrencilere göre daha yüksek olduğunu bildirmiştir. Akademik motivasyon açısından ise mevcut bulgular, Çetinkaya'nın (2020) akademik personel üzerinde cinsiyete göre anlamlı farklılık belirlemeyen çalışmasından ayrılmaktadır. Bu farklılığın araştırma gruplarının farklı özelliklere sahip olmasından kaynaklandığı düşünülmektedir.

Araştırmada yaş grupları ve öğrenim görülen bölüm değişkenlerine göre hem kendi kendine liderlik hem de akademik motivasyon düzeylerinde anlamlı bir farklılık belirlenmemiştir. Spor bilimleri öğrencilerinin benzer eğitim programı, uygulamalı ders içerikleri ve ortak mesleki hedeflere sahip olmaları bu sonucu açıklayabilir. Bu bulgu, yaş değişkenine göre anlamlı farklılık belirlemeyen Bozyiğit ve Duğan (2018), Bozyiğit (2018), Çetinkaya (2020), Aslantürk (2014), Arslanoğlu (2016) ve Mahmutoğulları (2015) tarafından elde edilen sonuçlarla paralellik göstermektedir.

Araştırmada düzenli spor yapan öğrencilerin görev motivasyonu ve toplam kendi kendine liderlik puanlarının spor yapmayan öğrencilere göre anlamlı düzeyde daha yüksek olduğu belirlenmiştir. Buna karşılık akademik motivasyon açısından spor yapma durumuna göre anlamlı bir farklılık bulunmamıştır. Düzenli sportif etkinliklere katılımın bireylerin hedef belirleme, öz disiplin geliştirme ve öz denetim becerilerini desteklediği düşünüldüğünde bu bulgu beklenen bir sonuçtur. Benzer şekilde Bozyiğit (2018), sporla aktif olarak ilgilenen öğrencilerin kendi kendine liderlik düzeylerinin ortalamanın üzerinde olduğunu bildirmiştir. Ayrıca Küçüker ve Işık (2022), spor bilimleri öğrencilerinin akademik motivasyon ve akademik öz yeterlik düzeylerinin yüksek olduğunu ve sporun akademik süreçlere olumlu katkı sağlayabileceğini ifade etmektedir. Bu bulgular, düzenli spor yapan öğrencilerin öz liderlik düzeylerinin daha yüksek bulunmasını dolaylı olarak desteklemektedir.

Millilik durumuna göre yapılan analizlerde kendi kendine liderlik açısından anlamlı farklılık bulunmazken, akademik motivasyonun bilmeye yönelik içsel motivasyon ve dışsal motivasyonun dış düzenleme alt boyutlarında milli olmayan öğrenciler lehine anlamlı farklılık belirlenmiştir. Bu durum, milli sporcuların yoğun antrenman ve müsabaka programları nedeniyle akademik süreçlere daha az zaman ayırmalarından kaynaklanmış olabilir. Bu sonucun farklı örneklemlerde yeniden incelenmesi, milli sporculara yönelik akademik destek mekanizmalarının geliştirilmesi açısından önem taşımaktadır.

Araştırmada motivasyonsuzluk ile kendi kendine liderlik arasında anlamlı bir ilişki belirlenmemiştir. Buna karşın Küçüker ve Işık (2022), motivasyonsuzluğun akademik başarı üzerinde olumsuz; akademik öz yeterliğin ise olumlu bir yordayıcı olduğunu ortaya koymuştur. Mevcut araştırmada akademik başarı yerine akademik motivasyon ile öz liderlik arasındaki ilişkinin incelenmiş olması, bulgular arasındaki farklılığın temel nedeni olarak değerlendirilebilir. Öz liderliğin öz düzenleme ve öz Küçüker, K., & Işık, Ö. (2022)yeterlik süreçlerini destekleyen bir yapı olduğu göz önüne alındığında, öz liderlik ile akademik motivasyon arasında belirlenen pozitif ilişkinin bu bulgularla kuramsal açıdan uyumlu olduğu söylenebilir. Küçüker, K., & Işık, Ö. (2022

Genel olarak değerlendirildiğinde araştırma bulguları, kendi kendine liderliğin spor bilimleri öğrencilerinin akademik motivasyonunu destekleyen önemli bireysel özelliklerden biri olduğunu göstermektedir. Öz liderlik becerilerinin geliştirilmesi; öğrencilerin akademik süreçlerini daha etkili yönetmelerine, hedef belirleme, öz denetim ve sorumluluk alma becerilerini güçlendirmelerine katkı sağlayacaktır. Bu yönüyle araştırmanın spor bilimleri alanında öz liderlik ile akademik motivasyon arasındaki ilişkiyi ortaya koyarak literatüre katkı sunduğu değerlendirilmektedir. Bu araştırmada spor bilimleri fakültesi öğrencilerinin kendi kendine liderlik düzeyleri ile akademik motivasyonları arasındaki ilişki incelenmiştir. Araştırma sonucunda, kendi kendine liderlik ile akademik motivasyon arasında pozitif yönlü ve orta düzeyde anlamlı bir ilişki olduğu belirlenmiştir. Ayrıca cinsiyet, yaş ve bölüm değişkenlerine göre kendi kendine liderlik düzeylerinde genel olarak anlamlı bir farklılık bulunmazken, düzenli spor yapan öğrencilerin kendi kendine liderlik düzeylerinin daha yüksek olduğu tespit edilmiştir. Elde edilen bulgular, kendi kendine liderlik becerilerinin öğrencilerin akademik motivasyonunu destekleyen önemli bir faktör olduğunu göstermektedir. Bu doğrultuda, spor bilimleri öğrencilerinin öz liderlik becerilerini geliştirmeye yönelik uygulamaların akademik motivasyonun artırılmasına katkı sağlayacağı düşünülmektedir.

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Perceptions, Knowledge And Demand For Aesthetic Treatments In Albania: Implications For The Development Of An Advanced Study Program In Dermo-Aesthetic

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Abstract: The increasing demand for aesthetic treatments globally and the influence of social media have driven the development of structured legal and educational frameworks in many countries. In the European Union, dermo-aesthetic practice is regulated through clear standarts for products, devices, and professional licensing, while formal education plays a key role in ensuring the safety and quality of services. In Albania, however, a comprehensive regulatory and academic framework in this field is still lacking. To assess the perceptions, knowledge and demands of individuals regarding aesthetic tretaments, as a basis for developing an advanced dermo-aesthetics study program in Albania. This study is analytical and cross-sectional, involving 57participants. Data were collected through an online questionnaire. Statistical analysis was conducted using descriptive and qualitative methods. Participants primarly define aesthetic treatments as procedures aimed at improving physical appearance and personal well-being. Social media was identified as a major factor influencing the increased demadn for these treatments. The most commonly percieved risks include infections, allergic reactions and procedures performed by unqualified individuals. Expectations toward aesthetic centers focus on professionalism, safety, hygiene and the use of certified products. The results reveal a mismatch between the growing demand for aesthetic treatments and the lack of professional and regulatory infrastructure in Albania. This highlights the urgent need to develop academic programs in dermo-aesthetics, standartize practices and strengthen the legal framework in line with standarts to ensure patient safety and service quality.

Keywords: dermo-aesthetics, aesthetic treatments, professional education, safety, legislation, Albania

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BACKGROUND

Dermoaesthetic treatments represent a rapidly developing field globally, driven by the increasing demand for aesthetic procedures and the influence of sociocultural factors, especially social media (ISAPS, 2023; Hopkins & Hill, 2020). This development has led to the need for standardization of practice and legal regulation to ensure patient safety and quality of services. At the international level, dermoaesthetics is regulated through well-defined legal and professional frameworks. In the European Union, Regulation (EC) No. 1223/2009 on cosmetic products and the Medical Devices Regulation (EU MDR 2017/745) set strict standards for the safety of aesthetic products and devices (European Parliament, 2009; European Union, 2017). In parallel, the practice of dermoaesthetics is closely linked to professional licensing, where aesthetic interventions, especially invasive ones, are performed by trained and authorized health professionals (Keogh et al., 2020).

A key element in ensuring quality is formal education. In many European and international countries, dermoaesthetics is integrated into university programs or offered as specialized postgraduate training, ensuring clinical competencies and high professional standards (Hopkins & Hill, 2020). These programs are also supported by requirements for continuing professional education and institutional monitoring (WHO, 2022).

In contrast, in Albania, a complete regulatory and academic framework for dermoaesthetics is lacking. There is no specific law that clearly defines the criteria for licensing, training standards and the boundaries of professional practice. This situation creates a gap between the high demand for aesthetic treatments and the professional capacities to provide them in a safe and standardized manner.

In this context, assessing the perceptions, knowledge and demands of the population for aesthetic treatments represents an important basis for the development of academic programs in dermoaesthetics and the strengthening of the regulatory framework in Albania.

2. PURPOSE OF THE STUDY:

To assess the knowledge, perceptions and needs of individuals regarding aesthetic treatments to support the development of a study program in dermoaesthetics.

3. METHODOLOGY

- Design: The study is analytical, cross-sectional.
- Instrument: Online questionnaire with open and semi-structured questions
- Sample: 57 participants
- Statistical analysis: was carried out through descriptive and qualitative analysis.

Data were obtained from questionnaire responses on knowledge, social influences, risk perception and expectations towards aesthetic services.

Participation was voluntary and anonymous, respecting the ethical principles of scientific research.

4. RESULTS

4.1 Knowledge of aesthetic treatments

The data show that most participants have a general understanding of aesthetic treatments, defining them mainly as procedures aimed at improving physical appearance and personal well-being. However, a significant lack of in-depth professional knowledge is noted, as some participants consider these treatments simply as aesthetic care without a medical dimension.

Table 1. Understanding of aesthetic treatments

Category	n	%
Improvement of physical appereance	38	66.7
Skin care	10	17.5
Medical/cosmetic procedure	6	10.5
No clear understanding	3	5.3

This indicates a general understanding, but not always technical or professional.

4.2 The influence of social networks

The influence of social networks turns out to be very high, with the majority of participants admitting that exposure to digital content significantly influences the desire to undergo aesthetic treatments. This influence is perceived as double, including both the informative aspect and the negative one related to the creation of unrealistic beauty standards.

Table 2. The influence of social networks

Influence	n	%
High	41	71.9
Medium	10	17.5
Low	6	10.5

Social networks are considered a key factor in increasing the demand for aesthetic treatments.

4.3 Perception of risks

Regarding safety, participants identify a series of risks associated with aesthetic treatments, the most common of which are infections, allergic reactions and complications resulting from interventions performed by unqualified persons. This indicates a moderate level of awareness of the risks, but also an uncertainty regarding the quality of services on the market.

Table 3. Perceived risks

Risk	n	%
Infections	25	43.9
Allergy	18	31.6
Deformities	20	35.1
Unqualified persons	22	38.6
Serious complications	8	14.0

4.4 Expectations towards aesthetic centers

Expectations towards aesthetic centers are mainly oriented towards professionalism, hygiene and safety. Participants emphasize the importance of qualified staff, the use of certified products and clear communication with the client. Also, the open-ended responses highlight the need for more information and professional advice before and after treatments.

Expectations	n	%
Professional and qualified staff	40	70.2
Hygiene and safety	35	61.4
Certified products	30	52.6
Information and professional advice	22	38.6

4.5 Negative experiences and suggestions

Overall, the results highlight a growing demand for aesthetic treatments, accompanied by concerns about safety and a lack of standardization, reflecting the need for professional and institutional development in this field. Participants emphasize:

• The need for more qualified staff

• Better information before and after treatment

• Increased safety standards

5. DISCUSSION

The increase in demand for aesthetic treatments identified in this study clearly matches the global dynamics of the last decade, where aesthetic procedures, especially non-surgical ones, have become a common part of personal care and well-being. International reports show a steady increase in aesthetic interventions, linked not only to technological advances, but also to sociocultural transformations that have redefined the concept of beauty and the body (ISAPS, 2023; American Society of Plastic Surgeons [ASPS], 2023). In this context, the results of this study show that a similar orientation exists

in Albania, where aesthetic treatments are perceived mainly as tools for improving physical appearance and increasing self-confidence, reflecting an internalization of these global norms.

One of the most important factors explaining this increase is the influence of social networks. International literature has extensively documented the link between exposure to social media and body dissatisfaction, as well as the increase in interest in aesthetic procedures (Fardouly et al., 2018; Tiggemann & Zaccardo, 2018; Walker et al., 2019). Platforms such as Instagram and Tik Tok create and reinforce idealized standards of beauty, often unattainable, exerting direct psychological pressure on individuals. In the Albanian context, this phenomenon may be even more pronounced due to the lack of critical health education and professional filtering of information, making the population more susceptible to the effects of digital marketing and influencers.

Another important finding in this study is the awareness of participants about the risks associated with aesthetic treatments. Infections, allergic reactions and interventions by unqualified persons constitute the main concerns identified. These results are consistent with international evidence showing that complications in aesthetic procedures are often linked to the lack of professional training and safety standards (Keogh et al., 2020; WHO, 2022). In countries with consolidated health systems, there are clear clinical protocols, licensing mechanisms and institutional oversight that reduce these risks. In contrast, in Albania, the lack of a strong regulatory and educational framework creates an environment where informal practices can flourish.

From a professional education perspective, the study highlights a significant gap between market demand and academic capacities. International literature emphasizes that formal education in dermoaesthetics and its integration into medical and nursing programs is essential to ensure safe and effective practices (Hopkins & Hill, 2020; Sarwer, 2019). In many European countries, aesthetic treatments are performed only by trained and licensed professionals, while in Albania the lack of structured academic programs creates a significant gap in professional competencies.

Another critical aspect is the ethical and psychological dimension of aesthetic treatments. Studies have shown that motivations for aesthetic interventions are often related to psychological factors such as self-esteem, social pressure and comparison with others (Cash, 2012; Griffiths et al., 2020). In this context, the lack of professional counseling before aesthetic interventions can lead to hasty decision-making and unsatisfactory results. In Albania, this dimension remains relatively unexplored and unintegrated in clinical practice.

Another important element is the role of health policies and institutional regulation. According to the recommendations of the World Health Organization (WHO, 2022), quality assurance in healthcare requires clear standards, continuous training and monitoring mechanisms. European strategies for the health workforce emphasize the importance of developing specialized competencies to meet new market demands (European Commission, 2022). In this regard, Albania needs to take concrete steps to integrate dermoaesthetics into the education system and to establish clear standards for professional practice. Critically, this study highlights an important paradox: while the demand for aesthetic treatments is constantly increasing, the professional and regulatory infrastructure has not evolved at the same pace. This imbalance creates a favorable terrain for unsafe practices and increases the risk for patients. This phenomenon is characteristic

for many developing countries, where the globalization of beauty standards is not always accompanied by the same development of health systems.

In conclusion, the findings of this study strongly support the need for the development of a study program in advanced dermoaesthetics in Albania. Such a program would contribute to:

- increasing patient safety
- standardization of practices
- professionalization of the sector
- harmonization with European standards

6. CONCLUSIONS

This study evidences a significant increase in interest in aesthetic treatments in Albania, mainly influenced by sociocultural factors and exposure to social networks. However, this growing demand is not accompanied by an equal development of professional and regulatory infrastructure, creating a significant gap between practice and safety standards.

The high perception of risks by participants, especially in relation to interventions performed by unqualified persons, emphasizes the need for immediate intervention at the institutional and educational level. In this context, the lack of

structured academic programs in dermoaesthetics and a clear legal framework for the practice of this practice constitutes a significant challenge for the Albanian healthcare system.

In line with international practices, the development of a study program in advanced dermoaesthetics appears as a strategic necessity. Such an approach would contribute to increasing professional competence, standardizing practices, improving patient safety and harmonizing the sector with European standards.

In conclusion, the results of this study provide a strong empirical basis for the design of regulatory policies and the development of educational programs in dermoaesthetics in Albania, aiming at a safer, more professional and sustainable system.

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Ethics Committee Approval

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Conflict of Interest

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Effects of Demographic Mobility on The Prevalence of Ocular Diseases in Albania

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Abstract: Demographic mobility has substantially reshaped population patterns in Albania and may influence ocular health outcomes. Migrants often encounter socioeconomic barriers and interruptions in healthcare access, potentially leading to higher rates of undiagnosed or untreated eye conditions. A mixed-methods approach was used, including epidemiological data collection, standardized ophthalmic examinations, and structured migration-history questionnaires among 1,250 adults. Quantitative analyses involved descriptive statistics, chi-square tests, and multivariate logistic regression, while qualitative data were examined using thematic analysis. Internal and external return migrants showed significantly higher prevalence of ocular diseases compared with non-migrants, particularly for glaucoma and diabetic retinopathy. Migrants also reported lower healthcare utilization, longer distances to clinics, and higher rates of delayed diagnosis. Migration status remained an independent predictor of ocular disease after adjusting for age, diabetes, and socioeconomic status. Migration functions as an important social determinant of eye health in Albania. Improved screening programs, targeted outreach, and enhanced healthcare accessibility are needed to mitigate disparities among mobile populations.

Keywords: migration, ocular disease, Albania, public health, epidemiology

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INTRODUCTION

Demographic mobility, including internal migration and return migration from abroad, has become a defining feature of Albania's population landscape over the past several decades [1, 2]. These movements have important implications for health systems, resource allocation, and disease distribution. Migrants frequently face socioeconomic vulnerabilities, limited health insurance coverage, and fragmented medical care, all of which may influence ocular health outcomes [3, 4].

Ocular diseases such as cataracts, glaucoma, refractive errors, and diabetic retinopathy are influenced by demographic, environmental, and socioeconomic factors [5, 6]. Previous research in global contexts suggests that migrant communities often experience lower screening rates and more advanced stages of disease at diagnosis [7]. However, data specifically focusing on Albania remain limited.

This study aims to evaluate how demographic mobility contributes to disparities in the prevalence and detection of ocular diseases in Albania. Understanding these associations is essential for designing targeted public health strategies and improving eye-care accessibility among mobile and vulnerable populations.

METHODOLOGY

A mixed-methods cross-sectional design was employed, combining quantitative epidemiological assessment with qualitative inquiry to evaluate migration-related barriers to eye care.

A total of 1,250 adults aged 18 years and older were selected using stratified multistage sampling. Participants were drawn from: high-migration urban centers, peri-urban internal-migrant settlements, and rural areas with high outward migration.

Medical record review for diagnosed ocular conditions. Standardized clinical eye exams, including visual acuity, intraocular pressure, slit-lamp evaluation, and fundus assessment. Structured questionnaire assessing migration history, socioeconomic status, healthcare access, and insurance coverage. Semi-structured interviews and focus groups were conducted with migrants and healthcare providers to capture access barriers, health-seeking behaviors, and perceptions of service quality. Independent variable: migration status (internal migrant, external return migrant, non-migrant). Dependent variables: prevalence of ocular diseases; delayed diagnosis. Covariates: age, gender, socioeconomic status, diabetes, rural/urban residence.

Quantitative analysis included descriptive statistics, chi-square tests, and multivariate logistic regression. Qualitative data were analyzed using thematic coding. Statistical significance was set at $p < 0.05$.

RESULTS

Table 1. Demographic characteristics (N = 1,250)

Variable	Internal Migrants (n=480)	External Return Migrants (n=220)	Non-migrants (n=550)	p-value
Mean age (years)	46.2	49.8	52.5	0.018
Uninsured (%)	27.4%	34.1%	14.2%	<0.001
Low socioeconomic status (%)	41.7%	38.2%	29.5%	0.004

Migrants exhibited significantly higher rates of being uninsured and low socioeconomic status (table 1)

Table 2. Ocular disease prevalence (%)

Condition	Internal Migrants	Return Migrants	Non-migrants	p-value
Refractive errors	38.5	41.2	29.8	0.003
Cataract	16.8	22.7	18.1	0.041
Glaucoma	9.4	13.6	7.1	0.012
Diabetic retinopathy	6.8	11.4	5.2	<0.001

Table 3. Access-to-care indicators

Indicator	Internal Migrants	Return Migrants	Non-migrants	p-value
No eye exam in 5 years (%)	44.6	52.1	28.4	<0.001
Distance to clinic (km)	11.2	13.5	5.4	<0.001
Delayed diagnosis (%)	32.8	39.6	17.2	<0.001

Table 4. Logistic regression: migration status and ocular disease

Variable	AOR	95% CI	p-value
Internal migrant	1.42	1.18–1.73	0.001
Return migrant	1.87	1.43–2.42	<0.001
Diabetes	2.56	1.94–3.38	<0.001

DISCUSSION

The findings demonstrate clear disparities in ocular health associated with demographic mobility in Albania. Migrants—particularly return migrants—had higher prevalence of glaucoma, diabetic retinopathy, and cataracts. This pattern aligns with studies in other countries showing that mobile populations often face disrupted healthcare and diminished preventive screening [8,9].

Lower insurance coverage and greater geographic distance to eye-care facilities likely contributed to delayed diagnosis among migrants. Delayed presentation is a well-known risk factor for irreversible vision loss in glaucoma and diabetic retinopathy [10].

Importantly, migration status remained a strong predictor of ocular disease even after adjusting for confounders. This underscores migration as an independent social determinant of health.

CONCLUSION

Demographic mobility significantly influences ocular health outcomes in Albania. Migrants experience higher disease burden, poorer access to care, and more frequent diagnostic delays. Strengthening screening programs, improving service accessibility, and integrating migrant-focused health policies are critical steps toward reducing vision-related disparities.

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Clinical Simulation In Health Education At The Faculty Of Health, University Of Vlora, Albania

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Abstract: Transformations in the education of health professionals have highlighted the role of digital teaching and clinical simulation as essential components for the development of professional competencies and increased patient safety. The integration of simulation into curricula is considered one of the most effective strategies for linking theory with clinical practice. Purpose: This study aims to analyze the role of clinical simulation as a tool for professional education and assessment at the Faculty of Health, "Ismail Qemali" University of Vlora, in the context of international recommendations and Albanian reality. Methodology: The study has a descriptive, analytical approach and is based on the analysis of the teaching model, the functioning of the Digital Simulator Center for health professionals at the FSH, and the academic results of students. Results: The Digital Simulator Center for health professionals at the FSH, enables the development of clinical skills in a safe and controlled environment. The results show improved practical competencies, increased self-confidence and high levels of success in professional exams. The results show a very high pass rate in the practical exam (around 91%), reflecting consolidated development of clinical skills. The use of clinical simulation has contributed to increased self-confidence, reduced errors and improved clinical decision-making. Clinical simulation represents an effective tool for professional education and assessment, significantly improving the practical competencies of students. The Triad of Learning Model (theory-simulation-practice), implemented at the Faculty of Health in Vlora, results functional and in line with international standards.

Keywords: clinical simulation, nursing education, professional competencies, simulation center, clinical assessment.

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1. INTRODUCTION

The education of health professionals has undergone significant transformations in recent decades, moving from traditional models based mainly on theoretical lectures towards active, student-oriented and evidence-based approaches (Cant & Cooper, 2010). One of the most important innovations in this regard is clinical simulation, which is considered an effective strategy for developing practical skills, critical thinking and clinical decision-making (Jeffries, 2016). Organizations such as the World Health Organization emphasize that modern education should be competency-based, integrating theoretical knowledge with practical skills and clinical decision-making (WHO, 2013). In this context, digital teaching and clinical simulation have become essential elements of contemporary health education.

Clinical simulation is defined as the use of structured clinical cases and technologies to reproduce real clinical situations in a controlled environment, enabling active and safe learning (Gaba, 2004). International literature shows that simulation significantly improves clinical skills, professional reasoning, and self-confidence of students (Cant & Cooper, 2010; Shin et al., 2015).

European policies for the digitalization of education, led by the European Commission, through the Digital Education Action Plan 2021–2027, highlight the importance of integrating innovative technologies into teaching and developing digital competences as a strategic priority (European Commission, 2021). In parallel, the International Nursing Association for Clinical Simulation and Learning (INACSL) has developed detailed standards for the implementation and evaluation of simulation in healthcare education (INACSL, 2021).

Global recommendations emphasize that health education should focus not only on theoretical knowledge, but also on the development of practical skills and critical thinking through technology. Recent studies show that the use of technology-supported simulation (simulation-based learning) contributes significantly to the development of clinical reasoning and decision-making skills (Stenseth et al., 2025). In particular, various forms of simulation technology, such as patient simulators, computer simulations and virtual reality, have been identified as being widely used to enhance the quality of nursing education.

At the international level, the standardization of simulation is led by the International Nursing Association for Clinical Simulation and Learning (INACSL), which has developed evidence-based standards for implementing, evaluating, and improving simulation in health education. These standards emphasize the importance of scenario design, facilitation, debriefing, and performance assessment as essential components for effective learning. International reports also suggest

that simulation should be systematically integrated into curricula and supported by strategic leadership and institutional collaboration to maximize its impact on the quality of health care.

Another important aspect of the global recommendations is the development of digital competencies of health professionals. Studies show that education programs need to be adapted to reflect the transformations caused by digitalization, integrating not only the technical use of technologies, but also their understanding in the clinical and ethical context. In this regard, clinical simulation is considered one of the most effective strategies to link theory with practice and improve learning outcomes, including communication, self-confidence and critical thinking of students.

In Albania, although steps have been taken towards the digitalization of education, especially after the COVID-19 pandemic, the integration of clinical simulation is still developing. Traditional teaching models continue to be dominant, while advanced simulator infrastructure is limited.

In Albania, the integration of clinical simulation in health education is a relatively new development and still in a consolidation phase. The Faculty of Health at the “Ismail Qemali” University of Vlora represents one of the institutions that has taken concrete steps towards the integration of simulation in the academic curriculum, through the creation of the Digital Simulator Center for health professionals at the FSH, systematically integrating clinical simulation into the teaching process. This center represents an important step towards compliance with international standards and contemporary education, enabling active, safe learning and oriented towards the development of professional competencies. This development is based on a long teaching tradition that stems from the “Jani Minga” Medical High School (1967-1994), known for the quality training of health professionals, nurses, midwives and physician assistants with the right to a stethoscope and prescriptions, since 1994 the creation of the Faculty of Nursing and now the Faculty of Health.

In this context, this study aims to analyze the role of clinical simulation as a tool for professional education and assessment, focusing on the experience of the Faculty of Health in Vlora and its impact on the development of student competencies.

2. METHODOLOGY

The study was conducted at the Faculty of Health, “Ismail Qemali” University of Vlora, an institution with a consolidated tradition in the education of health professionals. The study analysis includes the assessment of the role and functioning of the Digital Simulator Center for health professionals at the FSH, as a key component of the learning infrastructure, analyzing its use in the development of practical skills, the implementation of clinical cases and the assessment of student performance.

This study has a descriptive-analytical approach, based on:

- analysis of the teaching model in the Faculty of Health;
- description of the clinical simulation infrastructure;
- assessment of students' academic and professional results;
- analysis of feedback from students and alumni.

Data sources include:

- institutional documents and academic reports;
- results of student teaching evaluations;
- data on success in the State Exam;
- evidence from simulation practices in laboratories.

The main focus is the role of the Digital Simulator Center for health professionals at the FSH in developing professional competencies.

3. RESULTS

The Faculty of Health, "Ismail Qemali" University of Vlora, is an institution with a consolidated tradition in the education of health professionals. This historical heritage has contributed to the building of an institutional culture based on academic responsibility, quality assurance and continuous improvement of pedagogical methods.

The Faculty of Health has gradually evolved from traditional teaching models towards a student-oriented and competency-based approach, in line with contemporary international standards. A key component of this transformation is the creation and development of the Digital Simulation Center for Health Professionals at the Faculty of Health Sciences, which constitutes the main infrastructure for the implementation of clinical simulation in the learning process.

This center is equipped with advanced simulation technologies, including manikins (such as Juno and Noelle), cardiopulmonary resuscitation simulators with real-time feedback systems, and equipment for simulating polytrauma situations. These technologies enable the simulation of real clinical cases in a controlled environment similar to daily hospital practice, favoring learning through practical experience and ensuring patient safety.

The learning process is organized in an integrated and longitudinal manner, ensuring continuous support for students from the first year to graduation and beyond through the alumni network.

This model includes:

1. *Theory (evidence-based)* - theoretical teaching based on scientific evidence*;*
2. *Clinical simulation (controlled environment)* - practical training in simulator laboratories;
3. *Clinical practice (real environment)* - supervised clinical practice in health institutions.

Quality assurance is achieved through systematic teaching evaluation mechanisms, including student feedback at the end of each course, institutional analysis of results and the implementation of improvement plans. Academic staff also engage in international mobility and training programmes (such as Erasmus+), contributing to the adoption of innovative practices and harmonisation with European higher education standards.
Conceptual Framework: The Learning Triad Model

The Triad learning model implemented in the Faculty of Health is based on a framework that integrates three essential and interrelated components:

1. Evidence-based theoretical learning

This component includes the acquisition of up-to-date scientific knowledge, based on evidence, and develops clinical reasoning and critical thinking skills. The basic and referenced literature are from recent years.

2. Learning through clinical simulation

Simulation represents an intermediate stage between theory and real practice, where students develop practical skills, clinical decision-making and professional self-confidence in a safe environment. This process plays an essential role in reflecting and improving performance.
3. Clinical practice in hospital and primary health service
Clinical practice takes place in health institutions, where students apply the knowledge and skills acquired in concrete patient care situations, consolidating professional competencies.
The Faculty of Health has a modern simulation infrastructure, including:

- advanced manikins such as Juno and Noelle for obstetric simulation;
- cardiopulmonary resuscitation manikins with digital feedback;
- polytrauma and intubation simulators.

Clinical simulation is used for:

- development of practical skills;
- improvement of team coordination;
- objective assessment of student performance.

Results show:

- increased clinical competencies;
- reduction of errors during practice;
- increased student self-confidence;
- high success in the State Exam

The pass rate in the Practical Assessment of Proficiency (VAP) for students of the Faculty of Health in Vlora appears to be very high and stable over the years. The data shows that in 2025 the total pass rate reaches around 91%, with almost the same levels for both nursing (91%) and midwifery (90%) students, reflecting a solid practical preparation of the students. Overall, the pass rate in the VAP remains in the 90-92% range, demonstrating the effectiveness of practical training and the use of clinical simulation in the development of professional competencies.

4. DISCUSSION

The transformation of health education in the European Union (EU) has been characterized by a systematic integration of digital technologies and clinical simulation into university curricula, supported by internationally harmonized education and health policies. Frameworks such as the European Commission’s Digital Education Action Plan 2021-2027 highlight the importance of developing digital competences and using innovative technologies in teaching as a strategic priority

(European Commission, 2021). In this context, European universities have widely integrated high-fidelity clinical simulation, virtual reality and online learning platforms, creating advanced models of competence-based education (McGaghie et al., 2010).

In EU countries, clinical simulation is no longer considered as a complementary tool, but as a mandatory structural component in the education of health professionals. Standards developed by the International Nursing Association for Clinical Simulation and Learning (INACSL) and other professional bodies are formally integrated into curricula and accreditation processes, ensuring consistent quality and objective assessment of competencies (INACSL, 2021). Furthermore, European institutions continuously invest in training academic staff in the use of digital technologies and simulation methods, considering this as a key element for the development of higher education.

In contrast, in Albania, although important steps have been made towards the modernization of education, the integration of digital teaching and clinical simulation still remains heterogeneous and partial. National strategies for education and health have emphasized the importance of digitalization and innovation, but practical implementation is often affected by infrastructural, financial and human capacity constraints. Institutions such as the Ministry of Education and Sports (Albania) have promoted the use of technologies in teaching, especially after the COVID-19 pandemic, but the focus has been more on online teaching than on advanced clinical simulation.

An important difference between Albania and EU countries is related to the level of institutionalization of simulation. In the EU, simulation laboratories are an integral part of university structures and often function as interdisciplinary research and training centers. In Albania, these structures are still in a development phase and usually limited to specific institutions that have strategically invested in this direction.

The Faculty of Health at the “Ismail Qemali” University of Vlora represents a positive and relatively unique case at the national level, through the development of the Digital Simulator Center for health professionals at the FSH. This center demonstrates a clear compliance with European standards, providing an advanced environment for the development of practical skills and the assessment of student performance in simulated clinical conditions. Its integration into the learning process reflects a shift from the traditional model towards an approach based on competencies and controlled practical experience.

The role of the Digital Simulation Center for Health Professionals at the FSH is in line with international best practices in health education, where simulation laboratories are considered essential for the development of clinical competencies and for ensuring safe and effective learning (INACSL, 2021). The integration of this center into the academic curriculum represents a successful model of modernization of nursing education in Albania, contributing to the preparation of professionals capable of facing the challenges of contemporary health systems.

The results of this study are consistent with the international literature, which considers clinical simulation as one of the most effective methods in health education (Cant & Cooper, 2010; Jeffries, 2016). The use of simulation at the Faculty of Health in Vlora confirms that the combination of theory with simulated and real practice significantly improves learning outcomes.

An important aspect is the reduction of clinical errors, which is a global priority for patient safety (WHO, 2013). Simulation allows students to learn from mistakes in a safe environment, improving their performance in real situations (Gaba, 2004).

Also, the use of simulation positively impacts the development of non-technical skills, such as communication, teamwork, and stress management, which are critical in clinical practice (Liaw et al., 2014).

In the Albanian context, this model represents an important step towards the modernization of health education. Investments in simulation laboratories and their integration into the curriculum constitute a good practice that can be adopted by other institutions.

The Triad of Learning Model implemented at the Faculty of Health is consistent with contemporary frameworks of competency-based education, which emphasize the integration of theory, simulation and clinical practice as inseparable elements of professional training. This approach is in line with international recommendations that consider simulation as a bridge between theoretical knowledge and real clinical performance (Jeffries, 2016; INACSL, 2021). The effectiveness of this model is reflected in student outcomes, including high pass rates in state exams (around 91%) and successful integration into the international labor market. Furthermore, alumni feedback confirms the importance of this model in preparing for complex and technologically advanced clinical environments.

However, to achieve full harmonization with EU practices, it is necessary for Albania to take further strategic steps, including:

- standardizing the use of simulation across all health education institutions;
- formally integrating simulation into program accreditation and evaluation processes;
- sustainable investments in infrastructure and technology;
- developing the capacities of academic staff in digital pedagogy and clinical simulation.

In conclusion, while EU countries have achieved a high level of integration of digital teaching and clinical simulation, Albania is in a transition phase, with considerable potential for development. The Faculty of Health shows that, through strategic investments and institutional vision, it is possible to achieve a level comparable to European standards and contribute to improving the quality of health education in the country.

5. CONCLUSIONS

Clinical simulation represents an essential tool for professional education and assessment at the Faculty of Health, "Ismail Qemali" University, Vlora. The Triad of Teaching and Learning Model, based on theory, simulation and clinical practice, has contributed to the development of professional competencies and the preparation of students for the global labor market. The effectiveness of this model is reflected in the results of students, including high levels of passing in state exams (about 91%) and successful integration into the international labor market. This model can serve as a reference for the development of health education at the national and regional levels.

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Elucidating The Role Of Collaborative Innovation Networks In Shaping New Product Performance Via Innovation Capabilities And Absorptive Capacity

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Abstract: This study investigates the impact of collaborative innovation networks on new product performance by examining the mediating roles of product innovation capability and process innovation capability, as well as the moderating role of absorptive capacity. Although prior studies have explored the direct association between collaborative innovation networks and new product performance, empirical findings remain inconclusive and fragmented. Addressing this gap, the present research proposes and tests a moderated mediation framework in which collaborative innovation networks enhance new product performance indirectly through the development of firms' innovation capabilities. Furthermore, the study assesses how absorptive capacity conditions the effectiveness of collaborative innovation networks in strengthening both product and process innovation capabilities. The empirical analysis is based on survey data collected from 258 firms operating in high- and medium-technology manufacturing industries in Iran. The results provide robust evidence that the benefits of collaborative innovation networks are contingent upon firms' absorptive capacity. Specifically, the findings indicate that collaborative innovation networks significantly improve product and process innovation capabilities only when firms possess sufficient absorptive capacity. This suggests that the ability to identify, assimilate, and exploit external knowledge is critical for transforming collaborative efforts into innovation outcomes. Moreover, the results reveal that, under high levels of absorptive capacity, collaboration with research organizations and competitors exerts a positive influence on product innovation capability, whereas partnerships with research organizations and suppliers are more influential in enhancing process innovation capability.

Keywords: New product performance, Absorptive capacity, Collaborative innovation networks, Innovation capability.

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1. INTRODUCTION

In today's highly globalized and competitive business landscape, firms increasingly acknowledge the importance of investing in new product development (NPD) as a means to ensure survival and achieve competitive advantage[1]. Despite its importance, NPD is widely recognized as a costly and resource-demanding process that involves substantial risk. Prior research has highlighted a range of internal (e.g. innovation capability) and external factors (e.g. collaboration with channel members and absorptive capacity) that contribute to the success of NPD initiatives [2].

Engaging with external actors—including suppliers, customers, competitors, and research institutions (such as universities or government laboratories)—enhances firms' ability to share knowledge and acquire market insights. This interaction broadens the firm's knowledge base and ultimately strengthens its innovation capability. Such collaborative efforts are widely regarded as key external determinants of NPD performance[3]. In this study, "collaborative innovation networks" refer to a firm's engagement with various partners—including suppliers, customers, competitors, and research organizations—for the purpose of developing new products. Beyond NPD, these networks may also support objectives such as improved distribution, expanded product variety, enhanced manufacturing flexibility, and regulatory compliance.

Collaborative innovation networks offer several advantages, including improved access to complementary resources, enhanced exchange of both tacit and explicit knowledge, and reduced R&D risk through cost-sharing among partners . Consistent with prior definitions that conceptualize collaborative innovation networks as the extent of participation by channel members in innovation and NPD processes (Tsai, 2009), this study considers collaboration with both channel members (e.g. suppliers and customers) and non-channel actors (e.g. competitors, universities, research institutions, and government laboratories) as an integral component of the innovation process [4]. A substantial body of research has examined how different forms of collaborative innovation networks influence new product performance. However, findings in this area remain mixed and sometimes contradictory. While some studies report a positive relationship between collaborative innovation networks and new product performance, others identify insignificant or even negative effects [5].

These inconsistencies can be interpreted from both empirical and theoretical viewpoints. Empirically, differences in research contexts may explain the variation in findings. For instance, [6]examined innovation processes across 10 countries in Europe and North America and found support for their hypotheses. In contrast, [7]) did not find evidence

supporting the direct impact of collaborative networks on product innovation performance within traditional Taiwanese manufacturing firms. Likewise, [8], in a study of SMEs in Northern Britain, observed that although firms with broader innovation networks are more likely to introduce new products or processes, the nature and strength of these relationships differ across sectors and innovation types.

From a theoretical perspective, these divergent results may stem from insufficient attention to contingency factors influencing the relationship between collaborative innovation networks and new product performance, as well as limitations in how the underlying mechanisms are conceptualized. Understanding these mechanisms and contextual conditions is essential to explain how and when collaborative innovation networks contribute to improved new product outcomes.

Accordingly, the primary objective of this study is to provide deeper insight into the relationship between collaborative innovation networks and new product performance. Specifically, we propose product and process innovation capabilities as key mechanisms through which collaborative networks influence new product outcomes. Furthermore, we investigate whether the relationship between collaborative innovation networks and these innovation capabilities is dependent on the firm's level of absorptive capacity.

This study is grounded in the Resource-Based View (RBV) of the firm and organizational learning theory. From an RBV perspective, firms achieve superior performance by leveraging internal capabilities such as product innovation capability, process innovation capability, and learning capability[9]. Firms are viewed as collections of resources that can strategically engage in collaborative arrangements to combine complementary assets and pursue sustainable competitive advantage (Mention[10]). Innovation capability—comprising both product and process dimensions—is recognized as a critical internal resource driving firm performance. Without these capabilities, knowledge acquired through collaborative networks may not translate into meaningful outcomes, particularly in terms of new product success.

However, this study argues that while participation in collaborative innovation networks is important, it is not sufficient on its own to enhance innovation capability and NPD success. Instead, organizational learning capability is proposed as a necessary complement. In other words, collaborative networks contribute to innovation capability only when firms possess adequate learning capacity. Previous research identifies learning as a fundamental driver of innovation. More recent work emphasizes absorptive capacity (AC) as a key construct explaining how organizations acquire, assimilate, and utilize knowledge[11]. Nevertheless, existing studies (Wu, 2014) have largely overlooked the moderating role of absorptive capacity in the relationship between collaborative innovation networks and innovation capability.

Therefore, this research makes two main contributions. First, it examines product and process innovation capabilities as distinct mechanisms linking collaborative innovation networks to new product performance. Second, it investigates whether the effectiveness of collaborative innovation networks in enhancing these capabilities depends on the firm's level of absorptive capacity.

2. THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

2.1. Collaborative Innovation Networks, Innovation Capability, and New Product Performance

Research on network management has developed substantially over the past two decades. Multiple perspectives have emerged for examining business networks (for a comprehensive review of different research streams in this area. One influential perspective is the strategic net view introduced by[12], which describes firms' deliberate efforts to establish strategic networks with selected key actors in order to pursue shared strategic objectives that extend beyond their individual resource bases. Similarly proposed the concept of network pictures, defined as "an organizational actor's subjectively perceived network"[13]. In recent years, the network picture perspective has attracted considerable scholarly attention.

Another important stream within network management research is innovation networks, which primarily focus on collaborative interactions among various actors to foster innovation. In examining how external partners (such as suppliers, customers, competitors, and research institutions) influence firms' innovation capability and new product performance, scholars emphasize the critical role of relationships and networks in shaping innovative outcomes. From the industrial network perspective, firms are embedded within a complex system of interconnected relationships that provide access to essential resources required for sustaining business activities, including successful new product development. Accordingly, firms actively develop networking capabilities , encompassing the initiation, management, and termination of business relationships, to effectively navigate their network environments and enhance their competitive advantage through improved innovativeness (Freytag & Young, 2014). Thus, firms' access to external knowledge sources and their capacity for innovation are strongly influenced by their network embededness.

Innovation networks have increasingly gained attention among both researchers and practitioners as a viable response to the growing knowledge intensity and escalating R&D costs, combined with the globalization of production. These factors

make it increasingly challenging for individual firms to sustain long-term innovation independently. Various forms of collaborative innovation networks—such as science-driven networks, design networks, platform-building networks, new product development networks, and commercialization networks—have emerged to support the innovation process.

To analyze innovation networks, some scholars adopt a social network analysis perspective, focusing on network characteristics such as power, centrality, size, and tie strength, as well as structural properties like network density and structural holes, along with firms' networking capabilities. According to this perspective, such factors enhance firms' innovation capability by improving access to novel knowledge, reducing redundancy, facilitating joint problem-solving, and mitigating uncertainty [14].

In contrast, other researchers shift their focus from structural aspects of networks to the intensity of collaboration with external partners—including suppliers, customers, competitors, and research institutions—as a key determinant of innovation capability. This study adopts the latter perspective to explore whether, and under what conditions, interactions with various collaborators enhance new product performance, measured in terms of achieving sales targets, market share objectives, return on investment, and customer satisfaction. This approach aligns with the study's objective, as it does not emphasize network structural characteristics but instead focuses on how collaboration with external actors contributes to new product development.

The theoretical foundation of this study is rooted in the Resource-Based View (RBV) and organizational learning theory. The RBV posits that access to valuable and strategic resources is a primary source of competitive advantage. In this context, collaboration with external partners in developing new products or processes enables firms to access critical resources that may not be available internally. Among these resources, knowledge plays a central role , defined as "information that is relevant, actionable, and based at least partially on experience". Knowledge can be categorized as explicit or tacit.

While explicit knowledge is codified and easily transferable, tacit knowledge is deeply rooted in individual experiences, skills, and emotions, making it difficult to articulate and share [15].

Prior research highlights the importance of collaboration with diverse partners—such as suppliers, customers, competitors, and academic institutions—in facilitating innovation, particularly through access to tacit knowledge . As knowledge processes become increasingly complex, firms are encouraged to seek valuable knowledge beyond their organizational boundaries to strengthen internal capabilities. Since essential innovation-related resources are not always internally available, collaboration provides an effective mechanism to overcome such limitations[16].

Building on prior studies of collaborative innovation networks[17], this study argues that such networks facilitate the exchange of resources between firms, particularly tacit knowledge, which often requires direct interpersonal interaction[18]. Increased interaction enhances mutual trust and encourages both knowledge providers and recipients to engage in knowledge-sharing activities. Consequently, collaborative innovation networks contribute to competitive advantage by improving access to and exchange of strategic resources such as tacit knowledge [19].

Despite its strengths, the RBV has been criticized for its limited ability to explain performance variations across firms. While access to strategic resources is essential, firms must also possess the internal capabilities necessary to effectively utilize these resources. Capabilities refer to firm-specific, often non-transferable competencies embedded in organizational skills and experiences, which enhance the effectiveness of other resources [20]. In this regard, collaboration alone does not automatically lead to improved new product performance. Therefore, this study emphasizes two key internal capabilities: innovation capability and absorptive capacity.

Innovation capability encompasses both product and process innovation, referring to the development of new or significantly improved products and processes. The second capability examined in this study is absorptive capacity. As defined by [20], absorptive capacity—an essential component of organizational learning—enables firms to identify, assimilate, and apply relevant knowledge from both internal and external sources. In this study, absorptive capacity is considered a boundary condition that enhances a firm's ability to utilize knowledge acquired through collaboration with external partners. Specifically, we examine whether the relationship between collaborative innovation networks and innovation capability is contingent upon the level of absorptive capacity (see Fig. 1).

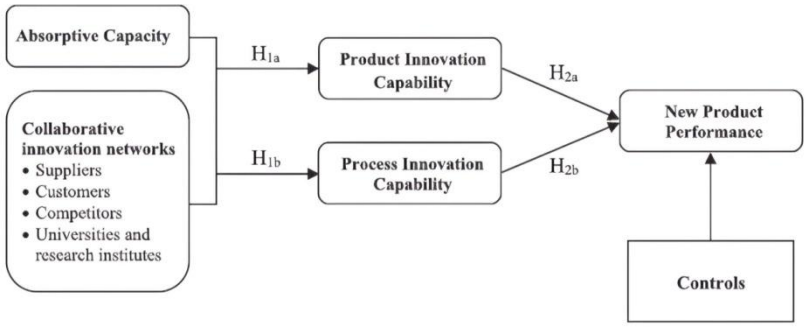

Fig. 1. Conceptual framework.

2.2. Collaborative Innovation Networks and Innovation Capability: The Moderating Role of Absorptive Capacity

Innovation can only occur when firms possess the necessary capabilities to support it[21]. It is commonly conceptualized in terms of changes in what firms offer to the market (product or service innovation) and the methods used to create and deliver those offerings (process innovation) (Francis &Bessant. Product innovation capability refers to a firm's ability to introduce new or improved products and services that meet evolving market demands , as well as its capacity to apply new technologies for commercial purposes . In contrast, process innovation involves the implementation of new inputs, methods, or operational procedures—including materials, workflows, task specifications, and equipment—within the production system . Such improvements contribute to enhanced product quality and/or cost efficiency [22].

Firms that pursue innovations with a higher degree of novelty typically rely on a broader range of knowledge sources during product development. Accordingly, firms that maintain strong collaborative relationships with diverse partners are more likely to develop superior innovation capabilities [23]. Increased levels of collaborative innovation promote more frequent and direct interactions between focal firms and their external partners, thereby facilitating the exchange of critical resources, particularly tacit knowledge . As a result, firms engaged in active collaboration are better positioned to innovate, as they gain improved access to the strategic resources necessary for developing new products and processes.

However, while collaboration with external actors plays a significant role in enhancing innovation capability, its effectiveness is likely to depend on the firm's level of absorptive capacity. Among the various determinants of successful innovation identified in prior research, absorptive capacity (AC) is recognized as a key factor [24]. Initially conceptualized as a mechanism for managing external knowledge , later studies suggest that absorptive capacity should also encompass the management of internal knowledge to support effective knowledge diffusion within the firm . Consistent with this perspective, absorptive capacity is defined here as "the organizational mechanisms that help to identify, communicate, and assimilate relevant external and internal knowledge" [25].

As previously discussed, collaborative innovation networks enhance firms' access to valuable knowledge from external actors. However, the extent to which firms benefit from such collaborations depends on their ability to absorb and utilize this knowledge. In other words, a sufficient level of absorptive capacity is essential for effective learning within collaborative arrangements [26]. Firms with strong absorptive capacity are better equipped to recognize valuable knowledge, facilitate internal communication, and assimilate external insights. This capability increases their sensitivity to relevant knowledge available in the external environment, and supports the effective utilization , development, and reconfiguration of acquired knowledge [27]. Consequently, when absorptive capacity is high, firms are more capable of leveraging knowledge obtained through collaborative innovation networks, thereby strengthening their innovation capabilities .

Conversely, even when firms maintain extensive and high-quality collaborative networks, a low level of absorptive capacity can limit their ability to benefit from such relationships. Firms that lack the capability to effectively absorb knowledge and technology may struggle to learn from their partners, which in turn can weaken their innovation capability . For instance, firms that are unable to identify valuable external knowledge, operate within poor internal communication environments, or lack sufficient prior knowledge may fail to recognize and utilize new ideas, technologies, or processes. This reduces both their willingness and ability to learn from external partners, ultimately hindering innovation capability [28]. Furthermore, even if knowledge is acquired, insufficient absorptive capacity may prevent firms from effectively applying and transforming that knowledge into tangible innovations. As a result, their ability to develop new products and processes remains constrained.

Based on these arguments, we propose that absorptive capacity enhances firms' learning processes and moderates the relationship between collaborative innovation networks and both dimensions of innovation capability:

H1a
The positive impact of collaborative innovation networks on product innovation capability is moderated by absorptive capacity.

H1b
The positive impact of collaborative innovation networks on process innovation capability is moderated by absorptive capacity.

2.3. Innovation Capabilities and New Product Performance

A substantial body of research has examined the role of product and process innovation capabilities in influencing new product performance. Although new product development does not always lead to success—and some studies estimate success rates to be as low as 25% [29]—the presence of strong product and process innovation capabilities can significantly improve the likelihood of successful outcomes, albeit through different mechanisms.

On the one hand, product innovation capability enables firms to effectively convert their resources into innovative offerings that are distinct from competing products in the marketplace. These offerings tend to be superior in terms of quality and better aligned with customer needs, thereby increasing their attractiveness and market acceptance. On the other hand, process innovation capability relates primarily to a firm's ability to enhance its internal operations, including improving production efficiency and effectiveness . Such improvements often lead to reduced production costs, which in turn contribute positively to the performance of newly developed products.

In line with prior studies [30], we argue that both product and process innovation capabilities play a direct and significant role in shaping new product performance.

H2a
Product innovation capability has a positive effect on new product performance.

H2b
Process innovation capability has a positive effect on new product performance.

3. Research methodology

3.1. Sample selection and data collection

We conducted our empirical investigation using a questionnaire-based survey approach. Data were gathered from a sample in the Middle East, specifically within the Iranian manufacturing sector. Historically, manufacturing in the Middle East and Africa has been linked to relatively slow performance. However, the sector is currently experiencing significant growth, partly driven by lower oil prices, and is increasingly serving as a key contributor to overall economic development. To sustain this progress, traditional manufacturing industries in the region must identify and capitalize on opportunities for improvement. In this context, innovation capability plays a crucial role by enabling firms to implement the process and technological advancements necessary for sustainable industrial development. Iran, in terms of both its developmental stage and cultural context, is representative of many Middle Eastern countries; therefore, the findings from this sample may be generalized to similar settings.

The questionnaire was initially developed in English based on an extensive review of the literature on collaborative innovation networks, absorptive capacity, innovation capability, and new product performance. It was subsequently refined through consultations with academics and research peers. The finalized version was then translated into Farsi and back-translated by two independent professional translators to ensure conceptual equivalence. Additionally, a pilot study involving six innovation managers was conducted to assess the face validity of the measurement items.

In line with the recommendations of Hoskisson, Lorraine, Chung, and Wright (2000) for research in emerging economies, the survey was administered through personal interviews. A total of 1000 manufacturing firms were randomly selected from the Iranian Ministry of Industry, Mine and Commerce database (www.behinyab.ir). Each firm was verified for operational status, resulting in the exclusion of 85 firms that were no longer active. The remaining 915 firms were contacted by telephone to determine their willingness to participate. Respondents were typically individuals holding positions such as vice president, product manager, or director of new product innovation and development. Firms were also screened to confirm whether they had introduced new products to the market within the past three years, ensuring their relevance to the study. Ultimately, 258 firms met these criteria and agreed to participate.

Data collection was carried out through on-site personal interviews with key informants. A total of 258 valid responses were obtained, yielding a 100% response rate among the qualified firms that agreed to participate. To address potential non-response bias, comparisons between responding and non-responding firms were conducted, revealing no significant differences in key characteristics, thereby indicating that non-response bias is not a concern.

The sample included a diverse range of high-technology and medium-to-high-technology manufacturing firms, classified according to OECD (2003) standards. Among the 258 valid cases, 35% operated in the chemical industry, 28% in medical and pharmaceutical sectors, 25% in electrical and electronics, and 12% in engineering and machinery. The participating firms had been in operation for periods ranging from 5 to 63 years, with workforce sizes varying between 15 and 6,500 employees.

3.2. Common Method Bias

Given that data for both dependent and independent variables were collected from a single informant, the potential for common method bias (CMB) exists. To mitigate this concern, we followed the three-step procedure recommended by Podsakoff, MacKenzie, and Lee (2003).First, all measurement items were adapted from established literature through a rigorous questionnaire development process, ensuring clarity and precision. The questionnaire was further refined through consultation with academic experts and research peers to eliminate ambiguity and improve readability. Second, to reduce respondents' ability to infer relationships among constructs, the questionnaire items were randomly distributed rather than grouped by construct. Third, respondent anonymity was clearly communicated and assured both within the questionnaire and during the interview process to encourage honest and unbiased responses.

Following data collection, confirmatory factor analysis (CFA) was conducted to statistically assess the presence of CMB by comparing models of varying complexity. CMB is considered problematic when a simpler model demonstrates fit indices comparable to a more complex model [31]. Two models were tested. In the single-factor model, all items loaded onto one factor, yielding $\chi^2 = 4628.40$ with df = 898. The proposed measurement model resulted in $\chi^2 = 1312.75$ with df = 862. The difference between the models was significant ($\Delta\chi^2 = 3315.65$; $\Delta df = 36$; $p < 0.001$), suggesting that CMB is not a serious concern.

Additionally, a marker variable test [32] was performed. The second smallest positive correlation among variables (0.003, between product innovation capability and firm size) was used as the marker variable. Adjusted correlations showed no meaningful change in statistical significance, further indicating that CMB does not substantially affect the results.

3.3. Measures

All constructs used in this study were adapted from well-established scales in prior literature. A seven-point Likert scale (1 = "strongly disagree" to 7 = "strongly agree") was employed to measure all variables. Detailed measurement items and their corresponding loadings are provided in Appendix A.

The construct of **new product performance** was measured using a five-item scale adopted from Langerak, Hultink, and Robben. This scale captures multiple dimensions of performance, including market outcomes, financial returns, and customer acceptance and satisfaction.

Collaborative innovation networks represent the extent of a firm's collaboration with different external partners. Following Tsai, this construct was operationalized using four single-item measures reflecting collaboration with suppliers, customers, competitors, and universities/research organizations. Respondents were asked to indicate the degree of collaboration with each of these partners.

Measures for **product innovation capability** and **process innovation capability** were adapted from Camison and Villar-Lopez. Product innovation capability was assessed using a five-item scale reflecting the firm's ability to develop new or significantly improved products. Process innovation capability was measured using a ten-item scale capturing the firm's ability to introduce new or substantially improved production and technological processes.

In this study, **absorptive capacity** is conceptualized as a second-order construct. We adopted the definition and measurement approach proposed by Tu et al., which has been widely applied in prior research [32]. Absorptive capacity is defined as the organizational mechanisms that enable firms to identify, communicate, and assimilate relevant knowledge from both internal and external sources.

Consistent with this conceptualization, absorptive capacity comprises five sub-dimensions: **manager knowledge, worker knowledge, communications network, communications climate, and knowledge scanning**. Manager and worker knowledge reflect the level of expertise, skills, and technological understanding possessed by managerial and operational staff, respectively. These dimensions can be viewed as components of human capital that can be enhanced through training and experience [33].

The **communications network** refers to the structure and intensity of internal relationships within the firm, while **communications climate** captures the overall environment that shapes communication behaviors and openness. A strong communication network facilitates access to knowledge, while an open communication climate promotes knowledge sharing and collaboration, thereby enhancing innovation capability [34].

Finally, **knowledge scanning** refers to the firm's ability to identify and acquire relevant knowledge from both internal and external sources. This capability enables firms to remain aware of emerging trends, technologies, and opportunities, thereby supporting innovation activities [35].

Each sub-dimension of absorptive capacity was measured using multi-item scales. Specifically, worker knowledge and manager knowledge were each measured using four items, communications climate and communications network were measured using six and five items respectively, and knowledge scanning was assessed using a seven-item scale.

In addition to the main constructs, **firm size** and **firm age** were included as control variables. To address potential skewness, the natural logarithm transformation was applied to both variables prior to analysis.

4. ANALYSIS

4.1. Reliability, Validity, and Descriptive Statistics

Prior to estimating the structural model, the measurement model was evaluated using confirmatory factor analysis (CFA). This step was undertaken to refine the measurement scales and ensure an adequate level of model fit. The CFA was conducted using AMOS 22.0. The results indicate that the model fits the data well, with $\chi^2 = 1312.75$; df = 862; IFI = 0.934; TLI = 0.927; CFI = 0.934; and RMSEA = 0.045.

Table 1 presents the descriptive statistics and measurement properties, including the means, standard deviations, factor loadings, average variance extracted (AVE), and composite reliability (CR) values for all constructs used in the study. As shown, all standardized item loadings exceed the recommended threshold of 0.60 and are statistically significant at the 0.01 level, thereby providing evidence of convergent validity [36].

In addition, the composite reliability (CR) values for all constructs are above the minimum acceptable level of 0.70, indicating strong internal consistency. Similarly, the AVE values exceed the recommended threshold of 0.50, confirming that each construct explains a substantial portion of the variance in its indicators.

To assess discriminant validity, Table 2 compares the square root of the AVE values with the inter-construct correlations. The results demonstrate that the square root of the AVE for each construct is greater than its corresponding correlations with other constructs thereby confirming adequate discriminant validity.

Table 1. Summary Statistics of the measurement analysis.

Variable					
New product performance	5.21	1.17	0.71–0.85	0.601	0.861
Collaborative innovation networks	5.34	0.92	0.63–0.82	0.568	0.842
Worker knowledge	4.72	1.19	0.82–0.90	0.741	0.921
Manager knowledge	5.23	1.20	0.78–0.87	0.709	0.906
Communications network	5.03	1.11	0.72–0.84	0.645	0.878
Communications climate	4.83	1.27	0.71–0.77	0.559	0.864
Knowledge scanning	5.52	1.12	0.67–0.81	0.571	0.889
Product innovation capability	5.73	1.02	0.69–0.81	0.565	0.839
Process innovation capability	5.40	0.98	0.66–0.82	0.531	0.912
Firm's size	1.93	0.50	n/a	n/a	n/a
Firm's age	1.26	0.25	n/a	n/a	n/a

Note: Item loadings are reported after excluding values below 0.60. SD denotes standard deviation. The control variables (firm size and firm age) were transformed using natural logarithms

4.1.1. Second-Order Factor (Absorptive Capacity)

As outlined earlier, absorptive capacity is modeled as a higher-order construct comprising five first-order dimensions: worker knowledge, manager knowledge, communications network, communications climate, and knowledge scanning.

Table 3 reports the standardized loadings, average variance extracted (AVE), and model fit indices for this second-order structure.

The loadings of the first-order constructs on the higher-order absorptive capacity factor range from 0.63 to 0.79, and all are statistically significant at the 0.01 level, indicating acceptable factor loadings. The ratio of χ^2 to degrees of freedom is 1.70, suggesting a good fit between the model and the data. In addition, other fit indices further confirm model adequacy, with IFI = 0.961, TLI = 0.954, CFI = 0.961, and RMSEA = 0.051.

The AVE value for absorptive capacity is 0.529, exceeding the recommended threshold of 0.50, which indicates satisfactory convergent validity. Overall, these results demonstrate that the second-order factor model provides an appropriate representation of absorptive capacity. Therefore, this higher-order construct was retained for subsequent analysis.

4.2. RESULTS

To test the proposed hypotheses, two structural equation models were estimated using AMOS 22.0 with the maximum likelihood estimation technique. Model 1 represents the baseline model examining the direct relationships, whereas Model 2 incorporates the moderating effects by including the interaction term between collaborative innovation networks and absorptive capacity.

Model 1 includes collaborative innovation networks, absorptive capacity, and both product and process innovation capabilities, along with the control variables (firm size and firm age). To address potential skewness, the natural logarithm transformation was applied to the control variables. The results indicate that the baseline model demonstrates an acceptable fit to the data (χ^2 = 1486.35; df = 965; IFI = 0.926; TLI = 0.919; CFI = 0.925; RMSEA = 0.045).

As reported in Table 4, collaborative innovation networks do not exhibit a significant direct effect on either product innovation capability (SPC = 0.018, p > 0.5, t = 0.214) or process innovation capability (SPC = −0.009, p > 0.5, t = −0.121). This suggests that collaboration alone is insufficient to enhance innovation capabilities.

Table 2. Inter-Construct Correlation Estimates and Square Root of the AVEs

Note: Diagonal values (bold) represent the square root of AVE $*$ p < 0.05, $**$ p < 0.01

	−1	−2	−3	−4	−5	−6	−7	−8	−9	−10	−11
(1) New product performance	0.78										
(2) Collaborative innovation network	0.201**	**0.753**									
(3) Worker knowledge	0.114	0.421**	**0.861**								
(4) Manager knowledge	0.158**	0.291**	0.412**	**0.842**							
(5) Communications network	0.134*	0.389**	0.472**	0.548**	**0.803**						
(6) Communications climate	0.121	0.322**	0.395**	0.429**	0.418**	**0.748**					
(7) Knowledge scanning	0.192**	0.356**	0.451**	0.562**	0.523**	0.431**	**0.756**				
(8) Product innovation capability	0.468**	0.214**	0.229**	0.338**	0.221**	0.246**	0.401**	**0.752**			
(9) Process innovation capability	0.459**	0.231**	0.251**	0.369**	0.334**	0.266**	0.399**	0.687**	**0.729**		
(10) Firm Size	0.047	0.031	0.052	0.061	0.149*	−0.002	0.003	0.004	0.028	NA	
(11) Firm Age	−0.061	0.021	−0.036	−0.010	0.018	0.029	0.019	−0.061	−0.022	0.301**	NA

Table 3. Absorptive Capacity: Second-Order Measurement Model

First-order construct	**Absorptive capacity**
Worker knowledge	0.64
Manager knowledge	0.76
Communications network	0.78
Communications climate	0.63
Knowledge scanning	0.79

$\chi 2$=383.11, df=225; IFI=0.96; TLI=0.95; CFI=0.96; RMSEA=0.05;AVE=0.53.

interactions are graphically presented in Fig. 2. It should be noted that our control variables do not result in significant associations with new product performance, product innovation capability, and process innovation capability in both models.

5. DISCUSSION AND CONCLUSION

This study makes a significant contribution to the marketing literature by providing deeper insights into whether and under what conditions collaborative innovation networks enhance new product performance in technology-intensive firms. The findings reveal that collaboration with external actors, by itself, does not necessarily lead to improvements in a firm's innovation capabilities. Rather, the positive impact of collaborative innovation networks on innovation capability becomes evident only when firms possess a sufficient level of absorptive capacity.

In other words, the extent to which collaboration with external partners contributes to innovation capability is contingent upon the firm's absorptive capacity. Specifically, the influence of collaborative innovation networks on both product and process innovation capabilities strengthens as absorptive capacity increases. These results highlight the critical role of absorptive capacity as a facilitating mechanism that enables firms to effectively leverage external knowledge obtained through collaboration.

Furthermore, both product and process innovation capabilities are found to be significant determinants of new product performance. This suggests that firms must not only engage in collaborative innovation networks but also develop strong internal capabilities to translate acquired knowledge into successful innovation outcomes.

Overall, these findings offer several important theoretical and managerial implications for both researchers and practitioners.

5.1. Theoretical Implications.

This study contributes to the existing literature by providing a clearer explanation of the relationship between collaborative innovation networks and firms' new product performance. Prior research presents conflicting findings regarding the outcomes of collaboration with external actors, reporting either significant [37] or insignificant effects [38] on new product performance. These inconsistent results may stem from the limited consideration of contingency factors. In contrast to earlier studies [39], this research questions the assumption that collaborative innovation networks alone act as the primary driver of new product performance. Instead, it highlights innovation capability and absorptive capacity as essential internal mechanisms that enable firms to derive value from such networks.

Table 4. Estimation of the Structural Model .

Structural Model Statistics	Main Effects (Model 1)	Interaction Effects (Model 2)
χ^2	1486.35	1509.82
d.f.	965	1004
CFI	0.925	0.927
TLI	0.919	0.921
RMSEA	0.045	0.043
Path	**Path Estimates**	**Path Estimates**
Predictors		
CIN → Product innovation capability	0.018 (0.214)	0.129 (1.462)
CIN → Process innovation capability	−0.009 (−0.121)	0.101 (1.248)
Product innovation capability → NPP	0.359 (3.098)	0.355 (3.052)
Process innovation capability → NPP	0.268 (2.331)	0.271 (2.366)
AC → Product innovation capability	0.428 (4.106)	0.392 (3.941)
AC → Process innovation capability	0.508 (4.726)	0.472 (4.581)
Interactions		
CIN × AC → Product innovation capability		0.334 (5.112)
CIN × AC → Process innovation capability		0.318 (5.041)
Controls		
Firm size → NPP	0.051 (0.862)	0.052 (0.874)
Firm age → NPP	−0.039 (−0.662)	−0.041 (−0.688)
Firm size → Product innovation capability	−0.024 (−0.392)	−0.011 (−0.172)
Firm size → Process innovation capability	0.012 (0.198)	0.027 (0.452)
Firm age → Product innovation capability	−0.069 (−1.032)	−0.089 (−1.398)
Firm age → Process innovation capability	−0.028 (−0.461)	−0.046 (−0.781)
$\mathbf{R^2}$ (product innovation capability.)	0.212	0.301
$\mathbf{R^2}$ (process innovation capability)	0.271	0.347
$\mathbf{R^2}$ (new product performance)	0.358	0.358

Note: To test the moderating effects, Model 2 incorporates the interaction term (CIN × AC), following the procedure suggested by Ping (1995). Prior to constructing the interaction term, all variables were mean-centered to reduce multi co linearity.

The findings demonstrate that while both product and process innovation capabilities positively influence new product performance, collaborative innovation networks do not exert a direct effect on either type of innovation capability. This suggests that a resource-based view of the firm, in isolation, is insufficient to explain variations in firms' innovation capabilities. However, the results further reveal that the relationship between collaborative innovation networks and both product and process innovation capabilities becomes significant when absorptive capacity is taken into account. In other words, collaborative innovation networks enhance a firm’s innovation capability only when the firm possesses a high level of absorptive capacity. This outcome aligns with the organizational learning perspective, which emphasizes absorptive capacity as a key determinant of competitive advantage [40].An important implication of this finding is that firms must develop sufficient absorptive capacity to effectively benefit from the strategic resources available through collaborative innovation networks. Without such internal capabilities, efforts to establish and maintain collaborative networks may result in inefficient use of resources. In this sense, collaboration without the ability to absorb and utilize external knowledge can be counterproductive.

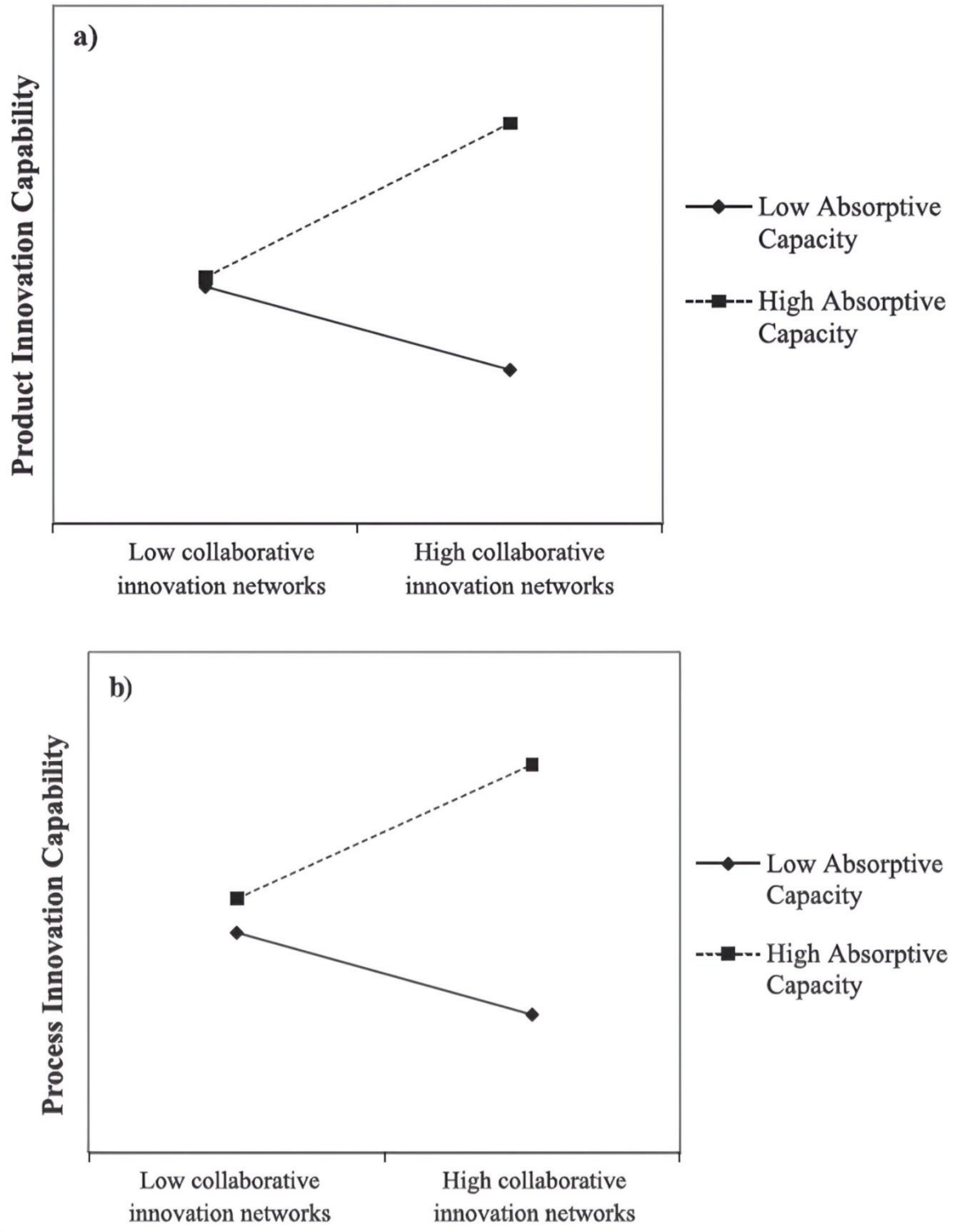

Fig. 2. Moderation effect plots. (a) Interaction between collaborative innovation networks and absorptive capacity on product innovation capability. (b) Interaction between collaborative innovation networks and absorptive capacity on process innovation capability.

Collaboration with external partners serves as an important mechanism for firms to identify and access valuable knowledge and information embedded within their partners [41]. Such collaborative innovation networks are particularly relevant in the context of Iran, where international sanctions over recent decades have compelled firms to rely more heavily on local actors to obtain resources not available internally . However, the effective utilization of these external knowledge resources depends on the firm's level of absorptive capacity [42]. When absorptive capacity is high, firms are better equipped not only to recognize new knowledge and opportunities but also to assimilate, apply, and reconfigure external knowledge [43]. Conversely, low absorptive capacity constrains the firm's ability to leverage acquired knowledge, resulting in weaker innovation capability.

These findings enrich the literature by integrating the organizational learning and resource-based perspectives, offering a more comprehensive understanding of the conditions under which firms can effectively utilize collaborative innovation networks to enhance innovation capability.

As an additional ad hoc analysis, this study further examines the individual effects of collaboration with different types of partners—namely suppliers, customers, competitors, and universities—on firms' innovation capability. The results indicate that collaboration with only certain external actors contributes positively to innovation capability when the firm's absorptive capacity is considered. These findings are discussed in detail for each type of collaborator in the following sections.

5.1.1. Collaboration with Suppliers

Collaboration with suppliers has been widely recognized as a means through which firms can extend their organizational boundaries to achieve competitive advantage . Prior studies suggest that such collaboration increases the level of direct interaction between firms and their suppliers, thereby fostering trust and facilitating inter-firm knowledge exchange [44].

The findings of this study are consistent with this stream of research, indicating that collaboration with suppliers contributes to the development of new processes within firms. However, this relationship is statistically significant only when firms possess adequate levels of absorptive capacity (SPC = 0.17, t-value = 2.20, $p < 0.05$). In contrast, the results reveal that collaboration with suppliers does not have a significant effect on firms' ability to develop new products (SPC = 0.03, t-value = 0.41, $p > 0.05$).

One possible explanation for these findings relates to the high level of uncertainty in the Iranian market, largely driven by international sanctions. Under such conditions, firms may be hesitant to share sensitive information and knowledge related to new product development, which can limit the effectiveness of collaborative efforts. Additionally, the context of the study provides further insight into these results. The manufacturing sector in Middle Eastern countries such as Iran continues to operate predominantly on traditional foundations despite recent developments.

In particular, prolonged economic sanctions have significantly restricted firms' access to advanced technologies, resulting in the continued use of relatively outdated production systems within the manufacturing sector. Moreover, these sanctions have constrained the country's economic capacity and limited the import of new products. Collectively, these factors have contributed to increased demand for existing products—demand that firms often struggle to satisfy. Consequently, manufacturing firms are less compelled to prioritize customer needs during the design phase of new product development, which may further explain the limited impact of supplier collaboration on product innovation capability.

5.1.2. Collaboration with Customers

Prior research suggests that collaboration with customers enables firms to better identify unmet customer needs, thereby enhancing their ability to develop superior products . However, the findings of this study do not support this argument in the context examined. Specifically, the interaction between customer collaboration and absorptive capacity does not have a significant effect on either product innovation capability (SPC = 0.01, t-value = 0.06, $p > 0.05$) or process innovation capability (SPC = 0.02, t-value = 0.29, $p > 0.05$).

One possible explanation for this result lies in the high level of environmental turbulence and uncertainty caused by international sanctions. In such conditions, particularly in the Iranian economic context over recent decades, firms are often primarily focused on survival [45]. As a result, managers may prioritize short-term objectives, such as achieving immediate financial returns, rather than investing in extensive customer engagement. This may lead firms to introduce products more rapidly and with limited customer feedback compared to firms operating in more stable environments.

Furthermore, firms may take advantage of the constrained market conditions in which customers have limited alternatives. Under such circumstances, companies might intentionally reduce their focus on detailed customer needs in order to lower costs and accelerate the product development and launch process. Consequently, firms may not invest sufficient time in interacting with customers or fully understanding their requirements. This lack of engagement increases the likelihood of a mismatch between products and customer needs, thereby reducing the potential benefits of collaboration with customers.

5.1.3. Collaboration with Competitors.

The findings indicate that collaboration with competitors enhances firms' ability to develop new products, but only when the level of absorptive capacity is sufficiently high (SPC = 0.25, t-value = 3.44, $p < 0.01$). In contrast, such collaboration does not have a significant effect on firms' process innovation capability (SPC = 0.08, t-value = 1.15, $p > 0.05$).

Collaboration with competitors can be viewed as a form of market imperfection that may weaken competitive dynamics while simultaneously generating certain benefits. Specifically, such cooperation can reduce the adverse effects of competition and promote information sharing, thereby contributing to enhanced product innovation capabilities [46].

However, the competitive nature of these relationships introduces inherent risks. Excessive collaboration may expose firms to opportunistic behavior and potential loss of competitive advantage.

As a result, firms may become cautious about sharing sensitive information, particularly regarding their technologies and production processes. This reluctance can limit the positive influence of collaboration with competitors on process innovation capability [47]. Furthermore, intense competitive pressure often compels firms to strengthen their product innovation capabilities. In this context, one key motivation for establishing collaborative relationships with competitors is mutual learning. Such interactions can enable firms to acquire valuable insights from one another, while also supporting the maintenance of their market share.

5.1.4. Collaboration with Research Organizations

The findings indicate that universities and research organizations are the only external partners that significantly enhance both product and process innovation capabilities, provided that firms possess a high level of absorptive capacity (SPC = 0.15, t-value = 2.11, $p < 0.05$ and SPC = 0.15, t-value = 2.21, $p < 0.05$ for product and process innovation capability, respectively).

This result is consistent with prior research, which identifies universities and research institutions as valuable knowledge sources associated with relatively low levels of risk and strong potential for supporting long-term strategic research. Such collaborations can substantially improve firms' innovation performance [48]. Indeed, partnerships between firms and research institutions are often considered key antecedents of innovation capability .

Moreover, the costs associated with collaboration with research organizations are generally lower compared to those incurred when collaborating with other types of external partners. This makes such partnerships particularly attractive for firms seeking to enhance their innovation capabilities in a cost-

5.2. Managerial Implications

This study offers several important implications for managers operating in technology-intensive firms. A key insight is that, in order to maximize innovation capability, firms must gain access to strategic resources, particularly technical knowledge available in the market. However, such knowledge is often tacit, complex, and difficult to acquire, making the process both costly and time-consuming. In this context, collaboration with external partners, including universities, becomes essential. Through increased direct interaction with external actors, firms can facilitate the exchange and acquisition of valuable technical knowledge that is otherwise difficult to obtain internally.

The findings further suggest that while collaboration with external actors is important, managers must simultaneously focus on strengthening internal capabilities, particularly absorptive capacity. Absorptive capacity enables firms to effectively recognize, assimilate, and utilize external knowledge. Firms with higher levels of absorptive capacity are better positioned not only to identify new opportunities but also to transform acquired knowledge into improved or entirely new products and processes. In contrast, firms lacking sufficient absorptive capacity are unable to fully benefit from the knowledge accessible through collaborative innovation networks, thereby limiting their innovation potential. Therefore, managers should adopt a balanced approach that combines external collaboration with the development of internal capabilities.

Moreover, the results indicate that collaborative innovation networks alone do not directly guarantee the success of new products. Instead, they contribute indirectly by enhancing firms' ability to develop new products and processes, which in turn improves new product performance. For managers in technology-intensive industries, this highlights the importance of not relying solely on external collaborations with suppliers, customers, competitors, and research institutions. Equal emphasis must be placed on strengthening internal product and process innovation capabilities to achieve superior product performance.

With regard to the distinct effects of collaboration with different external partners, the findings show that none of these collaborations significantly influence innovation capability when absorptive capacity is low. However, when absorptive capacity is high, collaboration with suppliers and competitors can enhance process and product innovation capabilities, respectively. In addition, collaboration with universities and research institutions plays a particularly critical role, as it significantly contributes to both product and process innovation capabilities. Therefore, managers are encouraged to expand and strengthen their collaboration with research institutions while simultaneously investing in the development of absorptive capacity to fully leverage these partnerships.

5.3. Limitations and Directions for Further Research

As with any empirical study, this research is subject to several methodological and theoretical limitations that offer opportunities for future investigation. First, the study focuses solely on the moderating role of absorptive capacity in the relationship between collaborative innovation networks and firms' innovation capability. Future research could explore

additional managerially relevant moderating variables. For instance, a firm's learning orientation may influence how collaborative innovation networks affect new product performance. Similarly, prior research suggests that the power dynamics and boundary conditions within and around firms can shape their ability to learn from external environments by affecting inter-firm knowledge exchanges [49]. Accordingly, future studies could examine whether the relationship between collaborative innovation networks and innovation capability is contingent upon such organizational factors.

Second, this study considers innovation capability as the primary mechanism linking collaborative innovation networks to new product performance. However, from the perspective of dynamic capability theory [50], firm performance is often driven by the interaction of multiple complementary capabilities. Future research could therefore investigate additional capability configurations, such as the interplay between marketing and innovation capabilities, to provide a more comprehensive explanation of how collaborative innovation networks influence new product performance.

Third, in line with Tsai (2009), collaborative innovation networks were measured by asking managers to indicate the extent of their collaboration with suppliers, customers, competitors, and universities/research institutions during product development and innovation processes. While this approach captures a broad range of external collaborations, it does not account for other important dimensions, such as the frequency, depth, and nature of these interactions. Future studies could enhance this measurement by incorporating these additional aspects of collaboration.

Fourth, this study primarily examines the conditions under which collaborative innovation networks enhance new product performance. Future research could extend this work by investigating how and under what circumstances such collaborations influence other organizational outcomes, such as the number of patents, new product introductions, and speed to market.

Finally, prior studies have shown that network characteristics, including relational ties, play an important role in facilitating collaborative innovation networks by fostering trust and enabling knowledge exchange among partners [50]. Future research could therefore explore whether the relationship between collaborative innovation networks and innovation capabilities is influenced by specific network characteristics.

Appendix A. Items, Loadings, and Cronbach's Alphas

Constructs	**Indicators**	**Loadings**
New Product Performance (0.851)	How well the organization met the following goals for its new products	
	Met sales growth goals	0.84
	Met market share goals	0.85
	Return on investment	0.71
	Customer acceptance and satisfaction	0.69
	Development costs[a]	–
Collaborative innovation networks (0.829)	Collaboration with suppliers	0.82
	Collaboration with customers	0.79
	Collaboration with competitors	0.63
	Collaboration with research institutes and universities	0.76
Worker Knowledge (0.918)	General knowledge level of first-line workers	0.90
	Technical knowledge of first-line workers	0.85
	Educational level of first-line workers	0.82
	Job competence of first-line workers	0.88
Manager Knowledge (0.910)	Knowledge for business decisions	0.87
	Knowledge of new technologies	0.85
	Knowledge in daily operations	0.86
	Ability to solve technical problems	0.80
Communications network (0.879)	Supervisor–subordinate communication is extensive	0.82
	Communication among functional areas is extensive	0.84

	Communication among functional areas is frequent	0.82
	Supervisor–subordinate communication is frequent	0.74
	Cross-department communication of new ideas[a]	–
Communications climate (0.862)	Employees tend to trust each other[a]	–
	Employees are supportive of each other	0.77
	Strong sense of belonging	0.73
	Free sharing of ideas	0.73
	Acceptance of new ideas	0.74
	Willingness to accept changes	0.76
Knowledge scanning (0.884)	Learning from market trends	0.83
	Routine search for useful information	0.72
	Benchmarking best practices	0.81
	Experimentation with new technologies[a]	–
	Learning from customers and suppliers	0.67
	Exploring new business opportunities	0.76
	Learning from R&D activities	0.73
Product innovation capability (0.830)	Ability to replace obsolete products[a]	–
	Extend product range	0.77
	Develop environmentally friendly products	0.72
	Improve product design	0.81
	Reduce time-to-market	0.71
	Manage interrelated technologies	0.67
	Absorb key technologies	0.72
	Reduce production costs	0.73
	Knowledge for process innovation	0.84
	Knowledge of work organization systems	0.78
	Efficient production organization	0.72
	Efficient resource allocation	0.69
	Environmentally friendly processes	0.66
	Efficient production management	0.76

Model Fit Indices

$\chi^2 = 1318.47$; df = 866; IFI = 0.934; TLI = 0.927; CFI = 0.934; RMSEA = 0.045

Note: All items were measured using seven-point scales anchored by 1 = “strongly disagree” and 7 = “strongly agree”. Cronbach’salphas are reported in parentheses.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Correlation Between Me-Msr Measured In P-A Cephalogram And C2-C7 Sva Spine Parameter

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Abstract: A postero-anterior cephalogram is used to analyze the Menton-Mid-Sagittal Reference (Me-MSR). To determine skeletal facial asymmetry, the horizontal deviation of the menton from the mid-sagittal reference plane is a factor to consider. The purpose of this study is to determine whether there is a correlation between these two parameters. This study included 37 patients aged between 25 and 65 years. Congenital facial asymmetry or asymmetry caused by trauma, tumors, uncorrected loss of permanent teeth, or autoimmune pathologies were not included. Cervical spine trauma, pregnant women, and breastfeeding women were also excluded. P-A cephalogram is the method used to measure Me-MSR, and L-L cervical radiography is used to measure C2-C7 SVA. The standard C2-C7 SVA is defined as being less than 4 cm. A Me-MSR that is normal is characterized by a measurement of 0-3 mm. Females made up 62.16% of the cases. Normal Me-MSR was found in approximately 56.76% of cases, while normal C2-C7 SVA was found in approximately 64,86 % of cases. The correlation between these two parameters was statistically significant ($p<0.001$). Abnormal values of Me-MSR and C2-C7 SVA increase with age. To conclude, we found that Me-MSR and C2-C7 SVA spine parameters have a statistically significant correlation in our study.

Keywords: Me-MSR parameter, C2-C7 SVA parameter, P-A cephalogram, spine parameter.

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1. INTRODUCTION

A crucial linear measurement for analyzing face asymmetry is the Me-MSR (Menton to Midsagittal Reference) parameter on a postero-anterior (PA) cephalogram, which assesses the chin's horizontal position. It calculates the separation between the midsagittal reference (MSR) plane and the Menton (Me), the lowest point on the mandibular symphyseal shadow. (1) Midsagittal Reference (MSR): To create the reference line, a vertical line is typically drawn across the anterior nasal spine (ANS) and the crista galli (Cg), extending inferiorly toward the chin. A variation of less than 3 mm is frequently regarded as symmetric or within normal bounds. An asymmetric mandible is usually defined as a deviation of three millimeters or more. (1, 2) In asymptomatic individuals, the normal C2-C7 Sagittal Vertical Axis (SVA) is commonly described as less than 40 mm (4 cm), with an average measurement of roughly 16.8 mm to 20 mm. In order to evaluate cervical balance, this measurement determines the horizontal distance between the odontoid (C2) and the posterior-superior corner of the C7 vertebral body. (3, 4)

The hyoid bone, muscles, and ligaments are the main means by which the craniocervical-mandibular system connects the jaw (mandible), skull (temporal bone), and cervical spine. It combines breathing, head posture, and jaw movement (chewing, swallowing). The temporomandibular joint (TMJ), suprahyoid/infrahyoid muscles, and craniovertebral stabilizers—where the temporal and sphenoid bones serve as important structural hubs—are important constituents. (5, 6, 7). The cervical vertebra's three-dimensional posture is impacted by the mandibular deformity, which can result in varying degrees of cervical displacement. Patients with mandibular asymmetry had more cervical vertebral posture and mandibular deviation than people with facial symmetry. Patients with skeletal mandibular asymmetry tend to tilt and bend forward in comparison to those with normal jaws. The irregular alignment of the cervical spine can influence the three-dimensional positioning of the mandible, leading to facial asymmetry in the lower third of the face due to changes in head and neck posture. (8, 9) The main objective of this research is to establish how morphometric assessment can aid in the early identification of factors contributing to facial asymmetry. Additionally, an orthodontist's evaluation of facial asymmetry can prompt referrals for the early diagnosis of cervical spine disorders. Strengthening cooperation in clinical settings between orthodontists and medical professionals who manage cervical spine issues is essential.

2. MATERIAL AND METHOD

37 patients between the ages of 25 and 65 were included in this study. Patients with cervical complaints, such as cervicalgia or cervicobrachialalgia with or without superior extremity paresthesia, as well as those with postural abnormalities, such as loss of physiological cervical lordosis, were included in this study. Uncorrected permanent tooth loss, tumors, autoimmune diseases, and congenital facial asymmetry were excluded. Pregnant women, nursing mothers, and those with cervical spine injuries were also not included. Me-MSR (Menton-Mid-Sagittal Reference) is measured

using a postero-anterior cephalogram, and C2-C7 SVA (C2-C7 sagittal vertical axis) is measured using latero-lateral cervical radiography. Less than 4 centimeters is the normal C2-C7 SVA. A value of 0-3 mm is indicative of a normal Me-MSR (1, 2, 3, 4). The University of Medicine in Tirana, Albania's Ethics Council granted permission to carry out the study, and each patient completed an informed consent form. Following the collection of data for every patient, it was examined to determine whether or not a statistically significant association existed.

3. RESULTS

Every patient in this study had complaints pertaining to the cervical region, including cervicalgia, cervicobrachialalgia with or without superior extremity paresthesia, and postural abnormalities such loss of physiological cervical lordosis. 37 patients between the ages of 25 and 65 were included in this study. 62.16% of the patients were female. Uncorrected permanent tooth loss, tumors, autoimmune diseases, and congenital facial asymmetry were excluded. Pregnant women, nursing mothers, and those with cervical spine injuries were also not included. Me-MSR on postero-anterior cephalograms and C2-C7 SVA on latero-lateral cervical radiography were computed for each patient.

Midsagittal Reference (MSR): A vertical line is typically drawn through the crista galli (Cg) and the anterior nasal spine (ANS), continuing downward towards the chin. A deviation of less than 3 mm is generally regarded as normal or symmetrical. The C2-C7 SVA measures the horizontal distance from the odontoid (C2) to the upper posterior corner of the C7 vertebral body to evaluate cervical alignment. Approximately 56.76% of cases exhibited normal Me-MSR, while around 64.86% of cases showed normal C2-C7 SVA. There was a statistically significant correlation between these two metrics ($p<0.001$). Abnormal Me-MSR and C2-C7 SVA values tend to increase with age.

4. DISCUSSION AND CONCLUSIONS

Additional studies are necessary to establish clearer conclusions by normalizing the standard values of cervical parameters based on age, gender, and demographics. While standardized values for cervical parameters are not yet available, certain studies with the largest populations of asymptomatic individuals are being referenced. This also applies to the diagnostic standards for facial asymmetry, where different researchers may utilize skeletal variations ranging from 2 to 4 mm (10, 11, 12). The clinical benefit that morphometric evaluation will offer in the early identification of alterations resulting in facial asymmetry is the study's ultimate objective. However, the orthodontist might refer cases for early identification of cervical spine disorders by evaluating face asymmetry. It is crucial that orthodontists and doctors who treat cervical spine disorders work together more in practical practice. In summary, our investigation revealed a statistically significant association between Me-MSR and C2-C7 SVA spine characteristics. Me-MSR and C2-C7 SVA abnormal levels rise with aging.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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A Review Of The Craniocervical-Mandibular System As A Functional Unit

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Abstract: Alterations in craniocervical posture have often been cited as the reason for changes in the position of the mandible. Numerous studies in global literature have elucidated this cause-effect relationship via the biomechanical link between the craniocervical system and the mandible. It is an analysis of comparable articles released in PubMed, Research Gate, Google Scholar concerning the biomechanical relationships of the craniocervical mandibular system. This evaluation encompassed clinical investigations of craniocervical alignment and jaw positioning. The craniocervical mandibular system is not viewed anymore as being made up only of the temporomandibular joints, chewing muscles, and ligaments that link the temporomandibular joint to the cervical area. There is increasing discussion suggesting that this system ought to be referred to as the tongue, mandible, and hyoid bone system. The pharyngeal constrictor and genioglossus muscles directly link the mandible and tongue. The geniohyoid and mylohyoid muscles link the mandible and hyoid bone. The hyoid bone and tongue are linked by two longitudinal muscles. The scalene, trapezius, and sternocleidomastoid muscles, upon contraction, can exert force on the jaw muscles. The biomechanical links of the craniocervical mandibular system are established via the muscles that link the mandible and tongue, the mandible and hyoid bone, the tongue and hyoid bone, along with the muscles that attach the jaw to the cervical area. Consequently, alterations in cervical posture will manifest as changes in the position of the mandible.

Keywords: craniocervical-mandibular system, temporomandibular joint, biomechanics

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1. INTRODUCTION

The craniocervical-mandibular system is considered a single functional unit that connects the head to the neck. Numerous studies have concluded that the craniomandibular region is biomechanically and neurophysiologically connected to the cervical region. Another terminology that can be used for this system is the ``Tongue, Mandible, Hyoid Bone`` system. (1) A good number of studies have shown a statistically significant correlation between temporomandibular disorders and changes in cervical spine posture. Some studies go further, linking these disorders to overall body posture. The neurological connection between the trigeminal nerve and the cervical spinal nerves at the level of the cervical trigeminal complex makes it possible for pain in one region to radiate to another. (2) This system is formed by the cranium, mandible, vertebral column, temporomandibular joint, atlanto-occipital joint, intervertebral joints, muscles, ligaments connecting the cranial and cervical regions, the continuation of the cervical spine such as the medulla oblongata, and the cervical trigeminal complex. Important blood vessels that supply the head and neck with blood pass through this system. (3)

To establish diagnoses and treatment strategies for complaints related to anatomical structures of the craniocervical mandibular system, a multidisciplinary team is needed. This team may consist of an orthodontist, rheumatologist, orthopedic surgeon, neurologist, maxillofacial surgeon, physiotherapist, depending on the type of pathology we are dealing with. Such a multidisciplinary approach would determine the etiology of the complaints as accurately as possible and the appropriate treatment. The study of biomechanical and functional connections aims to do exactly this. Before we rush to the conclusion that cervical pain is caused by degenerative and postural changes, we need to delve deeper to understand whether one of the initial causes was related to temporomandibular joint disorders. Compensations for pathological changes are made within the same system. Correction of temporomandibular disorders would affect the correction of cervical postural changes and pain management. (4, 5, 6)

2. MATERIAL AND METHOD

The purpose of this study is to review the literature that has been published in PubMed, Research Gate, Google Scholar, and searched for articles that focused on the 'biomechanicals of the craniocervical-mandibular system', 'anatomical head-neck connection', and 'physiology of the head neck system', We opted for English articles that contained studies that were carried out between 2000 and 2026. A summary of these articles was compiled to clarify the anatomical and functional relationship between the craniocervical mandibular system and the mandibular system. The anatomical and physiological connection explains why some symptoms begin in one region and spread to another.

3. RESULTS

More people are now aware of the tongue, mandible, and hyoid system. This system includes the cranium, mandible, hyoid bone, cervical vertebrae, and masticatory muscles such as the masseter, temporalis, lateral, and medial pterygoid. The first one closes the mouth by raising the jaw. The second one retracts and raises the mandible. The lateral pterygoid muscle, which extends from the mandible and moves it side to side, opens the mouth. The medial pterygoid muscle elevates and closes the jaw. The cranio-cervical system is composed of a variety of muscle groups, including the sternocleidomastoid, trapezius, suboccipital, and scalene muscles. These muscles regulate head position, stability, and movement. The suprahyoid muscles, which aid in mouth opening and swallowing, and the infrahyoid muscles, which are crucial for speaking and swallowing, are among the hyoid muscles. Respiratory mechanics, postural control, and oral function all depend on the coordination of these muscles. (1, 3, 4, 7, 8)

The genioglossus, geniohyoid, and mylohyoid muscles join the tongue, mandible, and hyoid to form a functional unit. The hyoid bone is maintained by a high or forward resting tongue position, which balances head posture. The masticatory muscles are balanced by the tongue. Tension in the neck and shoulders might result from improper alignment, such as a low tongue resting posture, which frequently causes the jaw to pull back and initiates a forward head posture. Breathing and the related muscle balance are directly impacted by the tongue's ability to keep the pharyngeal airway open and prevent its collapse. The tongue, which is connected to the trigeminal system, is a major center of afferent and efferent input that affects temporomandibular joint function. The cervical region's postural stability is improved by positioning the tongue correctly against the palate. Instead of just a cervical-cranial connection, the mandible, temporal bone, hyoid bone, and surrounding muscles form an interdependent "hyoid-mandibular-tongue" unit. (1, 4, 9,10,11)

The joint disc and ligaments control the intricate rotational and translational movements that make up the temporomandibular joint. Suprahyoid muscles function as depressors, while mandibular muscles work as elevators using the skull as a fixed point. To control mechanical stress during function, mandibular movements include medial convergence, dorso-ventral shear, and corporal rotation. Major head motion is provided by the atlanto-occipital and atlanto-axial joints, which are stabilized by the ligaments of the latter and the bony structure of the former. Jaw position and neck posture are closely related; overactive masticatory muscles or temporomandibular disorders can impact muscular chains, which may lead to scapular and neck dysfunction. For muscles to balance the head on the spine and for jaw movement, the hyoid is an essential anchorage point. The tongue, mandible, and hyoid system are now more widely acknowledged (12,13,14).

4. DISCUSSION AND CONCLUSIONS

The craniocervical mandibular system operates as an integrated biomechanical unit, with strong correlations between cervical mobility, head position, and jaw function, according to recent data and studies from 2000–2026. The stomatognathic system is a linked and coordinated apparatus involved in dental occlusions, temporomandibular joints, and related muscles. It may be coupled to the postural system through the various muscular groups. Any anomalies or differences in this system can have a detrimental effect on how other systems behave, impairing postural stability and perhaps resulting in cranio-cervical-mandibular diseases. Swallowing, cervical position, and jaw movements all work together as a unified biomechanical unit. The tongue, mandible, and hyoid system are now more widely acknowledged. To establish diagnoses and treatment strategies for complaints related to anatomical structures of the craniocervical mandibular system, a multidisciplinary team is needed. This team may consist of an orthodontist, rheumatologist, orthopedic surgeon, neurologist, maxillofacial surgeon, physiotherapist, depending on the type of pathology we are dealing with (1, 3, 4, 7, 9).

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Conflict of Interest

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Patient Satisfaction With Intravitreal Injections In Albania

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Abstract: Intravitreal injections are widely used in the treatment of retinal diseases such as Age-related Macular Degeneration, Diabetic Retinopathy, and Macular Edema. Although highly effective in preserving vision, these treatments require repeated administration over long periods, which may affect patient satisfaction and quality of life. This study aimed to evaluate patient satisfaction with intravitreal injections in Albania, focusing on medical care, treatment burden, and financial impact. A cross-sectional questionnaire-based study was conducted including 264 patients receiving intravitreal therapy in ophthalmology clinics in Albania. Patient satisfaction was assessed using a 1–5 Likert scale covering several domains including professionalism of staff, communication, safety, waiting time, treatment frequency, and affordability. Results showed high satisfaction with procedural safety (mean 4.5) and professionalism of medical staff (mean 4.4), while communication with physicians was also rated positively (mean 4.1). In contrast, the affordability of treatment received the lowest score (mean 2.3), indicating a significant financial burden. Treatment frequency and repeated injections were also associated with lower satisfaction scores. Overall satisfaction remained relatively high (mean 4.0), with most patients reporting satisfaction with visual outcomes and treatment effectiveness. In conclusion, although intravitreal injections are well accepted in Albania, financial burden and repeated treatment requirements remain major challenges. Improving reimbursement policies and optimizing patient support systems may enhance long-term satisfaction and treatment adherence.

Keywords: Intravitreal injections; patient satisfaction; retinal disease; Albania; anti-VEGF therapy

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INTRODUCTION

Intravitreal injections are widely used in ophthalmology for the treatment of chronic retinal diseases, particularly Age-related Macular Degeneration, Diabetic Retinopathy, retinal vein occlusions, and Macular Edema (1, 2). These conditions often require long-term and repeated administration of anti-VEGF therapy (3, 4), which has significantly improved visual prognosis by stabilizing or slowing the progression of retinal damage and reducing the risk of severe vision loss. As a result, intravitreal therapy has become the standard of care in many clinical settings worldwide.

Despite their proven clinical efficacy and relative safety, intravitreal injections may represent a considerable burden for patients. The need for frequent hospital visits, repeated intraocular procedures, and prolonged treatment schedules can negatively influence the patient experience (5, 6). In addition to mild to moderate procedural discomfort, many patients report psychological effects such as anxiety before injections, fear of complications, and emotional stress associated with long-term therapy. Over time, these factors may contribute to treatment fatigue and reduced adherence (7).

Furthermore, the economic aspect of therapy is an important consideration. In many healthcare systems, including Albania, limited reimbursement coverage means that patients often bear a significant portion of treatment costs themselves. This financial burden, especially in chronic conditions requiring multiple injections per year, may directly affect continuity of care and overall satisfaction with treatment (8, 9). The combination of clinical, psychological, and economic factors makes intravitreal therapy a complex long-term management challenge.

However, there is still limited evidence regarding how patients in Albania perceive and evaluate this treatment in routine clinical practice. Understanding patient satisfaction is essential, as it provides valuable insight into treatment adherence, healthcare quality, and potential areas for system improvement (10). Therefore, this study was conducted to assess patient satisfaction with intravitreal injections in Albania, focusing on clinical experience, treatment burden, and financial impact in a real-world setting.

METHODOLOGY

This study was designed as a cross-sectional, questionnaire-based observational study aimed at evaluating patient satisfaction with intravitreal injection therapy in real clinical practice in Albania. The study was conducted in ophthalmology clinics where patients routinely receive intravitreal treatment for chronic retinal diseases.

A total of 264 patients were included in the study. Participants were selected among individuals receiving intravitreal injections for conditions such as Age-related Macular Degeneration, Diabetic Retinopathy, retinal vein occlusion, and

Macular Edema. Inclusion criteria were age ≥18 years, having received at least three intravitreal injections, and willingness to participate in the study. Patients with cognitive impairment, communication difficulties, or incomplete questionnaires were excluded.

Data were collected through structured face-to-face interviews conducted by trained personnel to ensure clarity and consistency of responses. The questionnaire was specifically designed for this study and included both demographic and clinical information such as age, gender, diagnosis, duration of treatment, and number of intravitreal injections received.

In addition, the questionnaire assessed multiple domains related to patient satisfaction, including quality of medical care, communication with healthcare providers, perceived safety during the procedure, waiting time, organization of services, emotional and physical discomfort, treatment burden, and financial impact. Patient satisfaction was measured using a 1–5 Likert scale, where 1 indicated very low satisfaction and 5 indicated very high satisfaction.

All data were anonymized to ensure patient confidentiality. Participation was voluntary, and informed consent was obtained from all participants before inclusion in the study. Data analysis was performed using descriptive statistical methods, with results presented in frequencies, percentages, means, and standard deviations to provide a clear overview of patient responses and satisfaction levels.

RESULTS

Table 1 shows that patient satisfaction with medical care during intravitreal injections is generally high, particularly regarding procedural safety (mean 4.5) and professionalism of staff (mean 4.4), indicating that patients feel secure and trust the competence of healthcare providers during the procedure. Communication with the physician (mean 4.1) and explanation of treatment (mean 4.0) are also rated positively, suggesting that most patients receive adequate information and feel reasonably informed about their condition and therapy, although there is still some room for improvement in clarity and depth of explanations. Overall, the results reflect strong clinical performance and good patient–doctor interaction, which are key factors in maintaining confidence and adherence in long-term intravitreal therapy.

Table 1. Satisfaction with Medical Care

Aspect	1	2	3	4	5	Mean
Professionalism of staff	3	6	21	98	136	4.4
Communication with doctor	5	9	34	110	106	4.1
Explanation of treatment	6	12	38	104	104	4.0
Safety during procedure	2	5	18	92	147	4.5

Table 2. Organizational Aspects of Care

Aspect	1	2	3	4	5	Mean
Waiting time	18	34	62	96	54	3.5
Appointment organization	15	28	70	98	53	3.6
Clinic environment	10	22	58	110	64	3.8

Table 2 shows that organizational aspects of care are rated lower compared to medical care, with waiting time receiving the lowest score (mean 3.5), indicating some patient dissatisfaction with delays. Appointment organization (3.6) and clinic environment (3.8) are assessed as moderate, suggesting an acceptable but improvable service structure. Overall, patients are less satisfied with logistical aspects than with clinical care quality.

Table 3. Treatment Burden and Frequency

Aspect	1	2	3	4	5	Mean
Frequency of injections	42	58	74	60	30	2.8
Emotional stress	28	44	68	82	42	3.2
Physical discomfort	20	38	72	88	46	3.3

Table 3 shows that treatment burden is a relevant concern for patients undergoing intravitreal injections, especially regarding injection frequency (mean 2.8), which received the lowest score among all items. Emotional stress (3.2) and physical discomfort (3.3) are rated slightly higher but still reflect a noticeable impact on patient well-being. Overall, the results indicate that while treatment is clinically effective, its repetitive nature creates a moderate psychological and physical burden for many patients.

Table 4. Financial Burden

Aspect	1	2	3	4	5	Mean
Affordability of treatment	98	64	56	30	16	2.3
Financial impact on the family	85	72	58	35	14	2.4

Table 4 highlights that financial burden is the most negatively rated aspect of intravitreal therapy, with affordability scoring very low (mean 2.3), indicating significant difficulty for patients in covering treatment costs. The perceived financial impact on families is also low (mean 2.4), confirming that cost represents a major barrier throughout the treatment course. Overall, these findings show that economic factors are the strongest source of dissatisfaction among patients receiving intravitreal injections.

Table 5. Overall Satisfaction

Satisfaction Level	n	%
5 (Very satisfied)	88	33.3
4 (Satisfied)	103	39.0
3 (Neutral)	42	15.9
2 (Dissatisfied)	21	8.0
1 (Very dissatisfied)	10	3.8

Table 5 shows that overall patient satisfaction with intravitreal injection therapy is generally high, with the majority of patients reporting being satisfied (39.0%) or very satisfied (33.3%). A smaller proportion of patients remain neutral (15.9%), while only a minority report dissatisfaction (8.0%) or very low satisfaction (3.8%). Overall, these results indicate that despite financial and treatment burden concerns, most patients perceive intravitreal therapy positively, mainly due to its effectiveness in stabilizing or improving vision.

DISCUSSION

This study provides an overview of patient satisfaction with intravitreal injections in Albania, highlighting both strengths and limitations of current ophthalmic care (11, 12). Overall, patients reported a generally positive experience, especially regarding the professionalism of medical staff, procedural safety, and physician communication. These findings suggest that the clinical delivery of intravitreal therapy is well established and trusted by patients, which is an essential factor in long-term treatments for chronic retinal diseases.

However, despite high satisfaction with medical care, important challenges were identified. The most significant issue was treatment affordability (13), which consistently received the lowest scores across all evaluated domains. Many patients reported that the cost of repeated injections represents a substantial financial burden, sometimes affecting continuity of treatment (14, 15). This is particularly important in conditions such as Age-related Macular Degeneration and Diabetic Retinopathy, where long-term anti-VEGF therapy is required.

Another important finding was the psychological and physical burden associated with repeated injections (16). Although most patients tolerated the procedure well, a considerable proportion reported emotional stress and anxiety, especially before injections. This reflects the chronic nature of therapy and the need for repeated hospital visits, which may reduce quality of life over time. Similar patterns have been described in studies of patients treated for retinal conditions such as Macular Edema, where treatment adherence is strongly influenced by psychological comfort and perceived burden (17).

Organizational aspects, such as waiting time and appointment scheduling, were rated moderately. This indicates that while the healthcare system functions adequately, there is room for improvement in workflow efficiency and patient flow management.

Despite these challenges, overall satisfaction remained high. This suggests that the perceived benefit of vision stabilization or improvement outweighs many of the negative aspects of treatment. Patients appear willing to tolerate financial and logistical difficulties in exchange for preserving vision, which is often their main priority.

Study limitations include its cross-sectional design, reliance on self-reported data, and inclusion of patients from selected clinics, which may limit generalizability. Future research with larger multicenter populations and longitudinal follow-up would provide deeper insight into changes in satisfaction over time

CONCLUSION

In conclusion, intravitreal injection therapy in Albania is associated with high levels of patient satisfaction regarding clinical care, safety, and communication. However, financial burden and repeated treatment requirements remain the main sources of dissatisfaction. Improving reimbursement policies, reducing out-of-pocket costs, and optimizing service organization could significantly enhance patient experience and long-term adherence to therapy. Overall, while the medical quality of care is strong, system-level improvements are needed to address economic and logistical challenges faced by patients.

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None.

Conflict of Interest

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Nursing Care In Patients With Coronary Artery Disease

VIOLETA ZANAJ[1], JOANA BREGASI[2]

Abstract: Coronary Artery Disease (CAD) remains one of the most prevalent pathologies of the cardiovascular system and a leading cause of morbidity and mortality worldwide. It is characterized by progressive narrowing of the coronary arteries, secondary to atherosclerotic plaque accumulation, which compromises myocardial oxygen and nutrient supply. Clinical manifestations most frequently include angina pectoris, acute myocardial infarction, and heart failure, conditions that necessitate both immediate medical intervention and long-term management strategies. Within this framework, nursing care plays a pivotal role not only in clinical monitoring and symptom management but also in patient education, cardiac rehabilitation, and secondary prevention of recurrent cardiac events. This study provides a comprehensive review of the clinical, psychological, and educational dimensions of nursing care for patients with CAD. This review is based on an analysis of current literature addressing the anatomy, pathophysiology, and treatment of coronary artery disease, with particular emphasis on the role of nursing care. Epidemiology and Risk Factors: The review discusses epidemiological data, major risk factors—including arterial hypertension, dyslipidemia, diabetes mellitus, smoking, and obesity—early clinical presentations (angina pectoris, dyspnea), and disease progression. Diagnostic Methods and Evaluation: Diagnostic modalities such as electrocardiography (ECG), stress testing, echocardiography, and coronary angiography are analyzed with regard to their utility in disease identification and staging. Therapeutic Approaches: The study examines pharmacological therapies (antiplatelet agents, beta-blockers, statins, nitrates), invasive interventions (percutaneous coronary intervention with stent placement), and surgical management (coronary artery bypass grafting, CABG), as well as nursing guidelines for pre- and postoperative care. Nursing Care and Rehabilitation: Emphasis is placed on patient monitoring, complication prevention (arrhythmias, heart failure, myocardial reinfarction), pain management, lifestyle modification counseling (nutrition, physical activity, smoking cessation), and provision of psychological support. The primary objective of this study is to critically evaluate the role of nursing care in the management of patients with coronary artery disease, focusing on clinical, educational, and psychological dimensions. The paper highlights the significance of nursing interventions across all stages of care—from emergency management and surgical interventions to patient self-care education and long-term cardiac rehabilitation.

Keywords: Coronary arteries, cardiovascular diseases, myocardial infarction, nursing care, cardiac surgery, health education, cardiac rehabilitation, clinical management, surgical interventions.

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Anatomy of the Heart and Blood Vessels (Systema Cardiovascularis)

[1]The anatomy of the cardiovascular system encompasses the study of the heart and blood vessels. In the scientific literature, these two components are often addressed separately, with blood vessels considered as a distinct system, referred to as *systema vasorum* (angiology). Angiology, as a specialized branch of medicine, is the scientific discipline dedicated to the study of blood vessels—including arteries, veins, and lymphatic vessels.

The cardiovascular system (*systema cardiovasculare*) constitutes a closed circulatory system.

The heart represents the central organ of this system. Through its rhythmic contractions, the heart propels blood into the vascular network, thereby ensuring distribution of oxygen and nutrients to all tissues and cells, with subsequent return to the cardiac chambers.

Arteries are the blood vessels that transport blood away from the heart. During their course, arteries branch progressively into smaller vessels, called arterioles. Arterioles further divide into microscopic vessels known as capillaries, which form the site of exchange between blood and tissues. Arterial capillaries converge with venous capillaries to form small veins, termed venules, which continue into larger veins responsible for returning blood to the heart.

The heart itself is structurally divided into four chambers: two atria (*atria*) and two ventricles (*ventriculi*). The right atrium and right ventricle are separated from the left atrium and left ventricle by the interventricular septum, functioning as two independent pumping units.

Oxygenated blood exits the heart via the aorta, the largest artery in the body, from the left ventricle (*ventriculus sinister*), circulates throughout the systemic tissues, and returns to the right atrium (*atrium dexter*). This pathway is defined as the systemic circulation (*circulus sanguinus major*).

During systemic circulation, blood delivers oxygen to tissues and collects carbon dioxide for removal. Upon reaching the right atrium, blood enters the right ventricle (*ventriculus dexter*) and is subsequently ejected through the pulmonary artery (*truncus pulmonalis*) to the lungs for oxygenation. Oxygen-rich blood then returns to the left atrium (*atrium sinister*). This pulmonary pathway is termed the pulmonary circulation (*circulus sanguinus minor*).[1]

Coronary Artery Disease (CAD)

[2]Coronary artery disease (CAD) represents one of the most common and clinically significant forms of cardiovascular disease. It is primarily associated with the progressive narrowing or obstruction of the coronary arteries, which are responsible for supplying the myocardium with oxygen and essential nutrients. This obstruction is most commonly caused by atherosclerosis, a chronic inflammatory and degenerative process affecting the arterial walls.

When the heart does not receive sufficient oxygen to meet the metabolic demands of the body, characteristic symptoms of the disease emerge, including chest pain (angina pectoris) and, in more advanced cases, myocardial infarction. For nurses working in surgical settings, where patients undergo interventions such as coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI), knowledge and understanding of CAD are crucial for providing safe and individualized care.

The term “coronary artery disease” refers to a condition in which the arteries supplying the heart with blood become narrowed or blocked, usually due to the formation of atherosclerotic plaques in their inner walls. These plaques consist of cholesterol, calcium, dead cells, and other circulating substances.

This process is gradual and may remain asymptomatic for years or even decades until the arterial lumen becomes critically narrowed. At this stage, inadequate myocardial perfusion during physical activity leads to myocardial ischemia, clinically manifested as chest pain.

Coronary artery disease can present in several clinical forms, classified as follows:

- Stable angina pectoris
- Unstable angina pectoris
- Myocardial infarction (heart attack)
- Silent ischemia[2]

Clinical Manifestations

[3]Patients with CAD may remain asymptomatic for extended periods. The accumulation of atherosclerotic plaque develops over many years, even decades. However, as arterial narrowing progresses, mild symptoms may appear, indicating that the heart is working harder to supply oxygenated blood to the body.

Clinical manifestations of chronic coronary artery disease include:

- **Stable angina:** This is the most common symptom. It presents as transient chest discomfort or pain, occurring in a predictable pattern, typically during physical exertion or emotional stress. The pain is usually relieved by rest or administration of nitroglycerin.
- **Dyspnea (shortness of breath):** Some patients may experience breathlessness even with light physical activity.

In certain cases, the first manifestation of CAD may be an acute myocardial infarction (heart attack).[3]

Risk Factors for Coronary Artery Disease

[4]Multiple risk factors contribute to the development of CAD. Some are non-modifiable, while others can be managed through lifestyle changes or pharmacological therapy. Key risk factors include:

- Age over 45 years in men or over 55 years in women
- Family history of cardiovascular disease, particularly if a father or brother was diagnosed before age 55, or a mother or sister before age 65
- High intake of saturated fats or refined carbohydrates
- Sedentary lifestyle (lack of physical activity)
- Inadequate sleep
- Tobacco use, including smoking, e-cigarettes (vaping), or other tobacco products
- Atherosclerosis
- Hypertension
- Elevated LDL cholesterol (“bad” cholesterol)
- Low HDL cholesterol (“good” cholesterol)
- Hypertriglyceridemia
- Anemia
- Autoimmune diseases, including systemic lupus erythematosus and rheumatoid arthritis
- Chronic kidney disease
- Diabetes mellitus
- HIV/AIDS infection
- Metabolic syndrome
- Body mass index (BMI) >25 (overweight/obesity)
- Sleep disorders such as obstructive sleep apnea
- Early menopause (before age 40)
- Endometriosis
- History of gestational diabetes, eclampsia, or preeclampsia
- Use of hormonal contraceptives[4]

Diagnosis of Coronary Artery Disease (CAD)

[5]The diagnosis of coronary artery disease is initiated through a comprehensive clinical assessment conducted by a healthcare professional. The evaluation typically includes a detailed medical history and assessment of presenting symptoms. Patients presenting with chest pain (angina) or dyspnea may be referred for additional diagnostic tests to evaluate overall cardiovascular status.

Diagnostic and monitoring modalities for CAD include:

- **Blood tests:** These assess glucose and cholesterol levels. High-sensitivity C-reactive protein (hs-CRP) testing can detect inflammation associated with atherosclerotic processes.

- **Electrocardiogram (ECG):** A rapid, non-invasive test that records the electrical activity and rhythm of the heart. Electrodes are placed on the chest and occasionally on the limbs. ECG findings can indicate prior or ongoing myocardial infarction.

- **Echocardiography:** Uses ultrasound waves to visualize cardiac structure and blood flow. Poorly contracting myocardial segments may suggest ischemia or infarct-related damage.

- **Exercise stress testing:** Recommended when symptoms are exertion-related. The patient walks on a treadmill or pedals a stationary bicycle while cardiac function is monitored. Exercise increases heart rate and workload, potentially revealing abnormalities not present at rest. Pharmacological stress agents may be used if physical exercise is not feasible. In some cases, echocardiography is combined with the test.

- **Nuclear stress testing:** Evaluates myocardial perfusion at rest and during stress. A small amount of radiotracer is administered intravenously, and imaging detects areas of hypoperfusion or myocardial damage.

- **Cardiac CT (Computed Tomography):** Visualizes coronary artery calcifications and stenoses. Contrast-enhanced CT, or CT coronary angiography, provides detailed images of coronary anatomy.

- **Cardiac catheterization and coronary angiography:** The most specific invasive method for identifying coronary stenoses. A flexible catheter is introduced, typically via the femoral or radial artery, and advanced to the heart. Contrast medium is injected to visualize coronary arteries under fluoroscopy/X-ray. Therapeutic interventions such as balloon angioplasty or stent placement can be performed during the procedure.[5]

Management of Coronary Artery Disease (CAD)

[6]Management of CAD may involve:

- **Lifestyle modifications:** Smoking cessation, healthy diet, and increased physical activity.

- **Pharmacological therapy**

- **Invasive or surgical cardiac interventions**

Pharmacological Therapy

Several classes of medications are employed in CAD management:

- **Lipid-lowering agents:** Recommended to reduce LDL cholesterol (“bad” cholesterol) and slow atherosclerotic plaque formation. This group includes:

  - Statins
  - Niacin
  - Fibrates
  - Bile acid sequestrants

- **Aspirin (acetylsalicylic acid):** Low-dose daily therapy reduces platelet aggregation and prevents thrombosis. It is indicated for primary prevention of myocardial infarction or stroke in selected individuals. Daily use may cause gastrointestinal bleeding; medical consultation is required before initiation.

- **Beta-blockers:** Lower heart rate and blood pressure. Post-myocardial infarction, they reduce the risk of reinfarction.

- **Calcium channel blockers:** Indicated when beta-blockers are not tolerated or ineffective; they reduce anginal pain.

- **Angiotensin-converting enzyme (ACE) inhibitors) and angiotensin II receptor blockers (ARBs):** Lower blood pressure and slow progression of coronary disease.

- **Nitroglycerin:** Dilates coronary arteries and is used for angina control; available as tablets, sprays, or transdermal patches.

- **Ranolazine:** Used to reduce chronic stable angina, typically in combination with or as an alternative to beta-blockers.

urgical and Interventional Procedures

In cases of severe coronary artery obstruction, invasive procedures are indicated:

- **Percutaneous Coronary Intervention (PCI) with stent placement:** This procedure is used to open narrowed coronary arteries. A catheter with a balloon is inserted into the occluded artery and inflated to improve blood flow. A metallic stent, often drug-eluting, is frequently placed to maintain vessel patency and prevent restenosis.

- **Coronary Artery Bypass Grafting (CABG):** This open-heart surgical procedure involves using an autologous vein or artery (e.g., the great saphenous vein or internal mammary artery) to create an alternative route for blood flow, bypassing the obstructed segment.

Post-CABG, cardiac rehabilitation is often recommended, which includes:

- Health education
- Psychosocial counseling
- Supervised exercise programs

The aim is to optimize recovery and improve post-surgical health outcomes.[6]

The Role of the Nurse in Pre- and Post-CABG Care

Preoperative Nursing Care:

- Educating the patient and family about the surgical procedure
- Assessing clinical status, including respiratory function, nutritional status, and coagulation profile
- Providing psychological preparation and emotional support

Postoperative Nursing Care:

- Monitoring vital signs and hemodynamic parameters
- Managing thoracic drains and the surgical incision site
- Preventing complications, including infection, arrhythmias, and thromboembolism
- Caring for patients on mechanical ventilation
- Encouraging early mobilization and participation in cardiac rehabilitation
- Educating the patient regarding self-care upon hospital discharge

The Role of the Nurse in Pre- and Post-PCI Care

Pre-procedure Nursing Care:

- Obtaining informed consent from the patient and family, and providing detailed explanation of the procedure
- Assessing for allergies to iodine or contrast agents

- Educating the patient about procedural steps and expectations

Post-procedure Nursing Care:

- Monitoring the catheter insertion site (usually femoral or radial artery)
- Observing for bleeding, hematoma, or local infection
- Monitoring renal function due to contrast exposure
- Evaluating for signs of re-occlusion: chest pain, ECG changes, hypotension
- Educating the patient on maintaining a healthy lifestyle and the importance of follow-up with the cardiologist

9. Common Nursing Diagnoses in Coronary Artery Disease (CAD) According to NANDA-I (North American Nursing Diagnosis Association – International)

[7]The use of the international classification system for nursing diagnoses provided by NANDA-I enables accurate identification of health problems experienced by patients with coronary artery disease, whether in the acute phase, chronic phase, or post-surgical period.

Decreased Cardiac Output

Definition: Reduction in the amount of blood pumped by the heart to meet the metabolic demands of the body.
Evidence: Hypotension, weak pulse, cold and pale skin, fatigue, EKG changes.
Nursing Goal: Improve systemic perfusion and stabilize hemodynamic parameters.

Ineffective Tissue Perfusion (Cardiac)

Definition: Decrease in oxygen delivery to cardiac tissue at the cellular level.
Evidence: Chest pain, ST-segment changes, dyspnea, abnormal troponin levels.
Nursing Goal: Increase oxygen supply and reduce myocardial oxygen consumption.

Activity Intolerance

Definition: Physiological response indicating an inability to perform or sustain physical activity.
Evidence: Dyspnea, fatigue, tachycardia, hypotension during exertion.
Nursing Goal: Enhance activity tolerance and support participation in cardiac rehabilitation.

Acute Pain (Chest Pain)

Definition: Experience of discomfort or pain resulting from myocardial hypoxia.
Evidence: Patient reports of pain, elevated blood pressure, agitation, pallor, diaphoresis.
Nursing Goal: Achieve effective pain management and reduce cardiac stress.

Anxiety
Definition: Feeling of apprehension or fear related to health status.

Evidence: Emotional tension, tachycardia, rapid breathing, difficulty concentrating.

Nursing Goal: Reduce anxiety and promote a supportive therapeutic environment.

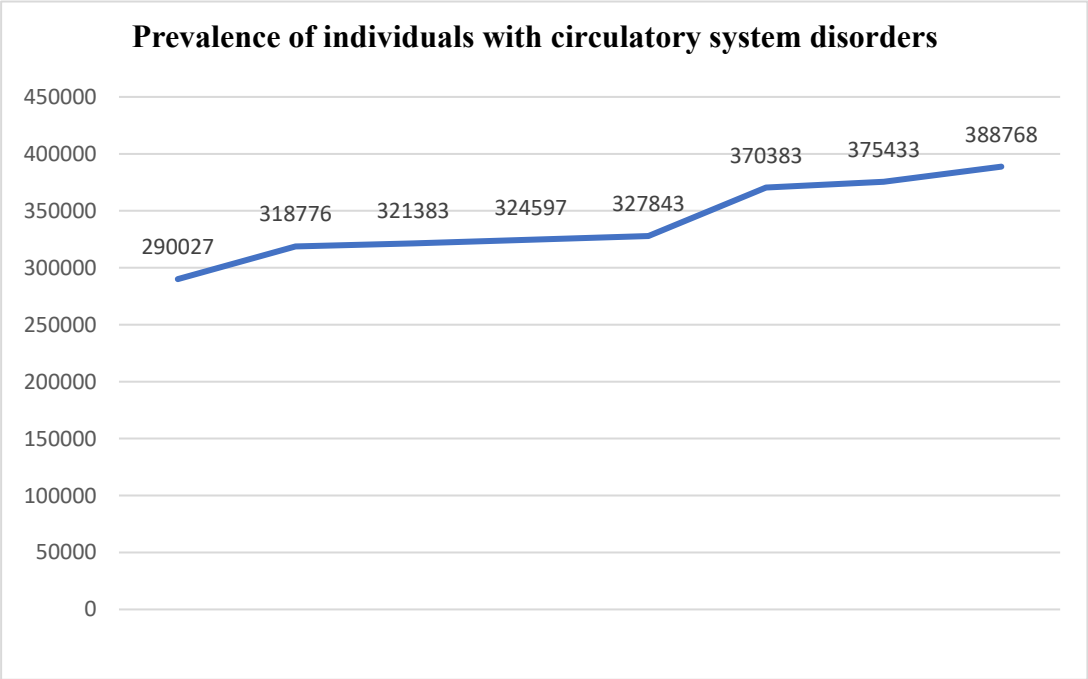
Knowledge Deficit Related to Disease Process

Definition: Lack of sufficient information regarding coronary artery disease, medications, and lifestyle modifications.
Evidence: Frequent questions, errors in medication adherence, lack of confidence in self-management.
Nursing Goal: Educate the patient for effective self-management and improve adherence to treatment.[7]

Statistics and Graphs

A group of experts from the Institute of Public Health analyzed the prevalence of non-communicable diseases in Albania for the year 2017, highlighting a particularly high incidence of cardiovascular diseases and hypertension.

During this period, a total of 388,768 patients with cardiovascular problems were registered with family physicians across the country, of which 281,857 cases were diagnosed with hypertension. In 2017, 85,869 patients were reported to be living with heart disease in Albania, among whom 37,225 had ischemic heart disease—conditions caused by impaired oxygen supply to the myocardium due to narrowing or blockage of the coronary arteries.



Graph 1. Prevalence of individuals with circulatory system disorders.

Table 1. Prevalence of individuals with circulatory system disorders, Albania.

Year 2010	290027
Year 2011	318776
Year 2012	321383
Year 2013	324597
Year 2014	327843
Year 2015	370383
Year 2016	375433
Year 2017	388768

The districts with the highest prevalence of coronary artery disease in Albania in 2017 were Tirana, Durrës, Berat, and Gjirokastër. The lowest prevalence was observed in Elbasan, Kukës, and Dibër.

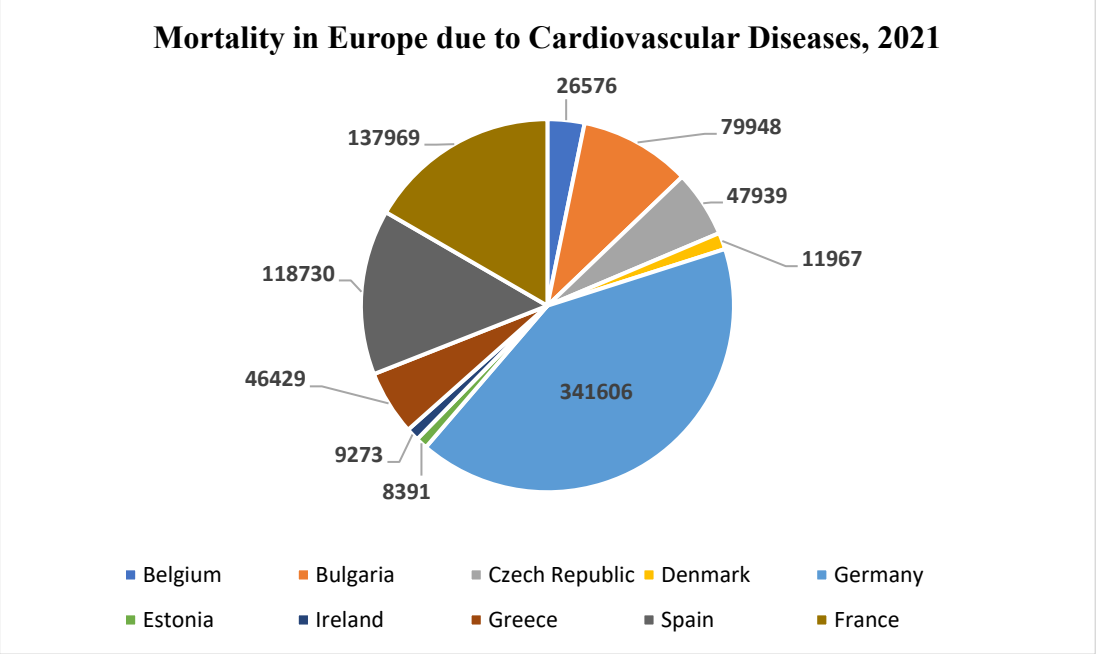
Global Mortality from Cardiovascular Diseases

[9]Cardiovascular diseases (CVDs) account for nearly one in three deaths worldwide, estimated at approximately 20 million deaths in 2021—an average of 55,000 people per day, or one death every 1.5 seconds. They remain the leading cause of death globally.

In 2021, an estimated 10.5 million men and 9.6 million women died from CVDs worldwide. The global number of deaths from heart and circulatory diseases is expected to rise further in the coming years.

Age-standardized mortality rates from CVDs have decreased globally, primarily due to improvements in life expectancy. However, these trends have resulted in a larger number of individuals surviving to ages at which the development of, or death from, cardiovascular diseases is more likely.

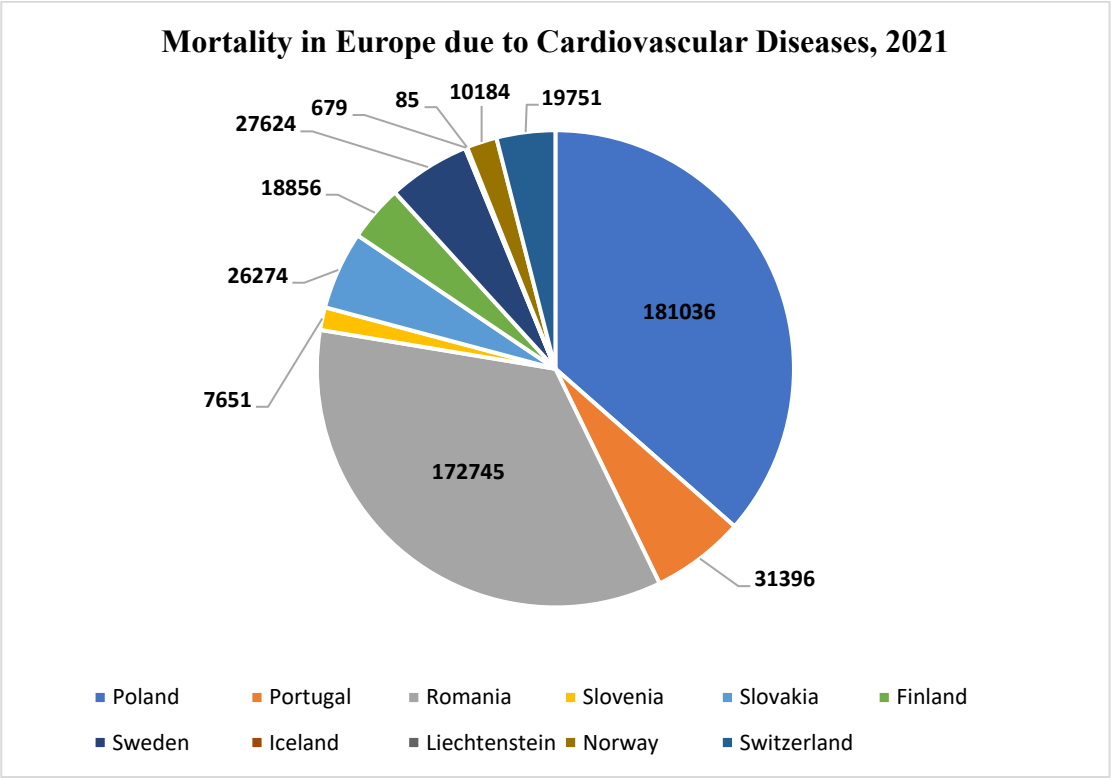
CVDs continue to be the leading cause of death worldwide. In every recent year, except during the COVID-19 pandemic years of 2020 and 2021, coronary heart disease was the leading global cause of death, followed by stroke as the second leading cause.[8]



Graph 2. Mortality in Europe due to cardiovascular diseases, 2021.

Table 2. Mortality in Europe due to cardiovascular diseases, 2021.

Belgium	26576
Bulgaria	79948
Czech Republic	47939
Denmark	11967
Germany	341606
Estonia	8391
Ireland	9273
Greece	46429
Spain	118730
France	137969



Graph 3. Mortality in Europe due to cardiovascular diseases, 2021.

Table 3. Mortality in Europe due to cardiovascular diseases, 2021.

Poland	181036
Portugal	31396
Romania	172745
Slovenia	7651
Slovakia	26274
Finland	18856
Sweden	27624
Iceland	679
Liechtenstein	85
Norway	10184
Switzerland	19751

Conclusions

In conclusion, this study provides a comprehensive and multidimensional overview of nursing care for patients with coronary artery disease (CAD), encompassing key anatomical, physiological, clinical, therapeutic, and ethical aspects.

Coronary artery diseases represent one of the major health challenges, not only globally but also within our societal and healthcare context. Throughout this work, the main risk factors, clinical manifestations, diagnostic methods, and commonly used treatments were analyzed, while emphasizing the vital role of nursing care at every stage of the disease.

Nurses are not merely assistants to physicians; they are pivotal figures in clinical support, health education, and long-term patient care. They remain at the patient's side during critical moments, monitoring vital signs, managing pain, preventing complications, and providing psychological support, which is often as essential as medical treatment.

Another key aspect highlighted by this study is the role of health education. Lifestyle modification, smoking cessation, healthy nutrition, and physical activity depend largely on patient and family awareness. Here, the nurse acts as an educator, directly influencing the patient's quality of life and reducing the risk of disease recurrence.

Furthermore, statistical data clearly indicate that the number of patients with cardiovascular problems is increasing annually. This underscores the need for our healthcare system to focus not only on acute treatment but also on prevention and rehabilitation. Nurses play an irreplaceable role in this process, being closest to patients and guiding them step by step toward better health.

This study demonstrates that nursing care in coronary artery disease is not merely a professional duty but a humanitarian mission, integrating knowledge, responsibility, and empathy. Through their dedication, nurses not only help patients cope with a challenging health condition but also make a tangible contribution to saving lives and improving their quality of life.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Surgical Management Of Cervical Cancer And The Role Of Nursing Care

VIOLETA ZANAJ[1], JOANA BREGASI[2]

Abstract: Cervical cancer is a significant public health issue affecting women worldwide, particularly in low- and middle-income countries. The cervix, located at the lower part of the uterus, plays a critical role in reproductive health but can be vulnerable to malignant changes, most commonly due to persistent infection with high-risk human papillomavirus (HPV). This article explores the anatomy and function of the cervix, the pathophysiology of cervical cancer, and the surgical interventions used in its treatment, such as hysterectomy and lymphadenectomy. It also examines the essential role of nursing care during the perioperative and postoperative periods, focusing on patient monitoring, education, and emotional support to ensure optimal recovery and quality of life.

Keywords: Cervical cancer, cervix, HPV, hysterectomy, surgery, nursing care, diagnosis, prevention, oncology, postoperative care, patient education

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Purpose

The purpose of this study is to provide a comprehensive overview of cervical cancer, including its anatomical and pathological basis, the surgical treatment options available, and the essential role of nursing in the care of affected patients. By examining the key risk factors, diagnostic processes, and surgical techniques, the study aims to highlight the importance of early intervention and the contribution of nursing professionals in both physical and psychosocial aspects of patient recovery.

Materials and Methods

This study is based on a literature review of the anatomy, pathology, and treatment of cervical cancer, with a specific focus on surgical intervention and nursing care.

• **Data on Cervical Cancer**: This section reviews epidemiological data, risk factors (such as HPV infection, smoking, and immunosuppression), early symptoms, and stages of cervical cancer.

• **Diagnostic Methods and Evaluation**: Diagnostic approaches such as Pap smear, HPV DNA testing, colposcopy, and biopsy were examined to understand their role in early detection and staging.

• **Surgical Treatment and Postoperative Care**: An analysis of current surgical treatments including total hysterectomy, radical hysterectomy, and pelvic lymph node dissection was conducted, along with guidelines for postoperative care and complication prevention.

• **Health Education and Prevention**: This part is based on cancer prevention strategies such as HPV vaccination, routine cervical screening, and public awareness programs.

• **Objective**: To deepen understanding of cervical cancer surgery and to evaluate the nurse's role in supporting patients undergoing these procedures, especially in relation to education, monitoring, and psychological support.

Anatomy and Physiology of the Female Internal Genital Organs
The internal female reproductive organs include the ovaries, uterine (Fallopian) tubes, uterus, cervix, and vagina. Together, they play a vital role in the reproductive cycle — from ovulation and fertilization to pregnancy and childbirth.

The ovaries are a pair of almond-shaped glands located in the pelvic cavity, one on each side of the uterus. Each ovary measures about 4 cm long and weighs around 6–8 grams. They serve a dual function: producing hormones like estrogen and progesterone and generating egg cells through a process known as oogenesis. The outer part of the ovary (the cortex) contains follicles at different stages of development, while the central part (the medulla) houses blood vessels and connective tissue.

The uterine tubes are slender, flexible structures about 10 to 15 cm in length, connecting the ovaries to the uterus. Each tube has four sections — the uterine part, isthmus, ampulla, and infundibulum with its fimbriae. These tubes are

responsible for capturing the released egg, providing a site for fertilization, and transporting the fertilized egg to the uterus.

The uterus is a muscular, hollow organ shaped like an inverted pear. It's located between the bladder and rectum and sits just above the vagina. In women who haven't given birth, the uterus typically measures 5 cm in length and weighs around 30–40 grams. It consists of three main parts: the body, the isthmus, and the cervix. Its wall is made up of three layers: the outer perimetrium, the thick muscular myometrium, and the inner mucosal endometrium — which thickens and sheds during the menstrual cycle.

The cervix is the lower, narrow end of the uterus, measuring about 2–3 cm. It connects the uterine cavity to the vagina and contains glands that produce mucus. The consistency of this mucus changes throughout the menstrual cycle to either hinder or facilitate the movement of sperm. The cervical opening (external os) is round in women who haven't given birth and slit-like in those who have.

Finally, the vagina is a muscular, elastic canal about 8–10 cm long that extends from the cervix to the external opening. It serves multiple functions: it's the passageway for menstrual flow, the organ for sexual intercourse, and the birth canal. In girls and women who have not yet had sexual intercourse, the vaginal opening may be partially covered by the hymen.[9]

What is Cervical Cancer?

Cervical cancer is a type of cancer that originates in the cervix — the lower part of the uterus that connects to the vagina. It develops when abnormal cells in the cervix begin to grow uncontrollably and can eventually invade surrounding tissues or spread to other parts of the body. The progression from the appearance of precancerous cells to invasive cervical cancer can take 10 to 20 years, which provides a valuable window for early detection and effective treatment.

Like other cancers, cervical cancer begins with a mutation in normal cells. Instead of following the natural cycle of growth, division, and cell death, these mutated cells multiply without regulation, forming a tumor. Over time, the tumor can invade nearby structures and metastasize to distant organs.

Cervical cancer is most commonly diagnosed in women under the age of 45, but any woman with a cervix is at risk. It often begins with pre-cancerous changes in the cervical tissue. If left undetected and untreated, these changes can evolve into full-blown cancer. The primary cause of these changes is persistent infection with **human papillomavirus (HPV)**, a sexually transmitted virus. Because of this, regular cervical screening through **Pap tests** is strongly recommended, as it helps identify abnormal cells before they become cancerous.

Cervical cancer is the **second most common cancer among women after breast cancer**, but it carries a **higher mortality rate**. In Europe alone, around 60,000 women are diagnosed with cervical cancer each year, and nearly half of them die from the disease. One of the main reasons for this high death rate is late detection, often due to a lack of awareness or access to preventive care. Many women discover the disease only after it has advanced, making treatment more challenging and less effective.

The positive side is that **invasive cervical cancer is largely preventable**. It typically develops slowly and passes through a lengthy precancerous stage. One of its most important characteristics is that **its primary cause is known**: infection with high-risk types of HPV. While there are over 100 known HPV strains, only a few are linked to cervical cancer. The virus can remain dormant in the body for years without causing symptoms, which is why routine screening and **HPV vaccination** are essential components of prevention. [10]

Early Warning Signs of Cervical Cancer

Cervical cancer is often referred to as a **"silent cancer"** due to its lack of obvious early symptoms. However, routine screening — especially the **Pap test** — allows for the early detection of precancerous and cancerous changes, offering a chance for prevention, treatment, and even cure if caught early.

Early Symptoms

Irregular Vaginal Bleeding

- After sexual intercourse
- Between menstrual periods
- After menopause

Unusual Vaginal Discharge

- Dark-colored, foul-smelling, or blood-streaked

Pain During Sexual Intercourse (Dyspareunia)

- May indicate tissue changes in the cervix

Pelvic or Lower Abdominal Pain

- Especially if persistent and without a clear cause

Menstrual Cycle Changes

- Longer, heavier, or more painful periods than usual[11]

Cervical Cancer: Common Symptoms

Once abnormal cervical cells form a tumor and spread to nearby tissue, a range of symptoms may develop. While these can vary depending on cancer stage and extent, any of the following signs should prompt immediate medical evaluation.

Visual and Physical Signs

Vaginal bleeding:

- After intercourse
- Between periods
- After pelvic exams or menopause

Heavier or prolonged menstruation

Unusual vaginal discharge:

- Thick, watery, or blood-stained
- May have a foul odor

On pelvic exam, the cervix may appear:

- Raised, ulcerated, discolored (red/white), or easily bleeding
- Advanced tumors may block the cervical canal or invade surrounding tissue

How Cervical Cancer May Feel

Normally, the cervix is smooth and firm. A warning sign: a lumpy or hardened cervix.

Though most lumps (e.g., cysts, polyps) are benign, only a health professional can determine the cause

Abdominal Bloating

- In later stages, cancer spreading to the liver may lead to **abdominal swelling** due to **ascites**

Lower Back and Pelvic Pain

- Early signs: mild pelvic pressure or lower back pain
- As the cancer advances, pain may worsen, especially during urination or intercourse

Leg Pain or Swelling

- Large tumors may compress pelvic nerves, causing **persistent leg pain or swelling**
- Though these symptoms can have other causes, they warrant investigation if persistent

Foul-Smelling Vaginal Discharge

- Strong, persistent odor may indicate **tissue breakdown or infection** within the tumor
- Discharge may contain necrotic material and resemble the smell of decaying tissue[12]

Risk Factors for Cervical Cancer

Cervical cancer is influenced by multiple risk factors — both behavioral and biological. Understanding these is crucial for prevention and early intervention.

Smoking

- Tobacco contains carcinogens that damage cervical cells.
- Smokers with HPV are more likely to develop persistent infections.
- Smoking weakens immune response, facilitating HPV progression.

Multiple or Changing Sexual Partners

- A higher number of sexual partners increases HPV exposure risk.
- Partners with multiple previous partners raise infection likelihood.

Early Sexual Activity

- Early onset of sexual activity increases vulnerability to HPV.
- The immature cervix is more susceptible to persistent infection.

Other Sexually Transmitted Infections (STIs)

- Infections like **herpes, chlamydia, gonorrhea, syphilis, and HIV/AIDS** can promote HPV persistence and cervical cell changes.
- HIV, in particular, weakens immune surveillance against HPV.

Weakened Immune System

- Immunocompromised individuals (e.g., HIV-positive patients) have a higher risk of chronic HPV infection and malignant transformation.

Exposure to Diethylstilbestrol (DES)

- In utero exposure to **DES** (used in the 1950s to prevent miscarriage) has been linked to **clear cell adenocarcinoma** of the cervix in adulthood.[13]

Diagnosis of Cervical Cancer

Cervical cancer is one of the most preventable malignancies when detected early through regular screening. Early diagnosis significantly improves survival and treatment outcomes. The main diagnostic methods include:

Pelvic Examination

- A routine gynecological procedure to assess the cervix's condition.
- The physician manually examines the cervix and pelvic organs for abnormalities.
- Non-invasive and typically painless; patients have the right to request a female physician or discontinue the exam at any time if uncomfortable.

Pap Smear (Papanicolaou Test)

- The primary screening tool for detecting precancerous and cancerous cervical cells.
- Cells are collected from the cervix (especially the transformation zone) and analyzed cytologically.
- Recommended every 1–3 years for women aged 21–65.
- Patients should avoid sexual activity, vaginal products, and menstruation before testing.

Colposcopy

- Performed after abnormal Pap results.
- Involves magnifying the cervix using a colposcope to detect tissue changes.
- Application of acetic acid or iodine helps highlight abnormal areas.
- Allows for detailed visualization of lesions not visible with the naked eye.

Cervical Biopsy

- Often performed during colposcopy when abnormalities are detected.
- A small sample of cervical tissue is taken and examined histologically.
- Confirms the presence of precancerous or cancerous cells.
- Considered the gold standard for definitive diagnosis.[14]

Stages of Cervical Cancer

Cervical cancer is classified into stages based on tumor size, depth of invasion, and spread to nearby or distant tissues. The staging follows the FIGO classification system:

Stage 0 – Carcinoma in situ

- Pre-cancerous stage; abnormal cells are present but limited to the surface of the cervix.
- Not officially included in the FIGO staging.

Stage I – Confined to the cervix

- Cancer is limited to the cervix, with no spread beyond it.
- **Stage IA (Microinvasive cancer)**

i. Detected only under a microscope.

ii. **IA1:** Invasion <3mm deep and <7mm wide.

iii. **IA2:** Invasion 3–5mm deep and <7mm wide.

- **Stage IB (Visible or larger lesions)**

i. Cancer is clinically visible or deeper than IA.

ii. **IB1:** Lesion ≤4 cm.

iii. **IB2:** Lesion >4 cm.

Stage II – Beyond cervix but not to pelvic wall or lower vagina

- Tumor invades the upper vagina or uterus.
- **Stage IIA:** No parametrial invasion.

i. **IIA1:** Tumor ≤4 cm.

ii. **IIA2:** Tumor >4 cm.

- **Stage IIB:** Invasion into parametrial tissue (tissue beside the cervix).

Stage III – Spread to pelvic wall, lower vagina, or causes kidney issues

i. Cancer affects pelvic structures or causes hydronephrosis.

ii. **Stage IIIA:** Tumor involves lower third of the vagina.

iii. **Stage IIIB:** Invasion into pelvic wall or causes kidney dysfunction due to ureter obstruction.

Stage IV – Distant spread

i. Cancer has metastasized beyond the pelvic region.

ii. **Stage IVA:** Invasion into nearby organs (bladder or rectum).

iii. **Stage IVB:** Distant metastasis to organs such as liver, lungs, bones, or brain.[15]

Types of Cervical Cancer

Cervical cancer is primarily classified into two main types, based on the cell origin:

Squamous Cell Carcinoma (SCC)

- Accounts for **70–80%** of all cervical cancer cases.
- Arises from the **squamous epithelial cells** covering the ectocervix.
- Most common form of **invasive cervical cancer**.

Histological subtypes include:

- **Keratinizing large-cell SCC:** Shows keratin pearl formation.

- **Non-keratinizing large-cell SCC:** Minimal keratinization, lacks pearl formation.
- **Small-cell SCC:** Poorly differentiated; may overlap with **neuroendocrine tumors**.

Less common variants:

- **Verrucous carcinoma:** Wart-like, rarely metastasizes, but may locally invade.
- **Papillary SCC:** Resembles transitional cell carcinoma; rare and aggressive.

Prognosis:
Keratinizing subtypes generally have a **better prognosis** than small-cell variants.

Adenocarcinoma

- Represents **~20%** of cervical cancers.
- Originates from the **glandular (mucus-secreting) cells** of the endocervix.

Key points:

- Often associated with **adenocarcinoma in situ (AIS)**.
- Can coexist with **squamous lesions** in up to 50% of cases.
- Diagnosis often aided by **colposcopy**.

Histological subtypes:

- **Endocervical type** (most common)
- **Endometrioid**, **intestinal**, **clear cell**, or **mixed types**

Note:
Adenocarcinoma can be more difficult to diagnose and treat due to its histologic diversity.[16]

Surgical Interventions in Cervical Cancer
Surgery involves removing the tumor along with some surrounding healthy tissue and is often the primary treatment for early-stage cervical cancer. The choice of surgery depends on tumor size, stage, potential complications, and the patient's fertility desires.

Common surgical options include:

Radical Trachelectomy:
Removes the cervix and upper vagina but preserves the uterus, allowing fertility preservation. Can be done vaginally, abdominally, or laparoscopically. Lymph nodes may also be removed. Pregnancy is possible post-surgery but with higher miscarriage risk.

Conization:
Removes a cone-shaped section of cervical tissue, used to diagnose and treat precancerous lesions or very early cancers. Techniques include cold knife biopsy, laser conization, or LEEP (Loop Electrosurgical Excision Procedure).

Simple Hysterectomy:
Removes the uterus and cervix without surrounding tissues. Used for severe precancerous lesions or early cervical cancer. Can be performed abdominally, vaginally, laparoscopically, or robotically.

Radical Hysterectomy:
Removes the uterus, cervix, upper vagina, and surrounding tissues (parametrium and uterosacral ligaments). Done abdominally or laparoscopically. Possible side effects include infertility, bleeding, infection, and urinary or bowel issues.

Pelvic Exenteration:

Reserved for recurrent cancer, this extensive surgery removes the uterus, vagina, bladder, rectum, and part of the colon. Urinary and fecal diversion may be required, often via surgically created stomas. Vaginal reconstruction may also be performed.

Lymph Node Sampling and Dissection:
Removal of pelvic and para-aortic lymph nodes during surgery to assess cancer spread and guide further treatment.

Radiotherapy in Cervical Cancer
Radiotherapy can be used before surgery to shrink tumors, after surgery to reduce recurrence risk, or as primary treatment. It is often combined with chemotherapy for better outcomes.

- **External Beam Radiotherapy (EBRT):**

High-energy rays target the tumor from outside the body to destroy cancer cells.

- **Brachytherapy (Internal Radiotherapy):**

Radioactive implants placed directly into the cervix deliver high radiation doses locally.

Side effects of radiotherapy include:
- Fatigue, emotional changes, skin irritation (external effects)

- Infertility, abdominal pain, bowel obstruction, early menopause, vaginal stenosis (internal effects)

Nursing care involves skin and mucous membrane monitoring, symptom management, and radiation safety precautions, especially during brachytherapy.

Chemotherapy
Chemotherapy uses drugs such as cisplatin, carboplatin, and ifosfamide to kill cancer cells intravenously over several months. It can be used alone or combined with radiotherapy, especially in advanced stages.

Common side effects:
Infection risk, hair loss, fatigue, diarrhea, loss of appetite, nausea/vomiting

Rare side effects:

- Kidney damage, hearing loss, anemia, cognitive issues

Nursing roles include monitoring fluid/electrolyte balance, infection risk, chemotherapy administration, and caregiver protection.

Immunotherapy
Also known as biological therapy, it enhances the body's immune response against cancer. Pembrolizumab is used for recurrent or metastatic cervical cancer.

1.1. Side effects may include:

Skin reactions, diarrhea, weight changes, flu-like symptoms.
Palliative Care in Cervical Cancer
Palliative care addresses physical, emotional, social, and financial challenges related to advanced cancer. It provides active support aimed at improving quality of life for patients and their families.

- Should be offered to all patients regardless of cancer type, stage, age, or gender.

- May include medications, nutritional support, relaxation techniques, emotional support, and other therapies.[17]

Pre-Operative Nursing Care

Pre-operative nursing begins when the patient is admitted to the ward. The nurse ensures all required lab tests and imaging—such as cardiology consult with EKG, pulmonology consult with lung ultrasound, blood biochemistry, blood typing, and anesthesiology consult—are completed before surgery.

A thorough patient assessment, including medical history and comorbidities, is essential. Clear and professional communication with the patient and family helps manage expectations and address concerns.

Vital signs are closely monitored and recorded until the patient is transferred to the operating room. All medications, including daily treatments, must be documented.

IV access is established to administer pre- and post-operative therapies as ordered. Patients are advised to fast after midnight and avoid fluids about two hours before surgery.

Finally, patients are prepared with appropriate hospital attire and escorted to the OR.

Post-Operative Nursing Care
Post-operative care starts when the patient returns from recovery to the surgical ward. The nurse ensures the patient is comfortable and assists with transferring to the bed. Pain management is critical, using epidural or IV analgesics, with regular pain assessments in the initial hours post-surgery.

Vital signs are continuously monitored and recorded. The nurse supports early mobilization to prevent complications such as muscle stiffness and impaired breathing, gradually encouraging independent activity.

Urinary catheter care is important; the nurse monitors output, color, and odor, keeps the catheter clean, and instructs the patient on its management if needed.

Wound care involves careful cleaning and dressing changes while watching for signs of infection. The nurse also coordinates required lab tests and imaging as per physician orders.

Emotional support plays a key role, especially for younger patients undergoing procedures like hysterectomy, as these surgeries can have profound psychological effects.

Hospital stay length varies by surgery type: 2-3 days after radical trachelectomy, 5-7 days after radical hysterectomy, and 14-21 days following pelvic exenteration.

Before discharge, the nurse completes documentation and educates the patient on post-op care, medications, activity restrictions, diet, and avoidance of alcohol and tobacco during recovery.

Rehabilitation may take 4-6 weeks, during which patients are encouraged to follow nursing guidance for physical and emotional well-being.[18]

Nursing Diagnoses for Patients with Cervical Cancer

Patients with cervical cancer face a range of physical, emotional, and spiritual challenges related to the disease and its treatments such as radiotherapy and chemotherapy. Common side effects include nausea, vomiting, pain, diarrhea, fatigue, and neutropenia. Key nursing diagnoses include:

- **Acute Pain** related to tumor growth or metastasis, requiring prompt pain management.
- **Impaired Urinary Elimination** due to surgery and catheter use, necessitating close monitoring.
- **Anxiety and Fear** stemming from misinformation and uncertainty about life after treatment, calling for emotional support.
- **Spiritual and Emotional Distress** especially in women post-hysterectomy due to loss of fertility, needing sensitive, ongoing support.
- **Risk for Infection** linked to surgical wounds or cervical changes, requiring vigilant preventive care.
- **Risk for Impaired Skin Integrity** from surgical wounds, emphasizing wound care to prevent infection and promote healing.

- **Risk for Deficient Fluid Volume** due to decreased intake or losses, necessitating careful fluid balance monitoring.

- **Altered Sexual Function** caused by disease and treatment side effects, an important concern needing compassionate intervention.

Each diagnosis should be personalized based on the patient's physical and psychological state, aiming to improve quality of life and support recovery.[19]

Statistics/Reports on Incidence and Mortality Rates in Albania

According to the monitoring report data from the Ministry of Health for the period January–August 2023, the number of women screened for cervical cancer decreased by 32% compared to the same period last year. The actual number of screenings from January to August 2023 was 7,029, compared to a total of 10,400 women screened in 2022. The sharpest decline in screenings was recorded in 2020 during the Covid-19 pandemic due to restrictions and fear of infection. The downward trend in screenings during the pandemic was a global phenomenon.

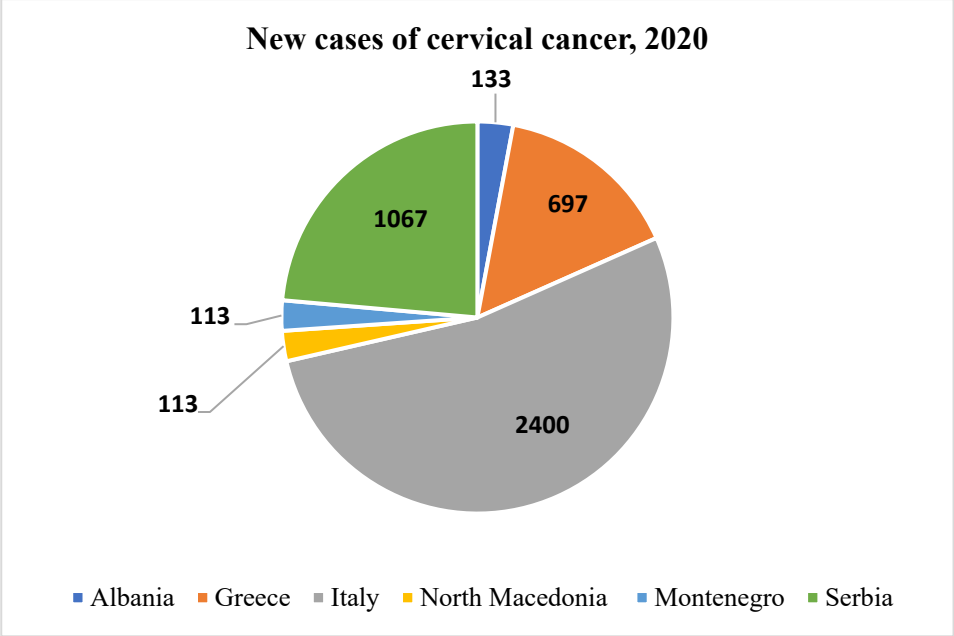

Chart 1. Comparative chart of new cervical cancer cases between Albania and neighboring countries for the year 2020.

In the chart presented above, a comparison is made between the number of newly reported cervical cancer cases in Albania and neighboring countries for the year 2020. The data shows:

- **Albania** – 133 new cases
- **Greece** – 697 new cases
- **Italy** – 2,400 new cases
- **North Macedonia** – 113 new cases
- **Montenegro** – 113 new cases
- **Serbia** – 1,067 new cases

In the chart below, we have a comparison of the number of deaths caused by cervical cancer in Albania and neighboring countries for the year 2020:

- **Albania** – 74 deaths

- **Greece** – 282 deaths
- **Italy** – 746 deaths
- **North Macedonia** – 62 deaths
- **Montenegro** – 54 deaths
- **Serbia** – 634 deaths

Albania has a population of approximately **1.2 million women aged 15 and above**, who are considered at risk of developing cervical cancer. Current estimates show that each year, around **140 women are diagnosed** with cervical cancer, and about **74 die** from the disease.

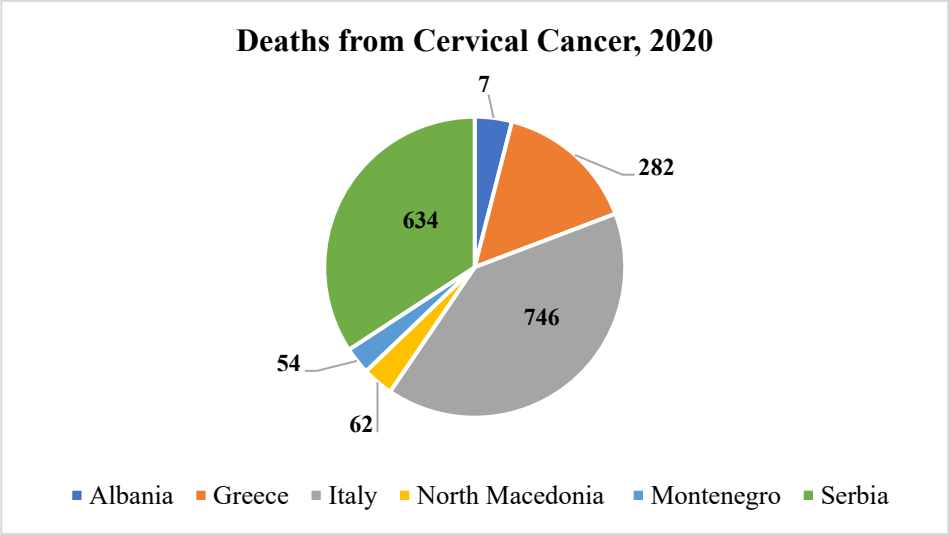

Chart 2. Comparative chart of cervical cancer-related deaths between Albania and neighboring countries, for the year 2020.

Cervical cancer ranks as the 5th most common cancer among women in Albania, and the 2nd most common cancer among women aged 15 to 44. Currently, there is no available data on the burden of HPV (Human Papilloma Virus) in the general population of Albania. However, in Southern Europe—the region Albania belongs to—approximately 3.8% of women in the general population are estimated to have a cervical HPV-16/18 infection at any given time. Furthermore, 68% of invasive cervical cancer cases are attributed to HPV types 16 or 18.[20]

CONCLUSIONS

Cervical cancer continues to pose a serious health challenge for women worldwide, affecting not only physical health but also emotional and reproductive well-being. While early diagnosis and treatment have improved, the disease remains prevalent, especially in regions with limited screening and healthcare access. This emphasizes the importance of comprehensive strategies that prioritize both prevention and treatment.

Surgical intervention remains a key treatment, particularly in early-stage cases. Tailored approaches—from conservative procedures like conization to radical surgeries such as hysterectomy or pelvic exenteration—should consider disease stage, fertility goals, comorbidities, and the patient's psychological state. Postoperative care presents ongoing challenges that require skilled nursing management.

Nurses play a central role throughout the treatment continuum—assessing, preparing, supporting, and educating patients. Beyond clinical duties, they are essential in promoting awareness, encouraging HPV vaccination, and guiding lifestyle changes to reduce risk.

Effective cervical cancer management must go beyond surgery and medication. It requires an integrated, patient-centered model combining medical expertise, evidence-based care, and compassionate support to improve both survival and quality of life.

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Ethics Committee Approval

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Conflict of Interest

The authors have no conflicts of interest to declare.

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Selective mutism in the school environment: are albanian teachers prepared to identify and support students with this disorder?

ORNEDA GEGA[1*]

Abstract: According to the Association for Child and Adolescent Psychiatry "Selective mutism is an emotional disorder of verbal communication. It is characterized by selective speech with certain people or in certain situations. The articulation, receptive and expressive language of those affected are generally within the normal range and at best are only slightly impaired based on developmental stages. (Castell/Schmidt, 2003) In other words, selective mutism is a childhood disorder characterized by the total absence of speech in at least one specific situation (usually in the classroom), despite the ability to speak in other situations. Since the word "mutism" comes from "mutus" (Latin) which means silent, this disorder is often viewed as unwillingness/unwillingness not to speak. Although in recent years international literature has shown a growing interest in this disorder, in teachers' knowledge and their preparation for early identification and intervention of children. In Albania, there is a lack of studies that analyze the level of knowledge of educational personnel on selective mutism and the strategies used to support affected students. Regarding the above, the research question that arises is, are pre-university education teachers equipped with knowledge regarding this disorder not only in identification for and in the implementation of intervention techniques and strategies. This study aims to explore the level of knowledge about this disorder, early identification and support for students with selective mutism. The study was conducted through a quantitative method with a structured questionnaire, addressed to teachers of different educational cycles in the Durres district. The questionnaire was managed through Google form. The results of the study were that a significant part of the teachers had limited knowledge about selective mutism and reported a lack of specific training in this field. Also, the need for structured professional development programs was identified to empower teachers in early identification, collaboration with families and specialists, as well as the implementation of effective support strategies in the school environment.

Keywords: selective mutism, teacher, knowledge, school intervention, social anxiety, inclusive education.

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LITERATURE REVIEW

Selective mutism is considered one of the anxiety disorders that appears in childhood and is characterized by a persistent inability to speak in specific social situations, despite the ability to communicate normally in other settings where the child feels safe. According to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5-TR), selective mutism is classified among anxiety disorders and is diagnosed when the absence of speech lasts for at least one month, interferes with social or academic functioning, and cannot be explained by other communication or developmental disorders (American Psychiatric Association, 2022).

For many years, selective mutism was misinterpreted as oppositional behavior or as an unwillingness to speak. However, contemporary studies have shown that, in most cases, children with selective mutism want to communicate but experience high levels of anxiety that prevent them from speaking in certain social situations. Muris and Ollendick (2021) argue that selective mutism should primarily be understood as a manifestation of social anxiety, as many children diagnosed with this disorder display a marked fear of negative evaluation, shyness, and insecurity in social interactions.

International literature has highlighted that selective mutism has significant consequences for children's academic, emotional, and social development. Children with this disorder often experience difficulties participating in classroom activities, establishing relationships with peers, and demonstrating their knowledge through verbal communication. Cunningham et al. (2004) reported that these children are at greater risk of social isolation, low self-esteem, and difficulties with school integration. Similarly, Omdal (2007) emphasizes that the school environment can be particularly challenging for children with selective mutism, as demands for verbal communication are continuous and often accompanied by high levels of anxiety.

For teachers and education professionals, early identification of behaviors related to selective mutism is essential in order to provide the necessary educational and psychological support. Observation of classroom behaviors can provide valuable qualitative and quantitative data regarding the nature and intensity of the difficulties experienced by the child (Daukantas, 2025).

Collaboration between speech and language therapists, parents, and teachers is essential for implementing strategies aimed at improving communication both at home and at school (Adams & Lloyd, 2007). Parents should possess in-depth knowledge of their child's social communication skills, which is necessary for planning detailed and personalized interventions (Baxendale et al., 2013). Teachers and teaching assistants should provide valuable information about the child's functioning in the classroom and school environment. By working together, intervention in the pragmatic aspect of communication can be adapted to the child's level, integrating directly taught skills into real-life situations (Baxendale et al., 2013).

Although international literature has produced a considerable number of studies on selective mutism, in Albania this field remains underexplored. No published studies have been identified that specifically analyze teachers' level of knowledge about selective mutism, their readiness to identify this disorder, or the strategies they use to support affected students. This lack of scientific evidence creates an important gap in Albanian literature, particularly at a time when inclusive education policies emphasize the need for early identification and support for children with special educational needs (Ministry of Education and Sports, 2021).

In this context, the current study aims to contribute to filling this gap by exploring the knowledge, experiences, and training needs of pre-university education teachers regarding selective mutism. Understanding teachers' current level of preparation represents an important step toward the development of effective training programs and the improvement of support practices in Albanian schools.

METHODOLOGY

This study employed a quantitative research approach to explore the level of knowledge of pre-university education teachers regarding selective mutism, as well as their perceptions related to the identification and support of students affected by this disorder.

Study Aim

The aim of this study was to explore the level of knowledge, perceptions, professional experiences, and training needs of teachers and educators regarding selective mutism, as well as to identify their readiness to recognize and support students presenting with this disorder in the school environment.

Study Objectives

The following objectives were established to achieve the aim of the study:

1. To assess teachers' and educators' level of knowledge regarding selective mutism.
2. To identify their perceptions concerning the causes and characteristics of selective mutism.
3. To explore participants' professional experiences in identifying suspected cases of selective mutism.
4. To assess teachers' level of confidence and preparedness in supporting students with selective mutism.
5. To analyze perceptions regarding the readiness of Albanian schools to provide support for these students.
6. To identify teachers' training needs and the topics they consider most important for professional development.

Research Questions

The study sought to answer the following research questions:

1. How much knowledge do teachers and educators have about selective mutism?
2. Are they able to identify the main characteristics of selective mutism?
3. How confident do they feel in identifying students with selective mutism?
4. How prepared do they feel to support these students in the school environment?
5. Which strategies are considered most appropriate for supporting students with selective mutism?
6. How do participants evaluate the readiness of Albanian schools to support these students?
7. Is there a need for professional training on selective mutism?

Research Hypothesis

*Teachers and educators have limited knowledge of selective mutism and demonstrate a need for professional training in this area***.**

Participants

A total of 180 teachers and educators voluntarily completed the online questionnaire. Participants represented education professionals working with children of different age groups and who may potentially encounter students with selective mutism during their professional practice.

Research Instrument

Data were collected using a researcher-designed questionnaire administered through Google Forms. The questionnaire consisted of 20 questions organized into four main sections:

Section I – Demographic Information

This section collected basic information about participants, including age, gender, educational level, and professional experience.

Section II – Knowledge of Selective Mutism

This section assessed participants' knowledge of selective mutism, its definition, key characteristics, association with social anxiety, and its impact on students' academic and social functioning.

Section III – Professional Experience

This section explored participants' experiences in identifying suspected cases of selective mutism, their confidence in identifying such cases, and their perceptions regarding their readiness to provide support.

Section IV – Intervention Strategies and Training Needs

This section aimed to identify strategies participants considered appropriate for supporting students with selective mutism, their perceptions regarding the preparedness of Albanian schools, and their professional training needs.

Data Collection Procedure

The questionnaire was distributed electronically through Google Forms. Participants were informed about the purpose of the study and were assured of the anonymity and confidentiality of their responses. Participation was voluntary, and no identifying information was required.\

Significance of the Study

Selective mutism is a relatively rare disorder but one that has a significant impact on children's academic, emotional, and social development. Due to the lack of Albanian studies in this field, this research contributes to identifying the level of knowledge and needs of educational staff, providing valuable information for the development of training programs and supportive policies within educational institutions.

Limitations of the Study

The study presents several limitations that should be considered when interpreting the findings:

- Data were collected through self-report measures, which may affect the accuracy of responses.
- The study is primarily descriptive and does not aim to establish causal relationships.

Po, sigurisht. Ja përkthimi akademik në anglisht i pjesës së parë (**Data Analysis – Section I and Section II**):

- **Data Analysis**

Section I: Demographic Characteristics of the Participants

A total of 180 teachers participated in the study. Of these, 86% were female and 14% were male. This result reflects the composition of educational staff in many preschool and pre-university institutions, where the presence of women has traditionally been higher.

Regarding age, participants represented different age groups, ensuring a diversity of professional experiences. The most represented group was teachers over 50 years old (38.9%), followed by those aged 41–50 years (33.3%) and 31–40 years (22.2%), while participants aged 22–30 years accounted for only 5.6% of the sample. These data indicate that the majority of participants belong to age groups with considerable professional experience in education.

Concerning the educational level at which they work, half of the participants (50%) were employed in primary education, while 22.2% worked in preschool education and another 22.2% in lower secondary education. Only 5.6% of participants were employed in upper secondary education. This indicates that the sample was dominated by teachers working with younger children, an age group in which the early identification of selective mutism is particularly important.

With regard to professional experience, more than half of the participants (55.6%) had over 20 years of teaching experience, while 33.3% had between 11 and 20 years of experience. Only 11.1% of participants had less than 10 years of professional experience. This suggests that the sample consisted primarily of highly experienced teachers, which adds weight and credibility to their perceptions regarding the knowledge, identification, and support of students with selective mutism.

Overall, the demographic characteristics of the sample indicate that the study was conducted primarily with experienced female teachers working mainly in preschool, primary, and lower secondary education. These professionals represent the group most directly involved with children during the early stages of development and education.

Section II: Knowledge of Selective Mutism

“Have you ever heard of selective mutism before?”

- Yes: 55.6%
- No: 44.4%

The results indicate that slightly more than half of the respondents had previously heard of selective mutism. However, the relatively high percentage of participants who had never heard of the disorder (44.4%) suggests that knowledge of selective mutism remains limited. This finding highlights the need for increased awareness and professional training for teachers and educators, given that early identification of selective mutism is crucial for effective intervention.

“How would you rate your level of knowledge about selective mutism?”

- Very low: 22.2%
- Low: 22.2%
- Moderate: 11.1%
- Good: 44.4%
- Very good: 0%

Although 55.6% of participants reported having heard of selective mutism, only 44.4% rated their knowledge as good. Additionally, 44.4% reported having low or very low levels of knowledge, while no participant rated their knowledge as very good.

These findings suggest that familiarity with the term *selective mutism* does not necessarily correspond to a comprehensive understanding of its characteristics, symptoms, and intervention strategies. The absence of responses in the “very good” category indicates a need for further professional development and training in this area.

“Selective mutism is:”

The results indicate that:

- 61.1% correctly identified selective mutism as an anxiety-related communication disorder.
- 5.6% incorrectly considered it a hearing disorder.

- 33.3% reported that they were unsure.
- No participant identified it as an intellectual disability.

The findings suggest that most participants have an accurate understanding of the nature of selective mutism. However, the fact that one-third of respondents were uncertain about its definition indicates that gaps in theoretical knowledge still exist. This highlights the need for additional information and professional training, particularly regarding the distinction between selective mutism and other developmental or communication disorders.

“Children with selective mutism usually speak normally in some situations and remain silent in others.”

The results show that:

- 33.3% strongly agreed.
- 27.8% agreed.
- 27.8% were neutral.
- 11.1% strongly disagreed.
- 0% selected the option “Disagree.”

Overall, 61.1% of participants agreed with the statement, indicating that the majority possess accurate knowledge of the core characteristic of selective mutism: a child’s ability to speak normally in certain environments (e.g., at home) while remaining silent in others (e.g., at school or in social situations).

However, the relatively high proportion of neutral responses (27.8%) and disagreement (11.1%) suggests that not all participants clearly understand the manifestations of this disorder. This may affect the early identification of cases within educational settings.

“Selective mutism is often associated with:”

The results indicate that:

- 61.1% selected the correct answer, “social anxiety.”
- 5.6% incorrectly associated it with hearing problems.
- 0% associated it with motor disorders.
- 33.3% reported that they did not know.

Most participants demonstrated accurate knowledge regarding the relationship between selective mutism and social anxiety, consistent with contemporary scientific literature. Nevertheless, the relatively high proportion of those lacking sufficient information (33.3%) suggests that a considerable number of teachers and educators require additional training on the psychological factors associated with this disorder.

“Do you think selective mutism can affect a student’s academic performance and social integration?”

The results show that:

- 61.1% believe that selective mutism affects academic achievement and social integration.
- 38.9% are uncertain.
- 0% deny such an impact.

More than half of the participants are aware of the consequences that selective mutism may have on a child’s school and social life. However, the fact that nearly 40% of respondents are uncertain indicates a lack of knowledge regarding the short- and long-term effects of this disorder.

Selective mutism can limit a student's active participation in the learning process, hinder communication with teachers and peers, and negatively affect the development of social relationships. Therefore, awareness of these consequences is essential for the early identification and support of affected students.

Section III. Professional Experience

"Have you ever had a student in your classroom whom you suspected might have had selective mutism?"

The results indicate that:

- 27.8% answered Yes.
- 27.8% answered No.
- 44.4% answered Not sure.

The high percentage of participants who were unsure whether they had encountered cases of selective mutism indicates difficulties in identifying the disorder in everyday educational practice. This may be related to limited knowledge of the specific symptoms and distinguishing characteristics of selective mutism. On the other hand, the fact that nearly one-third of respondents reported suspecting the presence of the disorder in their classrooms suggests that selective mutism may be more common in school settings than is generally perceived.

"If yes, how did you identify the situation?"

The results indicate that:

- 33.3% identified it through personal observation.
- 11.1% identified it through the psychologist/psychosocial service.
- 5.6% identified it through colleagues.
- 50% selected the option "Other."
- No participant reported that the identification came from the family.

The findings suggest that direct observation of the student's behavior is the primary mechanism for identifying possible cases of selective mutism. This result highlights the important role of teachers as the first observers of communication difficulties in the classroom. However, the high percentage of responses in the "Other" category suggests that participants may have relied on different sources of information or specific circumstances to identify cases, which would merit further qualitative analysis if the questionnaire included open-ended responses.

Furthermore, the fact that only a small number of participants identified cases through psychologists or psychosocial services may indicate the need for more structured collaboration between teachers and school specialists.

"How confident would you feel in identifying a student with selective mutism?"

The results indicate that:

- 22.2% do not feel confident at all.
- 27.8% feel slightly confident.
- 33.3% feel moderately confident.
- 16.7% feel confident.
- 0% reported feeling very confident.

The findings indicate that the level of professional self-confidence in identifying selective mutism is relatively low. Half of the participants (50%) reported feeling either not confident at all or only slightly confident in identifying a student with selective mutism, while none of them reported feeling very confident in this process.

This finding reinforces the results of previous questions, suggesting that existing theoretical knowledge is not sufficient to be translated into practical competencies for identifying cases within the school environment.

Section IV. Strategies and Interventions

"If you had a student with selective mutism, how prepared would you feel to support them?"

The results indicate that:

- 22.2% feel not prepared at all.
- 22.2% feel slightly prepared.
- 38.9% feel moderately prepared.
- 16.7% feel prepared.
- 0% feel very prepared.

Regarding support for a student with selective mutism, the results also indicate a limited level of professional preparedness. Only 16.7% of participants reported feeling prepared to support a student with this disorder, while 44.4% stated that they feel either not prepared at all or only slightly prepared. The absence of responses in the "very prepared" category suggests that participants perceive a need for more practical knowledge, intervention strategies, and professional support in order to work effectively with students who present selective mutism.

"Which of the following strategies do you consider appropriate?"

The results indicate that:

- 50% (9 participants) selected creating an emotionally safe environment.
- 16.7% (3 participants) selected collaboration with the family.
- 16.7% (3 participants) reported "I am not sure."
- 5.6% (1 participant) selected avoiding forcing the student to speak in front of the class.
- 5.6% (1 participant) selected collaboration with the school psychologist.
- 5.6% (1 participant) selected the use of alternative forms of communication.

Creating an emotionally safe environment was perceived as the most appropriate strategy by participants, indicating a good awareness of the importance of reducing anxiety among students with selective mutism. However, the low percentage of responses related to collaboration with the school psychologist or the use of alternative communication methods suggests that participants may not be fully familiar with the approaches recommended in the scientific literature. Additionally, the fact that 16.7% expressed uncertainty highlights the need for more in-depth training on effective intervention strategies.

"How important is collaboration among teachers, families, and specialists in cases of selective mutism?"

The results indicate that:

- 88.9% rated it as very important.
- 11.1% rated it as important.
- No participant selected options that minimized the importance of collaboration.

This is one of the strongest findings of the study. All participants (100%) considered collaboration among teachers, families, and specialists to be important or very important in addressing cases of selective mutism. This result demonstrates that participants recognize that effective support for students with selective mutism requires a multidisciplinary approach and coordination among the key individuals who influence the child's development and well-being.

"Do you think Albanian schools are prepared to support students with selective mutism?"

The results indicate that:

- 5.6% believe Albanian schools are prepared.
- 44.4% believe they are partially prepared.

- 27.8% believe they are not prepared.
- 22.2% are unsure.

The findings reveal a generally critical perception regarding the readiness of Albanian schools to support students with selective mutism. Only one participant believed that schools are fully prepared, whereas the majority considered them only partially prepared or unprepared. This suggests that participants perceive shortcomings in professional knowledge, support resources, specialized training, and collaboration between school structures and specialists. The result is consistent with findings from previous questions, where participants expressed uncertainty regarding the identification and support of students with selective mutism.

"Would you like to receive specific training on selective mutism?"

The results indicate that:

- 100% answered Yes.
- 0% answered No.

This finding represents one of the most important outcomes of the study. All participants expressed interest in receiving specific training on selective mutism. This reflects not only an awareness of the importance of the topic but also a perceived need for professional development in this area. The unanimous interest in training suggests that teachers and educators consider knowledge of selective mutism to be an essential professional competency and are motivated to improve their skills in identifying and supporting students with this disorder.

"Which topics would you like to be covered in a training program?"

The results indicate that:

- 38.9% selected the option "All of the above."
- 22.2% would like training on early identification.
- 22.2% would like training on classroom intervention strategies.
- 16.7% would like more information about the characteristics of selective mutism.

No participants selected topics exclusively related to collaboration with families, specialists, or practical case studies, which may be explained by their preference for a more comprehensive training program. The results suggest that participants are seeking a complete and integrated approach to training on selective mutism. The fact that the most frequently selected option was "All of the above" indicates that teachers and educators are not only seeking theoretical knowledge but also practical skills related to early identification, understanding the characteristics of the disorder, and implementing intervention strategies in the classroom. This finding further reinforces the results of previous questions, in which participants expressed uncertainty regarding the identification and support of students with selective mutism, as well as a unanimous desire for professional training.

RESULTS

The study findings revealed that 55.6% of participants had previously heard of selective mutism, while 44.4% reported having no prior knowledge of the disorder. Although the majority of participants correctly identified selective mutism as an anxiety-related verbal communication disorder, a considerable proportion expressed uncertainty regarding its characteristics and manifestations.

Most teachers (61.1%) associated selective mutism with social anxiety and recognized its impact on students' academic performance and social integration. However, only a small proportion of participants reported feeling confident in identifying a student with selective mutism, while approximately half indicated that they felt little or no confidence in this process.

Regarding professional preparedness, 44.4% of participants reported feeling little or not at all prepared to support a student with selective mutism, whereas only 16.7% indicated that they felt adequately prepared. In addition, a substantial number of teachers reported uncertainty about whether they had encountered cases of selective mutism during their professional careers.

Concerning intervention strategies, creating an emotionally safe environment was identified as the most appropriate approach by participants. At the same time, all participants (100%) considered collaboration among teachers, families, and specialists to be important or very important in supporting students with selective mutism.

Another significant finding concerned participants' perceptions of the readiness of Albanian schools. Only 5.6% believed that schools are adequately prepared to support students with selective mutism, whereas the majority considered schools to be only partially prepared or not prepared at all.

Perhaps the most important finding of the study was that 100% of participants expressed a desire to receive specialized training on selective mutism. The most requested training topics included early identification of the disorder, its main characteristics, classroom intervention strategies, and collaboration with families and specialists.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

1. Organize specialized training programs for teachers and educators on selective mutism, with a particular focus on early identification and effective intervention within the school setting.

2. Develop practical guidelines and clear protocols for the identification and referral of suspected cases of selective mutism.

3. Strengthen collaboration among teachers, families, school psychologists, speech and language therapists, and other professionals working with children.

4. Incorporate topics related to selective mutism into continuing professional development programs for teachers.

5. Increase awareness within the school community regarding the nature of selective mutism in order to reduce misconceptions and promote an inclusive approach toward affected students.

6. Conduct further research with larger samples and across different regions of Albania to provide a more comprehensive understanding of educators' knowledge and professional needs regarding selective mutism.

Overall, the findings suggest that although a basic level of awareness of selective mutism exists among pre-university education teachers, there remains a substantial need for additional support and professional training to enable teachers to effectively identify and support students affected by this disorder.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Ethical Considerations In Assessing The Cost Of Dementia: A Literature-Based Reflection With A Focus On Albania

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Abstract: Dementia is increasingly recognised not only as a clinical condition, but also as a social, economic and ethical challenge. Cost-of-illness studies help estimate its burden, yet in dementia they cannot be treated as neutral accounting exercises. They require choices about what is counted, whose time is valued, how dignity is protected, and how the hidden work of family caregivers becomes visible without turning the person living with dementia into a monetary burden. This paper offers a literature-based ethical reflection on dementia cost assessment with a focus on Albania. It combines international cost-of-illness literature, the Resource Utilization in Dementia approach, research ethics, person-centred dementia ethics and the ethics of care. Particular attention is given to informal family caregiving, older spousal caregivers, gender differences and the future use of assistive and digital technologies. The Albanian context is relevant because long-term care remains strongly family-based, formal dementia services are limited and national cost evidence is still fragmented. The paper argues that ethical dementia cost assessment should make care visible while preserving human dignity, recognising the separate interests of caregivers, the double vulnerability of older caregivers and the unequal distribution of unpaid care. It also treats digital technologies as ethically conditional tools, not automatic solutions. A future Albanian cost-of-illness study should therefore combine validated resource-use measurement with culturally sensitive consent procedures, caregiver-burden indicators, gender-sensitive analysis, privacy safeguards and transparent reporting of assumptions.

Keywords: dementia, cost of illness, ethics of care, Albania, caregivers, digital care.

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1. INTRODUCTION

Dementia is one of the most demanding health and social care challenges linked to population ageing. It affects memory, thinking, behaviour and the ability to carry out everyday activities, but its consequences do not stop with the person who receives the diagnosis. They reach the family kitchen, the bedroom where a spouse wakes repeatedly during the night, the workplace where an adult child reduces hours, and the public system that must decide whether long-term care remains a private family matter or becomes a recognised social responsibility (World Health Organization [WHO], 2025).

In daily life, dementia often begins with small uncertainties: a forgotten appointment, a repeated question, a misplaced object, a moment of confusion in a familiar street. Over time, these signs may grow into a need for supervision, emotional reassurance, protection from risk, help with intimate personal care and continuous organisation of daily routines. For this reason, the burden of dementia cannot be understood only through hospital costs, medicines or specialist consultations.

Cost-of-illness studies are used to estimate the direct and indirect costs generated by a disease. In dementia, these costs may include medical care, social care, medicines, transport, home adaptation, paid help, lost income, supervision and unpaid family caregiving. Global evidence shows that dementia creates a very large economic burden and that informal care accounts for a substantial part of total costs (Alzheimer's Disease International [ADI], 2025; Wimo et al., 2023). Evidence remains much thinner in low- and middle-income settings. Malaha et al. (2023) found that relatively few studies have measured dementia costs in such countries, despite the need for data that can guide policy.

Albania gives this question particular urgency. The country is ageing, while long-term care is still developing and remains heavily dependent on families. UNDP Albania (2025) describes long-term care as a growing policy issue shaped by demographic ageing, changing family structures and the needs of older adults. Albania-specific research has also begun to make dementia more visible. Hoxha et al. (2024) screened cognitive impairment among Albanian residents aged over 50 and reported an estimated prevalence of cognitive impairment and early dementia of 14.04% using the Mini-Mental State Examination, while noting that further clinical assessment is needed for diagnostic confirmation. Recent studies on formal and informal caregivers in Albania have also shown that dementia care raises practical, emotional and ethical dilemmas, including questions of dignity, safety, autonomy, family burden and perceived injustice (Gaxhja et al., 2025; Gaxhja et al., 2026).

This paper argues that estimating the cost of dementia is not a purely technical exercise. It is also an ethical act because it decides which forms of suffering, care, dependency and sacrifice become visible to policy. If a study counts only hospitalisations and medicines, dementia may appear less burdensome than it is. If unpaid family care is excluded, the work of spouses, children and relatives remains hidden. If the research process is insensitive, it may expose private family difficulties, ignore the voice of the person living with dementia, or reduce a human life to a line of expenditure. In Albania, where dementia is still largely absorbed inside families, an ethical approach to cost assessment is essential for moving from private burden to public responsibility.

2. MATERIAL AND METHOD

This paper is based on a narrative literature review and ethical analysis. The review draws on international literature concerning dementia cost-of-illness studies, informal care valuation, the Resource Utilization in Dementia (RUD) instrument, caregiver burden, assistive technologies and ethical principles in dementia care. It also integrates recent Albania-specific evidence on cognitive impairment, formal and informal caregiving, gendered care responsibilities and long-term care policy. Recent sources were prioritised where possible because dementia care, assistive technology and long-term care policy are rapidly changing fields.

The aim is not to calculate a national monetary estimate for dementia in Albania. Based on the literature reviewed for this paper, a comprehensive national Albanian cost-of-illness study of dementia using a validated instrument such as RUD was not identified. The purpose is therefore conceptual and methodological: to identify the ethical issues that should guide future dementia cost research in Albania and to explain how international costing methods should be adapted to a low-data, family-centred care context

The analysis is organised around one theoretical ethical framework and seven applied issues. The framework clarifies the concepts used in the paper: respect for autonomy, beneficence, non-maleficence, justice, respect for persons, human dignity, relational autonomy, solidarity and the ethics of care. The applied analysis then examines what dementia cost assessment usually measures, how informal care is valued, why older caregivers and gender differences require particular attention, how consent and privacy should be protected, and how assistive and digital technologies should be assessed ethically.

3. RESULTS

3.1. Theoretical ethical framework for dementia cost assessment

The ethical basis of this paper is broader than a general appeal to compassion. Dementia cost assessment sits at the intersection of illness, dependency, family life, public resources and social inequality. A cost study can help protect dignity and inform policy, but it can also harm participants if it extracts intimate information, ignores hidden care or presents persons living with dementia mainly as economic burdens.

The first layer of the framework is biomedical ethics. The four principles commonly used in this field are respect for autonomy, beneficence, non-maleficence and justice (Beauchamp & Childress, 2019; Varkey, 2021). In dementia cost assessment, autonomy means that the person living with dementia should be involved in research decisions whenever possible, instead of being automatically replaced by the caregiver. Beneficence means that the study should have credible social value, such as improving policy knowledge, caregiver support or long-term care planning. Non-maleficence requires researchers to avoid preventable harm, including humiliating language, unnecessarily long interviews, repeated questioning that creates distress and data practices that expose private family difficulties. Justice requires attention to who carries the burden and who benefits from the knowledge produced.

The second layer is research ethics. The Belmont Report identifies respect for persons, beneficence and justice as central principles for research involving human participants (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). Applied to dementia, respect for persons requires capacity-sensitive informed consent, simplified information sheets, assent where appropriate and attention to refusal expressed through discomfort, silence or withdrawal. Beneficence requires that the benefits of the research are not merely academic. Justice requires that vulnerable households are not used only as sources of data while the resulting policies fail to return support to them.

The third layer is human dignity. Dementia may affect memory, language and independence, but it does not remove the moral value of the person. Person-centred dementia ethics, associated with Kitwood's work, insists that the person comes before the diagnosis and that care should respond to biography, relationships and remaining abilities rather than only to deficits (Kitwood, 1997). The Nuffield Council on Bioethics also stresses that the person with dementia remains the same, equally valued person throughout the illness and that autonomy and well-being should be promoted within relationships (Nuffield Council on Bioethics, 2009). For cost assessment, this means that the language of "burden" must be used with care. The burden lies in the disease, the lack of support and the organisation of care, not in the person as such.

The fourth layer is relational autonomy. In dementia, autonomy is rarely exercised alone. Decisions about diagnosis, treatment, money, safety, home care or institutional care are often made through family relationships. This does not mean that the person with dementia loses moral voice. It means that autonomy must be supported through trusted relationships, familiar communication, repetition and attention to previously expressed values. In Albania, where family decision-making is culturally important, this idea is especially relevant. A researcher should not treat the family as a substitute for the person, but as a context that can either support or silence the person's preferences.

The fifth layer is the ethics of care. This approach treats care not as a private sentiment but as a moral and social practice. Tronto's account of care emphasises attentiveness, responsibility, competence and responsiveness (Tronto, 1993). These concepts are useful for dementia cost research. Attentiveness asks whether the study notices hidden needs such as night supervision, anxiety, loneliness, washing, feeding and the management of behavioural symptoms. Responsibility asks who is expected to respond to these needs and whether the burden is fairly shared. Competence asks whether care is safe and informed, not merely available. Responsiveness asks whether the person receiving care and the caregiver are actually helped, or whether they remain alone after their situation has been measured.

The final layer is vulnerability and solidarity. Dementia creates vulnerability for the person who progressively needs support, but it may also create vulnerability for caregivers, especially older spouses, women, poor households and families in areas with limited services. The Nuffield framework links dementia ethics to solidarity, meaning that society has responsibilities toward people with dementia and those who care for them (Nuffield Council on Bioethics, 2009). In cost assessment, solidarity means that family caregiving should be made visible not in order to exploit it further, but in order to justify public support, respite care, training, home services and social protection.

3.2. Dementia cost assessment involves ethical choices

Dementia cost assessment generally distinguishes between direct medical costs, direct non-medical costs, indirect costs and informal care costs. Direct medical costs include consultations, diagnostic tests, medicines, hospitalisations and emergency care. Direct non-medical costs may include transport, paid home help, home adaptations, assistive devices and residential or day care services. Indirect costs include productivity losses, reduced working hours, early retirement and lost income due to caregiving. Informal care costs refer to unpaid care provided by family members, relatives, neighbours or friends.

These categories look technical, but each of them involves an ethical choice. A study that includes only direct medical costs gives a narrow image of dementia and may underestimate its real burden. A study that excludes supervision time may miss one of the most demanding parts of advanced dementia. A study that does not record unpaid care may make the work of families invisible. A study that treats all caregiving hours as equal may fail to distinguish between occasional help, night-time vigilance, personal hygiene, behavioural management and continuous supervision.

The RUD instrument is relevant because it was designed to collect data on resource use in dementia and has been applied in international settings (Wimo et al., 2013). Its value for Albania is that it can help document both formal service use and informal caregiving. However, it should not be used mechanically. Translation, cultural adaptation, pilot testing and ethical review would be necessary. In a country where families often provide care without formal recognition, the instrument should be sensitive enough to capture the daily texture of care, not only its minimum measurable units.

Neubauer et al. (2008) showed that measuring only the primary caregiver can underestimate total informal care time when several relatives contribute to care. This matters for Albania, where care may be shared between spouses, adult children, daughters-in-law, neighbours or relatives abroad who contribute financially. Ethically, a cost study should not simplify family care into one person if the real burden is distributed across a wider network.

3.3. Informal family care is the central ethical issue

Informal care is often the largest and least visible component of dementia costs. International estimates show that informal care represents a substantial share of total dementia costs (ADI, 2018; Wimo et al., 2023). In countries with limited formal services, its importance is even greater because families perform tasks that would otherwise require paid home care, day care or residential care. Yet the word "informal" can soften the reality. For many families, this care is not occasional or light. It is daily, intimate, emotionally demanding and often prolonged over many years.

In Albania, this issue has particular significance because care for older persons is strongly family-based. Family care may preserve emotional continuity and allow persons with dementia to remain in familiar surroundings. This is ethically valuable and should not be dismissed. Many caregivers do not experience care only as a burden; they may also experience it as loyalty, gratitude, love and responsibility. Nevertheless, when few alternatives exist, family care may become less a free choice than a practical necessity. The ethical danger is that the state and society rely on family solidarity while failing to recognise the cost of that solidarity.

Recent Albanian research confirms that caregivers experience complex ethical and practical challenges. The study by Gaxhja et al. (2026) on informal caregivers of individuals with dementia in Albania identified dilemmas linked to family burden, dignity, autonomy, safety and perceived injustice. The related study on formal caregivers found that professionals also face ethical concerns related to quality of care, resource allocation, family involvement and the need for training (Gaxhja et al., 2025). These findings suggest that dementia care in Albania is not only a medical issue, but also a question of support, fairness and institutional responsibility.

For cost assessment, the family should not be treated as an unlimited resource. A household may appear to "manage" dementia because no institutional cost is recorded, while behind that apparent absence of cost there may be lost sleep, physical fatigue, reduced employment, fear, isolation and conflict. Ethical research should therefore ask not only how many hours of care are provided, but what those hours mean for the caregiver's body, time, income, relationships and sense of self.

3.4. Older caregivers and the ethics of double vulnerability

A particularly sensitive issue in Albania is the position of older caregivers. Dementia care is often provided not only by adult children, but also by spouses who are themselves in the third age. A husband may care for a wife with dementia while managing his own health problems; a wife may supervise a husband day and night while also facing frailty, pain, loneliness or limited income. In such cases, care is produced inside old age itself.

This creates double vulnerability. The person living with dementia is vulnerable because of cognitive decline, dependency and reduced autonomy. The older caregiver is vulnerable because age, chronic illness, reduced mobility or financial insecurity may limit the capacity to provide sustained care. When both persons are older, dementia care may become a quiet struggle between two forms of fragility. The caregiver may love the person deeply and still be exhausted. He or she may refuse outside help not because help is unnecessary, but because services are unavailable, unaffordable, unfamiliar or culturally difficult to accept

International evidence on spousal caregivers also shows that caregiver health, stress, caregiving experience and social networks are closely connected, which reinforces the need to treat older caregivers as persons needing protection in their own right (Sabatini et al., 2024).

Older caregivers also create a methodological challenge for cost-of-illness studies. If opportunity cost is calculated mainly through lost employment income, the care provided by retired spouses may appear to have little or no economic value. This would be ethically wrong. A retired caregiver may not lose a salary, but may lose rest, health, social contact, personal safety, medical appointments, religious or community life and the possibility of ageing with dignity. A cost study that values only labour-market loss risks making older caregivers invisible precisely because they are outside the labour market.

The burden of older caregivers should therefore be measured with more than one indicator. Time-use data are important, but they should be accompanied by questions on sleep disruption, physical strain, emotional distress, social isolation, missed medical care, transport difficulties and fear about what will happen if the caregiver becomes ill. In dementia, supervision is often the most demanding form of care because it continues even when no physical task is being performed. An older spouse who must remain alert throughout the night is providing care even when sitting silently in the same room.

A further ethical issue is moral distress. Older caregivers may continue caring because of love, marital duty or fear that institutional care would be perceived as abandonment. At the same time, they may know that they are exhausted or no longer able to provide safe care. This conflict between what a caregiver feels morally obliged to do and what he or she is physically able to do should be recognised in research and policy. It is not a personal failure; it is a sign that family care has reached the limits of what can be asked without support.

The policy implication is clear: supporting older caregivers is not a private favour but a public necessity. If the caregiver collapses, the whole care arrangement may collapse. Respite care, home nursing, caregiver counselling, practical training, emergency support and simple telephone guidance could protect both the person living with dementia and the older caregiver. In ethical terms, dementia policy should not wait until family care fails; it should support families before exhaustion becomes crisis.

3.5. Gender differences must be made visible in dementia cost assessment

Gender differences are not a secondary issue in dementia cost assessment; in Albania they are central to the ethical validity of the analysis. When dementia care is measured only at household level, the distribution of care inside the household may disappear. This is ethically problematic because unpaid care is not shared equally between women and men, and the economic consequences of caregiving are therefore also unequally distributed.

The Albanian evidence points to a strong gender asymmetry in unpaid work and long-term care. The Gender Equality Index for Albania reports that more than 90% of women participate in unpaid care work compared with less than 50% of men; employed women devote about four hours to unpaid work, while employed men devote less than one hour (INSTAT, 2020). In long-term care, UNDP Albania reports that family caregiving remains the dominant form of support for older persons and that women constitute 67% of primary family caregivers (UNDP Albania, 2025). These data are particularly important for dementia because cognitive decline often requires continuous supervision, emotional labour, medication management and help with activities of daily living.

Gender also affects who receives care. According to the UNDP long-term care study, men in need of care rely heavily on wives, while women in need of care depend more often on children, in-laws or extended family, and are twice as likely as men to report having no caregiver (UNDP Albania, 2025). For dementia cost assessment, this means that the sex of the person living with dementia, the sex and relationship of each caregiver, employment status, migration of adult children and the division of tasks inside the household should be collected as core variables, not as optional background information.

In Albania, the gendered nature of dementia care may be seen in ordinary household tasks that rarely appear in health statistics. Women caregivers may organise medicines, prepare food, clean, accompany the person to consultations, manage hygiene, calm anxiety, respond to behavioural symptoms and communicate with relatives. Much of this work is quiet and repetitive. It does not always look like “medical care”, but without it the person with dementia could not remain safely at home. Ethical cost assessment should make this hidden coordination visible.

From an ethical perspective, ignoring gender would produce an incomplete and potentially unjust estimate of dementia costs. Opportunity-cost methods may undervalue the work of retired women, unemployed women or women outside formal employment, even when they provide intensive daily care. Replacement-cost methods can make this labour more visible, but they should be accompanied by sensitivity analysis and qualitative information on burden, loss of autonomy, social isolation and emotional exhaustion. A gender-sensitive Albanian study should therefore report caregiver time separately by sex, type of task and intensity of supervision, and should avoid treating family care as a free substitute for public responsibility.

Gender should also be considered in the future use of technology. Digital monitoring, caregiver applications or teleconsultations may reduce some forms of burden, but they may also transfer new administrative and emotional duties to the same women who already coordinate family care. A technological solution should therefore ask not only whether it saves money, but whose time it saves and whose responsibilities it increases.

3.6. Valuing unpaid care requires methodological and ethical caution

Several methods can be used to value informal care. The opportunity cost method values caregiving time according to the income or activity that the caregiver gives up. The replacement cost method values care according to the market cost of hiring someone to provide equivalent services. Other approaches may use willingness-to-pay or willingness-to-accept methods. Each method translates care into numbers, but none of them fully captures what it means to live beside dementia every day.

Each method has limitations. Opportunity cost may reflect real financial sacrifice when a caregiver leaves work or reduces working hours, but it may undervalue care provided by pensioners, unemployed relatives or persons outside the formal labour market. Replacement cost recognises unpaid care as labour, but it may not capture emotional attachment, moral responsibility and psychological strain. Willingness-to-pay approaches can be distorted by poverty because poorer families may report lower amounts not because care is less valuable, but because they have fewer resources.

For Albania, an ethically sound approach would be to report informal care using more than one valuation method. Replacement cost could be used as the main method because it makes visible the social value of unpaid care, while opportunity cost could be used in sensitivity analysis. Researchers should also report hours of care separately from monetary estimates. This prevents the ethical mistake of assuming that a price fully explains the caregiving experience.

Cost assessment should also distinguish between types of care. Helping with bathing is not the same as preparing meals; supervising wandering is not the same as paying bills; being available every night is not the same as visiting once a week. For caregivers, the most difficult burden may be the loss of uninterrupted time. Dementia can make the caregiver feel permanently “on duty”. A humanised cost study should try to capture this continuous responsibility rather than reducing care to isolated tasks.

3.7. Autonomy, consent and privacy must be protected

Dementia cost research often requires interviews with persons living with dementia and caregivers. This creates ethical challenges related to informed consent, capacity and privacy. A diagnosis of dementia should not automatically be treated as incapacity. Persons in the early stages may be able to understand the study and provide informed consent if information

is given clearly and accessibly. When capacity is impaired, proxy consent may be necessary, but the person living with dementia should still be involved as far as possible. Researchers should seek assent, observe signs of distress and respect refusal.

The same sensitivity is needed when interviewing caregivers. Caregivers may feel obliged to participate because they want help, because they respect professionals or because they hope that research will finally make their situation visible. Older caregivers may have difficulty with long questionnaires, written forms or technical language. Ethical consent should therefore be slow, clear and respectful. It should make explicit that participation is voluntary and that refusal will not affect access to care or professional attention.

Privacy is also central. Cost studies may collect data on health status, income, out-of-pocket expenses, employment loss, family conflict, personal care and behavioural symptoms. These data are sensitive. In small communities, especially in rural or close social contexts, anonymity is not only a technical requirement but also a form of social protection. Data should be anonymised, securely stored and used only for the stated research purpose. Interviews should also be conducted in a way that avoids exposing family tensions or creating pressure on caregivers.

3.8. Assistive and digital technologies add new ethical dimension

Assistive and digital technologies are increasingly relevant to dementia care and should be part of the future cost and ethics agenda. They may include GPS location devices, fall detectors, medication reminders, remote sensors, video or telephone follow-up, teleconsultations, electronic care plans, caregiver scheduling platforms, digital training modules, communication tools and, in the longer term, AI-supported decision-support systems. Their relevance for Albania lies in their potential to help families manage care at home where formal long-term care services remain limited.

The ethical value of technology should not be reduced to efficiency. Scerri et al. (2025) show that assistive technologies in dementia raise recurring concerns about autonomy, privacy, equity, accessibility, surveillance, depersonalisation and stigmatisation. This is particularly important in dementia, where cognitive impairment can make consent fluctuating and where devices designed for safety may easily become tools of control. A GPS device may reduce wandering-related risk, but it may also restrict liberty if used without meaningful consent. A home camera may reassure relatives, but it can also invade the private sphere of the person living with dementia.

For Albania, digital technologies should be considered both an opportunity and a risk. UNDP Albania recommends digital health platforms for telemedicine consultations, caregiver scheduling and resource allocation in long-term care (UNDP Albania, 2025). Such tools could support rural families, reduce unnecessary travel, improve communication with professionals and help coordinate fragmented care. At the same time, digitalisation may deepen inequality if older persons, poorer households, rural families or women caregivers lack devices, internet access, training or trust in digital services. OECD data for the Western Balkans show that progress in digital transformation remains modest and that Albania still faces challenges in digital skills and inclusion (OECD, 2025).

Technology has a specific ethical meaning for older caregivers. A digital reminder, emergency button or teleconsultation may reduce fear and make care less lonely. It may allow an older spouse to ask for help without travelling, or help adult children coordinate support from a distance. However, if the device is difficult to use, if instructions are not accessible, or if the caregiver is expected to solve technical problems alone, technology may create another layer of burden. A tool that is meant to help can become one more responsibility.

A future Albanian dementia cost study should therefore measure technology costs in a broader way. It should not count only the purchase price of a device. It should include internet access, subscriptions, installation, maintenance, replacement, caregiver training, professional monitoring, false alarms, time saved, time added and the administrative burden created by digital tools. If technology reduces hospital visits or caregiver travel, this should be measured. If it increases anxiety, surveillance or unpaid coordination work, this should also be reported.

The use of AI-supported tools requires even greater caution. AI may help with reminders, triage, risk alerts or caregiver education, but it should not replace clinical judgement, family communication or human presence. Algorithms may make errors, may not understand cultural context and may produce recommendations that families follow too confidently. In dementia care, where vulnerability is high, explainability and human oversight are essential. The person living with dementia and the caregiver should not become passive subjects of automated decisions.

The ethical conditions for using technology in dementia care should include privacy-by-design, data minimisation, clear consent procedures, involvement of the person living with dementia whenever possible, caregiver training, affordability, accessibility for rural areas and periodic reassessment as the disease progresses. Technology should complement human care, not replace it. In Albania, this point is especially important because family caregiving is already the backbone of long-term care; digital tools should strengthen families and protect dignity, not become a cheaper way of leaving families alone with more responsibility.

4. DISCUSSION AND CONCLUSIONS

The findings of this review suggest that dementia cost assessment in Albania should be understood as a tool for justice, dignity and solidarity, not merely as a financial calculation. The theoretical framework matters because the same numerical estimate can be interpreted in different ways. Without ethics, cost data may describe only financial pressure. With ethics, the same data can show where persons living with dementia need dignity, where caregivers need protection, where women and older spouses are carrying unequal burdens, and where public responsibility is required.

The Albanian context requires a balanced interpretation. It would be inaccurate to describe family care only as exploitation, because many families provide care out of love, duty and emotional continuity. At the same time, it would be ethically wrong to romanticise unpaid care when it produces exhaustion, income loss and social isolation. The purpose of dementia cost research should be to recognise the value of family care while showing that families should not be left alone. This is especially important when caregivers are older persons who may themselves need support.

A future Albanian cost-of-illness study should include several safeguards. First, it should use a validated resource-use instrument such as RUD or RUD-Lite, adapted to the Albanian language and care context. Second, it should measure informal care time carefully, including supervision and help with activities of daily living. Third, it should include caregiver burden measures so that non-monetary strain is not lost. Fourth, it should identify older caregivers and assess their health, fatigue and social support. Fifth, it should distinguish clearly between measured data, estimates and assumptions. Sixth, it should protect autonomy, consent and privacy through clear ethical procedures. Seventh, it should consider gender and inequality, because caregiving burdens are not distributed equally across households.

These safeguards are important for policy. Reliable and ethically collected data could support a national dementia strategy, caregiver training, respite care, home-based services, day centres, financial support and long-term care reform. UNDP Albania's work on ageing and long-term care shows that the country is already facing broader questions about how to support older adults in a changing social environment (UNDP Albania, 2025). Dementia should be part of that policy agenda because it is one of the conditions most strongly associated with dependency and sustained family care.

Gender-sensitive and age-sensitive cost assessment would improve policy relevance. For Albania, caregiver support should not be designed as a gender-neutral or age-neutral intervention when women and older spouses carry much of the daily responsibility. A financial estimate that does not show who provides care may be numerically precise but ethically incomplete. Policy should therefore recognise caregiving as work, as emotional labour and as a possible source of vulnerability.

Technology-sensitive cost assessment is also necessary. Digital health and assistive technologies should be introduced through pilot projects, user-centred design and ethical oversight, rather than as isolated devices purchased by families without guidance. A national dementia policy should connect cost measurement with caregiver protection, gender equality, digital inclusion and long-term care reform. Technology can be part of the future of dementia care in Albania, but only if it is designed around people rather than around devices.

The main limitation of this paper is that it is not an empirical cost study. It does not provide a national monetary estimate for dementia in Albania. It is also based on the currently available literature, which remains limited. Future research should include household-level data, rural-urban comparisons, service-use data, caregiver time measurement, out-of-pocket expenses and qualitative interviews with families and professionals. Future studies should also include older caregivers explicitly, because their burden may remain hidden if research focuses only on employment loss or formal service use.

In conclusion, estimating the cost of dementia is necessary, but it must be done with ethical care. The goal should not be to present persons living with dementia as an economic burden. The goal should be to reveal the burden created by disease, dependency, insufficient services and unsupported caregiving. In Albania, an ethically grounded cost assessment could help transform dementia from a largely private family problem into a recognised public responsibility. Such a transformation would support dignity for persons living with dementia, justice for caregivers and better evidence for long-term care policy. It would also make visible a simple human truth: dementia care is not only counted in money, but also in time, patience, fear, loyalty, exhaustion and love.

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Perceptions Of Social Workers In The Healthcare Sector Regarding Artificial Intelligence

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Abstract: Artificial Intelligence (AI) is transforming caring professions at a rapid pace, including social work. This qualitative study aims to explore how social workers in the healthcare sector perceive and are integrating AI into their professional practice, identifying the benefits, challenges, and ethical implications that arise from its use. The study sample comprises ten social workers employed in public and private healthcare institutions. Data were collected through structured interviews administered via Google Forms during May 2026 and were analyzed using thematic analysis. The findings indicate that artificial intelligence is already integrated into the daily practice of social workers in the healthcare sector, with ChatGPT being among the most widely used tools, owing to its accessibility and its capacity to support brainstorming processes, administrative tasks, and creative, informational, and awareness-raising activities. In particular, the field of health promotion and public awareness appears to be benefiting substantially from the advantages AI offers. Overall, participants display a predominantly positive attitude towards the incorporation of AI into their daily professional duties. The perceived benefits of AI are most closely associated with the facilitation of bureaucratic and organizational processes, while challenges and risks are viewed primarily in relation to client interaction. A notable tendency towards concern regarding the ethical and legal dilemmas posed using AI in social work is also observed, underscoring the need to develop regulatory frameworks and guidelines for its application in professional practice. Nonetheless, there is no perceived fear that AI will replace the social work profession, which is regarded as fundamentally relational and irreplaceable by technology. Despite this, there is a clear awareness of the need for the profession to adapt to AI developments as a means of strengthening professional preparedness and contributing more effectively to the protection, expansion, and empowerment of human rights.

Keywords: Artificial Intelligence, Social Work, Healthcare

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1. INTRODUCTION

Artificial intelligence (AI) is rapidly transforming numerous professional fields, and social work is no exception.

In the contemporary context, digital tools and AI are being increasingly used to support client assessment processes, to automate administrative tasks, and to deliver social services online (Nordesjö et al., 2022; Segal et al., 2025).

With reference to all these changes, this paper draws on an analysis of contemporary literature to offer a broader contextual perspective, while focusing attention on an examination of the current state of AI integration among social workers operating in the field of healthcare.

2. LITERATURE REVIEW

2.1 The Use of Artificial Intelligence in Social Work

Researchers in the field are documenting a wide-scale proliferation of AI use within the social work profession. An analysis of existing studies suggests a trend towards integrative adaptation of technological innovations, with increasing attention devoted to professional ethical dimensions, so that social work may maximise the benefits of technological development.

Among the primary categories of AI applications that have entered social work practice, the following may be noted: decision-support systems that assist social workers in assessing risks to children, older adults, and individuals with mental health issues (Garkisch & Goldkind, 2025); chatbots and virtual assistants for primary care, psychological support, and social assistance, which provide round-the-clock support—particularly in remote and isolated areas (Boetto, 2025); big data analytics for identifying vulnerable groups and planning social interventions (Goldkind, 2021); case management platforms that digitalise and optimise the steps of social intervention (Markovč, 2024); and ChatGPT and large language models, which have begun to be integrated into professional training and which, according to the literature, hold considerable educational potential (Kasneci et al., 2023; Gillon et al., 2026).

With reference to Boetto (2025), the EPIC model (Ethical, Person-centred, Inclusive, Critical) provides a useful framework for integrating AI into social practice, placing human and ethical values at the centre. As Diez (2023) also emphasizes, AI can be of value to the profession if developed and implemented with ethical sensitivity and a person-centred orientation.

With reference to the Albanian context, the study by Kulluri (2026) demonstrates that in primary healthcare, technological tools are becoming an integral part of the practical work of social workers.

2.2 Positive and Negative Effects of AI on Social Work

The academic literature in the field of social work documents a high number of positive and negative effects that AI has brought to the professional lives of social workers and their clients, effects that merit careful analysis given the considerable significance of the changes involved.

Many of the professional concerns of social workers have found redress and resolution through AI. Issues of work overload related to bureaucratic processes or administrative routines have been addressed, as reports, client files, and the completion of standard forms are increasingly entrusted to AI tools, relieving the professional of the burden of such tasks (Coulthard et al., 2025). Decision-making processes are also becoming automated by technology, resulting in a reduction of cognitive load (Garkisch & Goldkind, 2025) and addressing professional burnout, contributing to an increase in the wellbeing of practitioners in the field (Piwowar-Sulej et al., 2026). It is also noteworthy that AI is not constraining the critical thinking of professionals; on the contrary, it is stimulating it and elevating it to a higher level (Gillon et al., 2026). The opportunities that AI is creating for the social work profession extend to the provision of personalised training for practitioners, tailored to the specific characteristics of complex cases under their management (Ahn et al., 2025).

Notwithstanding all these advances, several aspects continue to raise critical concerns. Studies indicate that, although AI assists in facilitating decision-making, it generates considerable uncertainty regarding professional judgement and raises important dilemmas in cases where AI produces erroneous decisions. It remains unclear to whom the costs of such errors should be attributed—the social worker, the institution, or the creator of the AI system (Skórić & Galetin, 2024; Rodríguez-Martínez et al., 2024; Goldkind, 2021). One of the most significant negative aspects of using AI for professional decision-making is the neglect of social context and professional experience (Coulthard et al., 2025). Moreover, online counselling systems are raising dilemmas concerning fundamental professional values, such as client autonomy and the principle of self-determination (Lehtiniemi, 2024). The therapeutic relationships between social workers and clients have entered a phase of transition because of AI intervention (Arzroomchilar, 2025). According to Diez (2023), these dilemmas would be surmountable if more precise regulations were developed governing the use of AI in social work.

About benefits for clients, AI appears to expand access to social and therapeutic services for clients in remote areas, offering flexibility of appointment scheduling and real-time intervention, as well as personalized plans (Bruheim-Escobar et al., 2026; Villamil et al., 2019; Lehtiniemi, 2024). AI also assists in freeing clients from social stigma through the distance created by technology, while encouraging individuals to better manage various aspects of their lives (Singh, 2023; Nordesjö et al., 2022). However, there is no certainty regarding the management of sensitive data shared within AI systems. Furthermore, AI systems may exacerbate social inequalities because of algorithmic bias and digital exclusion affecting vulnerable target groups (Rodríguez-Martínez et al., 2024; Skórić & Galetin, 2024; Markovč, 2024).

2.3 Future Challenges for Social Work Under the Influence of AI

Contemporary literature concurs that AI and social work will intensify their interaction in the future, and that the principal challenges are not merely technical but are profoundly professional, ethical, and structural (Segal et al., 2025; Bruheim-Escobar et al., 2026). Researchers devote considerable attention to the preparation of social workers, who must develop digital literacy, while universities are called upon to enrich their curricula by integrating AI and digital rights concepts into social work programs, professional ethical codes, and national and international legal systems (Ahn et al., 2025; Gillon et al., 2026; Rodríguez-Martínez et al., 2024; Diez, 2023).

Issues relating to the protection of client privacy, professional empathy, and the minimisation of the social divide that digitalisation may exacerbate among vulnerable groups are among the specific concerns that have attracted the attention of numerous studies (Goldkind, 2021; Garkisch & Goldkind, 2025; Arzroomchilar, 2025; Boetto, 2025; Villamil et al., 2019; Skórić & Galetin, 2024). According to Piwowar-Sulej et al. (2026) and Coulthard et al. (2025), the focus should not be on fears of replacement of the profession by AI, but on identifying the opportunities that technology is creating, while protecting and cultivating the irreplaceable human role—empathy, morality, and relational capacity.

3. MATERIAL AND METHOD

The focus of this study is concentrated on the use of AI among social workers in the healthcare sector—both public and private—in the Municipalities of Shkodër, Vau i Dejës, and Lezhë, Albania. Through this qualitative study, we aim to

gain an understanding of the practices, effects, and future projections concerning the influence of AI, as perceived by social workers in the healthcare sector. The research is organized around three research questions: (1) How is Artificial Intelligence (AI) perceived and used in social work practice by social workers? (2) What are the benefits, practical impacts, and ethical challenges that the use of AI poses for social workers and their clients? (3) How is AI expected to influence the future of the profession and the role of the social worker?

The selected sample is purposive and consists of ten participants, all social work professionals in the healthcare sector, practicing in the municipalities of Lezhë, Shkodër, and Vau i Dejës. Most participants were female, with professional experience ranging from two to twenty years, and ages ranging from 27 to 46. Participants held various positions in local primary healthcare units, health centres, hospitals, supported housing for mental health, care homes for older adults, public institutions, and private organizations.

The instrument used was a structured interview administered via Google Forms, a practical and advantageous method for data collection, given that respondents have full freedom to choose the most convenient moment to complete the interview, thereby ensuring higher quality responses. The structured interview was developed based on five principal thematic areas: General Views on AI; Types and Methods of AI Use; Benefits and Practical Impact; Professional Ethics; and The Future of the Profession.

Data collection was carried out within a two-week period during May 2026. For data analysis, thematic analysis was employed (Braun & Clarke, 2006), through which sub-codes, codes, and discussion themes identified by participants were systematically mapped. Excerpts from the interviews were selected and incorporated into the paper, alongside comparisons of the findings with those of similar studies in the field.

4. RESULTS

During the data analysis, eight sub-themes and forty codes were initially identified. Three main themes were established: Opportunities and Benefits of AI; Human Boundaries and the Relational Dimension; and Ethical and Professional Challenges. Table 1 presents, in detail, the results of the thematic analysis of interviews with social workers in the healthcare sector.

Table 1. Thematic analysis results: main themes, sub-themes, and code

Main Theme	**Sub-theme**	**Codes**
Opportunities and Benefits of AI	Professional Efficiency and Productivity	Time savings, Speed of task completion, Rapid information processing, Documentation organization, Report structuring, Individualized plans, Informational materials, Posters and brochures, Process automation
	Language and Communication	Professional sentence formulation, expanded professional vocabulary, Text reformulation, Linguistic corrections, Document translation, Information retrieval and sourcing
	Tools and Platforms	ChatGPT, Microsoft Copilot, Canva AI, Google Translate, Design applications
	Benefits for Clients	Service accessibility, Rapid information provision, Service navigation, Personalized support, Needs identification, Continuous assistance
	Future Development	Administrative automation, Form digitalization, Data analysis, Online service delivery, Enhanced service efficiency, Advanced case management
Human Boundaries and the Relational Dimension	The Emotional Dimension	Empathy, Human feeling, Emotional support, psychological support, Human sensitivity, Active listening
	The Relational and Therapeutic Dimension	Human relationships, Therapeutic relationships, Real communication, Client–professional trust, Human mediation, social contact

	The Limits of AI in Relation to Human Nature	Irreplaceable, Replacement impossible, AI as assistant does not substitute, Facilitator but not fully reliable, Intellect vs. human feeling
	Vulnerable Groups and the Digital Divide	Difficulties for older adults, Persons living alone, Persons with physical disabilities, Families in need, Digital inequality, Limited accessibility
Ethical and Professional Challenges	Ethical Concerns Regarding Privacy	Client privacy, Confidentiality, Personal data, Demographic data, Correspondence logging, Information misuse, Insecure platforms
	Risks for Clients	Non-humanistic intervention plans, Potential client harm, Uniform plans for all, non-humanistic decision-making, Loss of individual perspective
	Legal and Ethical Regulation	Legal framework, Ethical framework, Legal restrictions, Privacy protection, Human-accountable decision-making, Protective legislation, Ethical use of AI
	Professional Training for AI	Professional development, Tool familiarization, Real-world practice, Critical inquiry, Ethics in training, Careful integration, Safe use, Professional adaptation

4.1 Opportunities and Benefits of AI

The interviewed social workers believe that AI is introducing positive innovations to their profession, particularly regarding the reduction of administrative workloads; by automating certain processes, less time is required, which can be more productively devoted to the client. There is considerable appreciation for the creative potential and speed with which AI performs certain tasks, especially those related to the health promotion sector.

"Using ChatGPT, I was able to structure the report more quickly and to formulate the text in a clearer and more professional manner."

"AI can facilitate access to information and services, leaving more time for human relationships and emotional support."

"Administrative tasks will be automated by AI: reports, documentation, planning."

Based on the perceptions of the interviewed social workers, the opportunities and benefits of AI are largely considered satisfactory—in part because a significant number of them do not view AI as having the potential to replace relational capacities between human beings. The study by Martínez-Martínez et al. (2025) on the role of AI in the healthcare system identifies the same tendencies: healthcare professionals perceive that AI can contribute to improving efficiency and accuracy in the delivery of care, while also identifying barriers such as fear of the replacement of the human role and deficiencies in training and technical support.

4.2 Human Boundaries and the Relational Dimension

Concern that AI might influence or undermine the social worker–client relationship is present throughout the interviews. The great majority of participants do not believe that AI could ever replace the human role in the relational dimension. Relationships of trust, empathy, and elements of cultural understanding can never be replicated by AI.

"The creation of trust with clients, or indeed professional and human empathy, cannot be replaced by anything."

"AI can offer ideas that are not from a human perspective when drafting an intervention plan, and this may harm the client more than it helps."

Their primary concern centres on the harm that AI may bring in relation to breaches of confidentiality and the deepening of social inequalities.

"If you enter information about a specific client or case, nothing is known about where it will end up or how it may be used."

"The difficulty that older adults experience in using technology."

As emphasised in the study by Yousefi et al. (2025), considerable challenges arise from inequalities in access and the technical competencies that AI will create among professionals. Many social categories currently at risk of being affected by the 'digital divide' will include people with disabilities, members of minority groups, and older adults. The digital exclusion that AI use in social and healthcare sectors would produce is also highlighted by Goldkind (2021), Garkisch & Goldkind (2025), and Skórić & Galetin (2024).

4.3 Ethical and Professional Challenges

Yousefi et al. (2025) argue that in order to improve the integration of AI in the health sector, improvements to infrastructure are needed, along with more in-depth training for professionals and the development of an ethical and legal framework that supports the safe and effective use of new technologies. Similar elements are evidenced in this study, with the interviewees themselves expressing the view that AI is not the problem, but rather the ethics with which a professional uses it that makes the difference.

"Legal restrictions must be established on the use of AI by professionals, including principles of privacy and confidentiality."

"Each social worker must exercise personal responsibility in preserving confidentiality by refraining from entering sensitive data into insecure platforms."

"The knowledge and training acquired through lectures, seminars, and real professional practice cannot and must never be replaced by something as formulaic as AI."

The interviewees note that it is necessary that not everything be left to the moral judgement of the professional and the code of ethics, but that these changes be also reflected through legislative measures, regulations, university curricula, or continuing professional training. This is consistent with the recommendation by Martínez-Martínez et al. (2025), who argue that a more comprehensive approach to the adoption of new technologies in helping professions is continuously needed, so that professionals may adapt and the negative effects transmitted to clients may be minimized.

5. DISCUSSION AND CONCLUSIONS

AI is already part of the daily practice of social workers in the healthcare sector. Among the AI tools most widely used is ChatGPT, valued for its accessibility and the opportunities it offers in relation to brainstorming, administrative and creative work tasks, and informational and awareness-raising activities. The field of health promotion is benefiting substantially from the advantages that AI is providing.

The interviewees generally regard the incorporation of AI into their daily professional duties with a positive outlook, even though they are not uninformed or insensitive to the negative dimensions it may bring, particularly in relation to client interactions. They associate the benefits of AI more closely with the bureaucratic aspects of the profession, while perceiving the risks as more closely linked to the client relationship.

A tendency towards concern regarding ethical and legal dilemmas is observed. The need to develop regulations or guidelines for the use of AI in the profession is now widely acknowledged as necessary. There is no perceived fear that in the future the social work profession will be threatened with replacement by AI; indeed, this is viewed as impossible given the relational nature of the profession. Nevertheless, there is a clear acknowledgement of the need for a new professional orientation towards the development of AI as a means of being better prepared and professionally safeguarded, to contribute even more effectively to the cause of protecting, expanding, and strengthening human rights.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Children's Participation in Sports and Its Impact on Social, Emotional, and Moral Development

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Abstract: Children's participation in sports is considered an important factor for their physical and emotional health, as well as for the development of their social and moral skills. The aim of this study is to identify and analyze the impact of children's participation in sports activities on the development of positive values and behaviors. Several studies have emphasized the positive role of sports in fostering prosocial behaviors among children and adolescents. Li et al. (2022) reported that participation in sports activities enhances cooperation, social interaction, and prosocial behavior. Similarly, Bronikowska et al. (2020) argued that engagement in sports contributes to the development of moral competence and ethical reasoning.

The methodology used in this study combines both quantitative and qualitative approaches. The instruments used for data collection were a questionnaire and interviews. The selected sample included children, parents, teachers, and sports coaches. A total of 340 children responded to the questionnaire, while 20 teachers, 5 sports coaches, and 10 parents were interviewed.

Through the questionnaire and interview questions, issues related to the impact of children's participation in sports on their social, emotional, and moral development were explored. The analysis focused on the influence of sports on the development of cooperation and communication skills, self-confidence, emotional management, respect for rules, and the acquisition of moral values such as honesty, responsibility, and fair play.

The findings revealed that regular participation in sports activities contributed to the improvement of children's communication and cooperation skills, enhanced their sense of responsibility, and promoted fairness in decision-making. Furthermore, sports encouraged inclusive participation and positive interactions among children.
This study highlights the importance of promoting sports in schools, communities, and families as an effective means of shaping children's personalities and fostering social and moral values.

Keywords: sports, children, social development, moral values, sports education

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Introduction

The involvement of children in sports activities is considered an important environment for their physical, social, and psychological development. The right to rest, leisure, play, and recreational activities is recognized by the United Nations Convention on the Rights of the Child[21] (CRC) and is therefore binding on all countries that have signed and ratified it. Albania, as a country that has ratified the Convention[22], has adopted Law No. 18/2017 "On the Rights and Protection of the Child."[23] In accordance with Article 19 of this law, which guarantees children's right to rest, recreation, cultural activities, and sports, efforts have been made to establish parks, sports facilities, gyms, and other environments that promote children's participation in recreational and sporting activities.

Participation in sports activities helps children develop communication skills, teamwork, cooperation, and emotional awareness, while also fostering abilities that can be transferred to everyday life situations[24]. Schools play a particularly important role in encouraging children to engage in sports activities, as participation in sports is recognized as an important tool for social, psychological, and moral development. Consequently, physical education has been incorporated

[21] United Nations. (1989). Convention on the Rights of the Child, Article 31, https://www.unicef.org/child-rights-convention/convention-text
[22] Low nr. 7531, dt 11.12.1991, "On the Ratification of the Convention on the Rights of the Child"
[23] Article 19, of Law No. 18/2017 "On the Rights and Protection of the Child.
[24] Gould, D., & Carson, S. (2008). Life skills development through sport: Current status and future directions. *International Review of Sport and Exercise Psychology, 1*(1), 58–78

into school curricula, and educational institutions increasingly invest in the infrastructure necessary to support sports participation.

The scientific literature also highlights sports participation as an essential component of children's physical and mental well-being[25]. Research has consistently demonstrated that involvement in sports contributes not only to physical health but also to social and emotional development.

For example, Eime et al. (2013)[26] examined the impact of sports participation on children's social development and concluded that involvement in sports is associated with numerous social benefits, including improved interaction with peers, the formation of new friendships, increased mutual respect, and greater acceptance of others. According to the authors, sports provide an effective means of promoting social integration and developing important social competencies among children and adolescents.

Purpose of the study

The aim of this study is to identify and analyze the impact of children's participation in sports activities on the development of positive values and behaviors.

The study examined the social, emotional, and moral benefits of children's participation in sports activities. Specifically, it explored the impact of sports on social development, emotional well-being, self-confidence, emotional control, and the development of moral values such as respect, responsibility, honesty, and fair play. Furthermore, the study investigated the role of sports in promoting social integration and preventing negative behaviors among children.

Hypothesis of the study

Regular participation in sports activities has a positive impact on the social, emotional, and moral development of children.

Methodology

This study employed a mixed-methods research approach, combining quantitative and qualitative methods to collect and analyze data. The quantitative component aimed to identify patterns, perceptions, and relationships among the variables under investigation, while the qualitative component provided a deeper understanding of participants' experiences and perspectives.

Data were collected through questionnaires administered to students and semi-structured interviews conducted with physical education teachers, sports coaches, and parents.

The study sample consisted of 340 students aged 8–14 years who participated in sports activities. Of the total sample, 241 (70.8%) were female and 99 (29.2%) were male. Participants were selected from three schools in Tirana: "7 Marsi" School, "Ali Demi" School, and "Naim Frashëri" School.

In addition, qualitative data were obtained through interviews with 20 teachers, 5 sports coaches, and 10 parents. The inclusion of multiple participant groups enabled a broader understanding of the impact of sports activities on children's social, emotional, and moral development.

Research Design and Data Analysis

The study had a descriptive research design. Its descriptive nature was related to identifying children's participation in sports activities and examining their perceptions regarding the impact of sports on their social, emotional, and moral development.

[25] Almeida, L., Dias, T., Corte-Real, N., Menezes, I., & Fonseca, A. (2025). Positive youth development through sport and physical education: a systematic review of empirical research conducted with grade 5 to 12 children and youth. *Physical Education and Sport Pedagogy*, *30*(3), 282–308. https://doi.org/10.1080/17408989.2023.2230208

[26] Eime, R. M., Young, J. A., Harvey, J. T., Charity, M. J., & Payne, W. R. (2013). A Systematic Review of the Psychological and Social Benefits of Participation in Sport for Children and Adolescents: Informing Development of a Conceptual Model of Health through Sport. International Journal of Behavioral Nutrition and Physical Activity, 10, 98.https://doi.org/10.1186/1479-5868-10-98

Data were collected through questionnaires administered to students and interviews conducted with physical education teachers, sports coaches, and parents. A single questionnaire was used in the quantitative phase of the study. Respondents were asked to indicate their level of agreement with each statement using a five-point Likert scale, where: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

The quantitative data obtained from the questionnaires were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. These statistical measures were used to summarize respondents' attitudes and perceptions regarding the impact of sports activities on their social, emotional, and moral development.

The qualitative data obtained through interviews were analyzed using thematic analysis. This approach enabled the identification of common themes and patterns in the experiences and perceptions of physical education teachers, sports coaches, and parents regarding the role of sports in children's development.

Ethical Considerations

Throughout the study, the fundamental ethical principles of scientific research were respected. Participation in the study was entirely voluntary, and no participant was obliged to take part. All participants were informed about the purpose of the research before providing their consent.

Anonymity and confidentiality were guaranteed throughout the research process. No personally identifiable information was collected, and all data were processed and stored securely. The information obtained was used exclusively for academic purposes and was handled in accordance with ethical standards governing educational and social science research.

Table 1. Demographic Characteristics of the Respondents

Gender	Frequency	Percentage
Girls	241	70.8%
Boys	99	29.2%
Total	340	100%

The results show that the majority of the sample is made up of girls (70.8%), while boys represent 29.2% of the participants. This indicates a higher representation of the female gender in the study.

Table 2. Age of the Respondents

Age	Frequency	Percentage
9–10 vjeç	96	28.3%
11–12 vjeç	91	26.7%
13–14 vjeç	102	30.0%
15–16 vjeç	51	15.0%
Total	340	100%

The results show that the largest group of participants belongs to the age group of 13–14 years (30%), while the smallest group is the age group of 15–16 years (15%).

Table 3. Frequency of Participation in Sports Activities per Week

Frequency of Participation in Sports Activities	**Frequency**	**Percentage**
1–2 times per week	247	72.6%
3–4 times per week	71	20.8%

No, I do not participate in sports activities	22	6.6%
Total	340	100%

The results show that the vast majority of participants (79.2%) engage in sports activities 1 to 2 times a week, while only 20.8% declare engaging in sports 3-4 times a week. This indicates that sports are a relatively common activity practiced by the children included in the study.

Table 4. Students' Attitudes toward the impact of sport on social development

Question	1(%)		2 (%)		3(%)		4(%)		5(%)	
Through sports activities I create new friendships.	0.0	21	6.2	44	12.9	0.0	21	6.2	44	21.8
I have increased cooperation with others through sports.	0.0	9	2.6	32	9.4	0.0	9	2.6	32	15.9
I have learned that the opinions of others should be respected during sports activities	0.0	25	7.4	94	27.6	0.0	25	7.4	94	10.3
Participating in sports has increased my spirit of collectivity and solidarity.	0	0.0	0	0.0	24	7.1	266	78.2	50	14.7

Table 5. Mean scores, Standard deviations, and Positive responses regarding the impact of sports on social development

Question	**N**	**Mean**	**SD**	**Positive (%)**
Through sports activities I create new friendships.	340	3.96	0.77	93.8%
I have increased cooperation with others through sports.	340	4.01	0.60	97.4%
I have learned that the opinions of others should be respected during sports activities	340	3.68	0.76	92.6%
Participating in sports has increased my spirit of collectivity and solidarity.	340	4.08	0.46	100.0%

From the students' responses, it can be observed that the mean scores for the items related to the impact of sports on social development range from 3.68 to 4.08, indicating a generally positive perception of the role of sports in students' social development. The highest mean score was recorded for the statement "Participating in sports has increased my spirit of collectivity and solidarity"[27] (M = 4.08, SD = 0.46), suggesting that participation in sports strongly contributes to students' sense of belonging, solidarity, and social integration.Similarly, the statements "I have increased cooperation with others

[27] Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., … Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport and Exercise Psychology*, *10*(1), 1–49. ://doi.org/10.1080/1750984X.2016.1180704

through sports"[28] (M = 4.01, SD = 0.60) and "Through sports activities I create new friendships"[29] (M = 3.96, SD = 0.77) show that sports play an important role in strengthening cooperation and building positive social relationships among students. A positive tendency is also observed in relation to respecting the opinions of others during sports activities (M = 3.68), although this item received the lowest mean score among the social development items.

Table 6. **Students' Attitudes toward the impact of sport on moral and emotional development**

Table 7. Mean scores, Standard deviations, and Positive responses regarding the impact of sports on moral and emotional development

Question					N	Mean	SD	Positive (%)
Question	1(%)		2(%)		3(%)	4(%)		5(%)	
Sports activities increase self-confidence					340	3.82	0.82	**76.8%**	
Sports activities increase self-confidence	8	2.4	16	4.7	55	16.2	212	62.4	49	14.4
During sports activities, I feel better emotionally					340	3.69	0.96	**74.1%**	
During sports activities, I feel better emotionally	15	4.4	27	7.9	65	19.1	198	58.2	54	15.9
Sports have helped me cope with losses without getting upset					340	3.19	1.04	**49.1%**	
Sports have helped me cope with losses without getting upset	31	9.1	52	15.3	90	26.5	154	45.3	13	3.8
I am more persistent in achieving my goals					340	3.69	0.88	**77.1%**	
Sports have taught me to respect the rules.					340	4.00	0.61	**88.2%**	
I am more persistent in achieving my goals	14	4.1	26	7.6	38	11.2	234	68.8	28	8.2
As a result of taking up sports, I have become more responsible					340	4.05	0.71	**81.5%**	
Sports have taught me to respect the rules.	0	0.0	12	3.5	28	8.2	248	72.9	52	15.3
Sports have taught me the importance of fair play					340	3.91	0.98	**78.8%**	
As a result of taking up sports, I have become more responsible	0	0.0	18	5.3	45	13.2	198	58.2	79	23.2
Sports have taught me the importance of fair play	12	3.5	24	7.1	36	10.6	180	52.9	88	25.9

Referring to the respondents' answers, sports activities are perceived as an important factor that has influenced the improvement of moral and emotional attitudes such as: increasing self-confidence, being more responsible, and learning to respect the rules. This is best shown by the result of calculating the average (Mean) derived from their answers. The degree of agreement of their answers for each question is high, which means that most of them have positive attitudes towards sports activities. The question, Sports helps me to have more self-confidence (M = 3.82, SD = 0.82) stating that sports activities influence the increase of self-confidence.

In terms of emotions, students report that sports help them feel more emotionally calm (M = 3.69) and more motivated to achieve their goals[30] (M = 3.69). The lowest, but still positive, averages are observed in the ability to cope with losses (M = 3.19).

For the question sports activities have made me more responsible, the average of compliance is (M = 4.05, SD = 0.71) and through sports I have learned to respect the rules, the average is (M = 4.00, SD = 0.61), confirming that sports

[28] Marqués-Sánchez P, Benítez-Andrades JA, Calvo Sánchez MD*, et al* "The socialization of the adolescent who carries out team sports: a transversal study of centrality with a social network analysis", *BMJ (*2021) Doi: 10.1136/bmjopen-2020-042773

[29] Fraser-Thomas, J. L., Côté, J., & Deakin, J. (2005). Youth sport programs: an avenue to foster positive youth development. *Physical Education and Sport Pedagogy*, *10*(1), 19–40. https://doi.org/10.1080/1740898042000334890

[30] McGarry, J. E., Rochon, R., Mala, J., & Ebron, K. A. (2025). Critical Approaches to Youth Development Through Sport: An Introduction to the Special Issue. *Youth*, *5*(3), 93. https://doi.org/10.3390/youth5030093v

activities help in the formation of moral values and discipline. Higher ratings are related to the importance of fair play, (M = 3.91, SD = 0.98) which is an important indicator in the formation of civic values.

In the students' responses, a positive attitude towards the impact of sports activities on their emotional and moral development is observed. The results show that students have a generally positive attitude towards the impact of sports on their moral and emotional development. (76.8%) of them think that engaging in sports activities has increased self-confidence. Also, most of them declare that sports motivate them and help them achieve their goals (77.1%). The highest percentage of positive attitudes was recorded for the statement "Sports have taught me to respect the rules" (88.2%), followed by "Sports have made me more responsible" (81.5%) and "Sports have taught me the importance of fair play" (78.8%). Lower positive percentages are observed in the ability to cope with losses (49.1%) and control emotions (50.9%), which suggests that these are the aspects where the impact of sport is perceived less strongly compared to other moral and emotional dimensions.

So, in general, students have positive answers about the impact of sports activities on their moral and emotional development, such as respecting the rules, increasing responsibility, increasing perseverance in achieving goals. From the answers, it is seen that there are limitations in their ability to cope with losses without getting upset, as only (49.1%) agree with this question. So, although sports have a positive impact on emotional development, coping with losses is seen as a challenge to be faced.

The respondents' answers indicate that sports activities are perceived as an important factor influencing students' moral and emotional development. The results show relatively high levels of agreement across all items, suggesting that most students hold positive attitudes towards the role of sports in fostering self-confidence, responsibility, perseverance, respect for rules, and fair play.

Regarding self-confidence, students reported a positive perception of the contribution of sports activities, with a mean score of 3.82 (SD = 0.82). This finding suggests that participation in sports helps students develop greater confidence in their abilities and enhances their self-esteem. Similarly, sports activities appear to have a positive influence on students' emotional well-being. The results indicate that students feel emotionally calmer after participating in sports activities (M = 3.69) and more motivated to achieve their goals (M = 3.69), highlighting the role of sports in promoting emotional balance and personal motivation.

The highest levels of agreement were observed in relation to moral development. Students strongly agreed that sports have taught them to respect rules (M = 4.00, SD = 0.61) and have made them more responsible (M = 4.05, SD = 0.71). These findings suggest that participation in sports contributes significantly to the development of discipline, responsibility, and moral values. Likewise, students recognized the importance of fair play[31], as reflected in the relatively high mean score (M = 3.91, SD = 0.98), indicating that sports promote ethical behavior, respect for opponents, and adherence to principles of fairness.

An examination of the percentage distribution further supports these findings. More than three-quarters of the respondents reported that participation in sports increases self-confidence (76.8%) and motivation to achieve personal goals (77.1%). The highest percentage of positive responses was recorded for the statement that sports have taught students to respect rules (88.2%), followed by increased responsibility (81.5%) and an understanding of the importance of fair play (78.8%). These findings highlight the substantial contribution of sports to students' moral development, character formation, and the acquisition of important social values. However, lower levels of agreement were found regarding the ability to cope with losses without becoming upset (49.1%) and the ability to control emotions (50.9%). Although these percentages still indicate a generally positive perception, they suggest that emotional regulation and coping with failure remain more challenging areas for students compared to other dimensions of moral and emotional development.

The responses obtained from the interviews with teachers and sports coaches regarding the effects of sports on children's social development confirm the findings reported by the surveyed children. Furthermore, teachers affirm that participation in sports activities helps children demonstrate ethical and emotional qualities that reflect important civic values. According to both teachers and sports coaches, engaging and working with children in sports activities is a challenge, as children are required to develop discipline, patience, and good physical abilities. Nevertheless, their overall perceptions of the impact of sports participation are positive.

[31] Wang, C. (2023) Students' Attitudes and Behaviors towards Fair Play in Sport. *Open Journal of Social Sciences*, **11**, 89-104. Doi: 10.4236/jss.2023.115008.

Conclusions

Overall, the findings indicate that sports activities have a positive impact on students' moral and emotional development. Participation in sports appears to promote self-confidence, motivation, responsibility, respect for rules, perseverance in achieving goals, and appreciation of fair play. At the same time, the results suggest that additional support may be needed to help students develop stronger emotional coping skills, particularly in dealing with losses and managing negative emotions.

Based on the findings of the study participation in sports activities contribute positively to students' social development by promoting cooperation, solidarity, mutual respect, the formation of new friendships, and teamwork.

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Severe Vitamin D Inadequacy In A Young Female Elite Albanian Athlete: Clinical And Lifestyle Implications In A Case Report

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Abstract: Vitamin D deficiency in the general population, including athletes, is widespread and remains a public health concern. Vitamin D plays an essential role not only in homeostasis of calcium and osteo-muscular health but also in the physical and sports performance of athletes. We report the case of a 26-year-old female volleyball player. The analysis was taken in November 2025, at a certified and accredited laboratory in a region of Albania. Laboratory analyses showed serum concentration of 25-hydroxyvitamin D {25(OH)D} 17 ng/mL, suggesting low-level vitamin D status based on accepted laboratory cut-off values and serum concentration of calcium 9.02 mg/dL within the normal reference range. Body Mass Index (BMI was 24.7 kg/m2, close to the upper limit of the normal reference range. The athlete reported daily exposure to sunlight for more than 60 minutes per day, a low intake of dairy products, approximately once per week, and musculoskeletal symptoms such as fatigue, muscle contractions, and leg and back pain. This case report highlights that vitamin D deficiency persisted even with sufficient sun exposure. Low vitamin D synthesis is influenced by seasonal variations in UV radiation and insufficient intake of dairy products. Although symptoms of fatigue, muscle contractions, leg and back pain are non-specific, their clinical significance should be considered in the biochemical assessment of the athlete. This case highlights the need for assessment of vitamin D status in athletes with non-specific osteomuscular symptoms. Although calcium levels are within normal levels, this does not rule out vitamin D deficiency. Therefore, continuous monitoring of vitamin D in the athlete population is necessary in the athlete's health monitoring protocols.

Keywords: Vitamin D deficiency, 25-hydroxivitamin D, serum calcium, athlete, case report

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INTRODUCTION

It is now widely accepted that adequate levels of vitamin D are essential for maintaining bone health and muscle function. Contemporary evidence suggests that this vitamin's role extends beyond the skeletal and muscular systems to other important physiological processes, including muscle development, immune function, modulation of the inflammatory response, cardiac function, and cellular regeneration. (Kim, Park, Kuo, & Park, 2019) (Knechtle, Jastrzębski, Hill, & Nikolaidis, 2021) Vitamin D insufficiency is a global concern affecting a significant number of individuals. According to laboratory classifications, vitamin D status is determined by a serum 25-hydroxyvitamin D concentration of 40 to 60 ng/mL. (Holick M. F., 2007) Values above 30 ng/mL are considered sufficient, while values between 20 and 29 ng/mL are classified as insufficient. Concentrations below 20 ng/mL are considered deficient. The 30 ng/mL threshold is used as the dividing line between sufficient and insufficient vitamin D status (Holick, et al., 2011). In most clinical and laboratory protocols, particularly low values of 25(OH)D, less than 10 or 12 ng/mL, should be avoided in all age groups. (Yoon, 2021) . Although athletes have low body fat and high physical fitness, studies show a worrying prevalence of vitamin D deficiency of around 56%. (Farrokhyar, et al., 2015) compared with 40% in the general population (Amrein, Scherkl, & Hoffmann, 2020). About 90.5% of athletes who train indoors have a higher rate of vitamin D deficiency than those who train outdoors (18.5%). (Kawashima, et al., 2021) Factors contributing to vitamin D deficiency in athletes include indoor training, mainly during the winter season, low ultraviolet radiation, insufficient intake of dairy products, skin pigmentation, and individual metabolic variability. However, sun exposure does not seem to be among the determining factors for significant differences in deficiency among athletes. (Holick M. F., 2007) (Holick M. F., 2013) (Ip, Fu, Ong, & Yung, 2022) Deficient vitamin D levels can increased the risk of fractures, muscle injuries, falls, respiratory infections, compromised physical and sports performance, cardiovascular disease, and diabetes mellitus (Wilson-Barnes, Hunt, Lanham-New, & Manders, 2020) (De la Puente Yagüe, Collado Yurrita, Ciudad Cabañas, & Cuadrado Cenzual, 2020) (Crescioli, 2022) (Hoxha, Bozo, Pojani, Lami, & Bozo, 2024) This case report presents an elite

volleyball player with low serum vitamin D concentrations, despite daily sun exposure and normal serum calcium values, accompanied by symptoms such as fatigue, muscle contractions, and back and leg pain.

2. MATERIAL AND METHOD

The case report participant initially provided written consent to participate in this study. Several anthropometric indicators, such as weight, body height, and BMI, were measured using the impedance method. The World Health Organisation's BMI reference values were used. Values < 18.5 were classified as underweight, 18.5-24.9 as normal, and 25-29.9 as overweight. (WHO, 2025)

Vitamin D and calcium levels were assessed using blood samples drawn from the cubital vein. After centrifugation, the resulting serum was analyzed with the automated COBAS INTEGRA® 400 plus for calcium measurement, and electrochemiluminescence (ECL) with the automated COBAS® E 411 system for measuring 25(OH)D levels, which is considered the best marker for vitamin D status. (Bikle, Bouillon, Thadhani, & Schoenmakers, 2017) Both the COBAS® E 411 and COBAS INTEGRA® 400 plus systems are calibrated and controlled according to the manufacturer's instructions and are approved by the Food and Drug Administration (FDA). (Roche, 2024) The laboratory range for serum calcium is 8.6- 10.2 mg/dL. The study was conducted in accordance with the Declaration of Helsinki.

3. RESULTS

Case presentation

In November 2025, a 26-year-old female volleyball player underwent a biochemical evaluation, which included serum 25-hydroxyvitamin D [25(OH)D] and calcium, as well as height and weight measurements. The athlete reported daily sun exposure of more than 60 minutes. However, dietary intake was inadequate, occurring once a week. She complained of fatigue, muscle cramps, and back and leg pain. No clinical diagnosis or supplementation was reported at the time of evaluation. Laboratory tests showed a serum 25(OH)D concentration of 17 ng/mL, suggesting low-level vitamin D status based on accepted laboratory cut-off values, serum calcium of 9.02 mg/dL, within the normal reference range, and BMI of 24.7 kg/m² close to the upper limit of the normal reference range.

VARIABLE	**FINDING**
Sex	Female
Age	26
Sport Discipline	Volleyball
Time of assessment	November 2025
Serum 25(OH)	17 ng/mL
Serum Calcium	9.02 mg/dL
BMI	24.7 kg/m^2
Sun exposure	> 60 minutes/day
Dairy intake	Once per week
Symptoms	Fatigue, muscle contractions, back, and leg pain

4. DISCUSSION AND CONCLUSIONS

This case underscores that we need direct lab tests for vitamin D in athletes, especially when they have neuromuscular issues. The athlete had a serum 25-hydroxyvitamin D level of 17 ng/mL, showing vitamin D deficiency according to lab standards. (Holick, et al., 2011) Notably, the calcium level was in the normal range.

An important consideration is that normal calcium concentrations don't rule out vitamin D deficiency. Our body regulates calcium through hormonal mechanisms, particularly parathyroid hormone activity, as well as compensatory adaptations

involving the kidneys and bones. (Fleet, 2017) (Holick, et al., 2011) Therefore, serum calcium may remain within normal limits even when vitamin D status is inadequate.

Although the athlete reported substantial sun exposure more than 60 minutes per day, vitamin D deficiency was present, highlighting the complex nature of vitamin D status (Harju, Gray, Mavroedi, Farooq, & Reilly, 2022) (De la Puente Yagüe, Collado Yurrita, Ciudad Cabañas, & Cuadrado Cenzual, 2020) It's affected by season, diet, metabolism, skin type, training conditions, and more.

The blood sample was collected in November, when UVB rays are down, meaning less vitamin D is made from the sun. (Wilson-Barnes, Hunt, Lanham-New, & Manders, 2020) In addition, the athlete reported low dietary intake, potentially reducing dietary sources of vitamin D and calcium.

Fatigue and muscle cramps were symptoms the athlete had. Although a causal relationship between vitamin D deficiency and these manifestations cannot be established from a single case. This observation supports the clinical value of assessing vitamin D status in athletes presenting with similar complaints. (Yoon, 2021) For sports medicine practitioners and laboratory professionals, this case emphasizes the need for direct biochemical assessment rather than relying solely on indirect assumptions or isolated indicators, such as reported sun exposure or dietary intake records.

The principal limitation of this report is that it describes a single case. Therefore, the findings should be interpreted as clinically informative observations rather than as evidence that can be generalized to the broader athlete population. Furthermore, the lack of parathyroid hormone assessment and bone turnover markers limited a more comprehensive evaluation of calcium-vitamin D homeostasis. Nevertheless, the case is clinically relevant because it documents vitamin D deficiency in a young athlete despite normal serum calcium concentrations. This observation supports the importance of routine laboratory assessment in the monitoring of athlete health.

This case demonstrates the importance of measuring serum 25-hydroxyvitamin D concentrations in athletes complaining of neuromuscular symptoms. Normal serum calcium levels aren't enough to rule out vitamin D deficiency. Even in a young female athlete with substantial daily sun exposure, vitamin D deficiency may still be present. This finding highlights the various factors affecting vitamin D status. Regularly checking athletes for vitamin D deficiency could help maintain bone and muscle health and support optimal athletic performance.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Severe Systemic Sclerosis-Associated Interstitial Lung Disease Presenting With Acute Respiratory Failure: A Case Report Highlighting The Impact Of Poor Treatment Adherence

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Abstract: Systemic sclerosis is a chronic autoimmune connective tissue disorder characterized by immune-mediated dysregulation, vascular injury, and progressive fibrosis involving the skin and internal organs. Pulmonary manifestations, particularly interstitial lung disease and pulmonary hypertension, are among the most serious complications and contribute substantially to morbidity and mortality. We report the case of a 63-year-old woman with a five-year history of systemic sclerosis who presented to the emergency department with severe dyspnea at rest. She reported a one-month history of progressive dry cough, dysphagia, peripheral arthralgia, generalized weakness, and worsening shortness of breath, initially on exertion and later at rest. Physical examination revealed sclerodactyly, telangiectasia, tachypnea, tachycardia, blood pressure of 100/60 mmHg, and fine bibasal pulmonary crackles. The patient had been treated with azathioprine and nifedipine, but reported poor adherence to therapy and lack of regular rheumatological follow-up over the past year. Electrocardiography showed right bundle branch block, while arterial blood gas analysis revealed type I respiratory failure with respiratory alkalosis. Chest computed tomography showed diffuse interstitial lung involvement, peripheral fibrotic changes, esophageal dilation, and fine reticular opacities affecting mainly the lower lobes, consistent with pulmonary fibrosis. Transthoracic echocardiography showed preserved left ventricular systolic function, right ventricular dilation, tricuspid regurgitation, and a significantly elevated estimated pulmonary artery systolic pressure of 75–80 mmHg, indicating severe pulmonary hypertension. Pulmonary function testing revealed severe mixed ventilatory impairment. This case underlines the clinical importance of early identification and continuous multidisciplinary surveillance of pulmonary complications in patients with systemic sclerosis. Interstitial lung disease, pulmonary fibrosis, esophageal involvement, and severe pulmonary hypertension may coexist and progress rapidly, particularly when treatment adherence is poor and specialist follow-up is insufficient.

Keywords: Systemic sclerosis; interstitial lung disease; pulmonary fibrosis; pulmonary hypertension; case report.

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1. INTRODUCTION

Systemic sclerosis (SSc) is a chronic autoimmune connective tissue disease of unknown etiology characterized by excessive deposition of collagen and other extracellular matrix components within the skin and internal organs. The disease is associated with profound fibroproliferative changes of the microvasculature and multiple immunological abnormalities involving both humoral and cellular immune responses. Although systemic sclerosis is not considered a hereditary disorder, genetic susceptibility plays an important role in its pathogenesis. (Denton and Khanna 2017)

The term scleroderma, derived from the Greek words skleros (hard) and derma (skin), was initially described by Hippocrates as a condition characterized by skin thickening. In 1836, Giovamabattista Fantonetti first used the term scleroderma generale to describe a patient presenting with darkened, leather-like skin. The disease encompasses a spectrum ranging from limited cutaneous involvement to diffuse forms associated with progressive internal organ involvement and, in rare cases, fulminant disease progression. (Hoffmann-Vold, et al. 2020)

Progressive skin thickening predominantly affects the trunk, proximal extremities, and face and is frequently accompanied by multiorgan involvement, including the gastrointestinal, respiratory, renal, cardiovascular, and musculoskeletal systems. The pathogenesis is complex and multifactorial, including interactions between genetic and environmental factors. Early endothelial injury and microvascular dysfunction are considered initiating events, followed by activation of inflammatory and immune pathways, autoantibody production, and fibroblast differentiation into activated myofibroblasts. Consequently, progressive fibroproliferative changes result in excessive deposition of collagen types I, III, and VI and other extracellular matrix components, primarily mediated by cytokines such as transforming growth factor-beta (TGF-B), ultimately leading to widespread fibrosis and characteristic vasculopathy. (Khanna, et al. 2015)

Diagnosis relies primarily on clinical assessment, while additional investigations are used to exclude alternative diagnoses, evaluate organ involvement, and monitor disease progression. Current therapeutic strategies are mainly directed toward symptom control, prevention of complications, and improvement of life quality. (Goh, et al. 2008)

CASE PRESENTATION

A 63-year-old woman presented to the emergency department with severe dyspnea at rest. She reported a one-month history of progressive dry cough, dysphagia, peripheral arthralgia, generalized weakness, and worsening shortness of breath, initially on exertion and subsequently at rest. On the day of admission, she also experienced chest discomfort.

Upon presentation, the patient was alert and oriented to time and place. Physical examination revealed sclerodactyly, teleangiectasia, tachypnea, tachycardia, and a blood pressure of 100/60 mmHg. Bibasal fine crackles were detected on pulmonary auscultation.



Figure 1 Sclerodactyly

The patient was diagnosed with systemic sclerosis five years ago and was being treated with:

- Azathioprine 50mg once daily
- Nifedipine 10mg once daily



Figure 2 Scleroderma facies. “Purse-string”, microstomia

She reported poor adherence to treatment and absence of rheumatology follow-up during the previous year.

ECG demonstrated right bundle branch block.

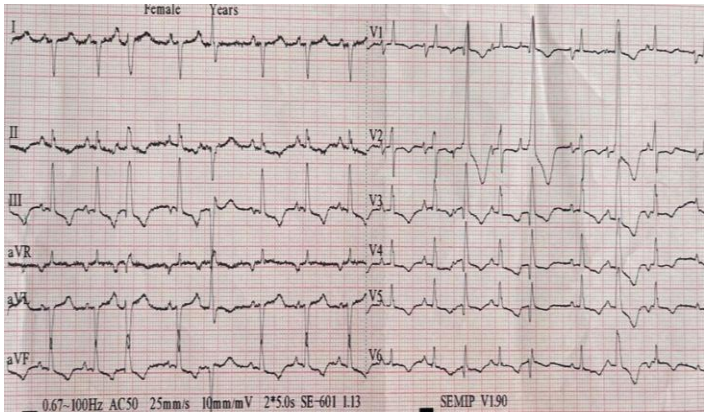

Figure 3 RBBB

Arterial blood gas analysis revealed type I respiratory failure associated with respiratory alkalosis.

Ph	7.54	7.35-7.45
PO2	46.60mmHg	83.0-108.0mmHg
PCO2	31.10mmHg	32.0-48.0mmHg
cHCO3	27.80mmol/L	22-26mmol/L
SO2	84.60%	

Figure 4 ABG, Type I respiratory failure, Respiratory alkalosis

Computed tomography of the chest demonstrated diffuse interstitial involvement with peripheral fibrotic changes. Degenerative skeletal changes and esophageal dilatation were also observed. Fine reticular opacities predominantly involving the lower lobes were consistent with pulmonary fibrosis.

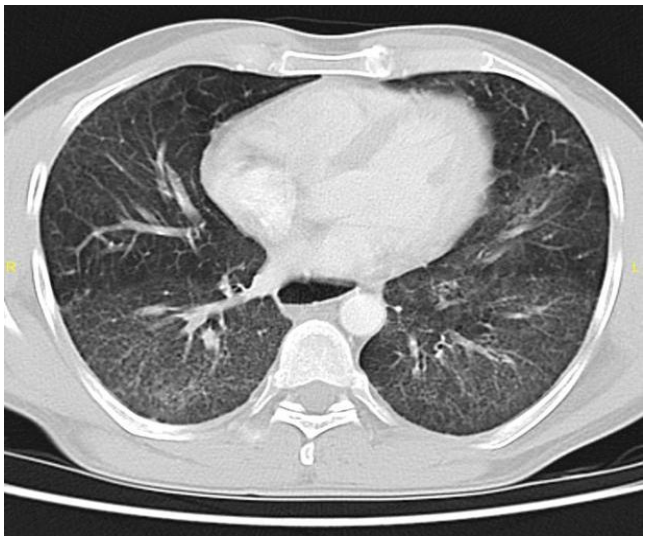

Figure 5: Fine reticular opacities predominantly involving the lower lobes, consistent with pulmonary fibrosis

The patient reported progressive dysphagia over several months. Chest X-ray demonstrated dilatation of the distal two-thirds of the esophagus.



Figure 6: Esophagus dilatation, including atony, lack of peristalsis, and manifested with dysphagia

Transthoracic echocardiography showed concentric left ventricular hypertrophy with preserved left ventricular systolic function (ejection fraction 60%) and no segmental wall motion abnormalities. Additional findings included prolapse of the anterior mitral valve leaflet with mild regurgitation, left atrial enlargement, right ventricular dilatation, tricuspid regurgitation, estimated pulmonary artery pressure (PSAP) of 75-80 mmHg, and right atrial enlargement, indicating severe pulmonary hypertension.

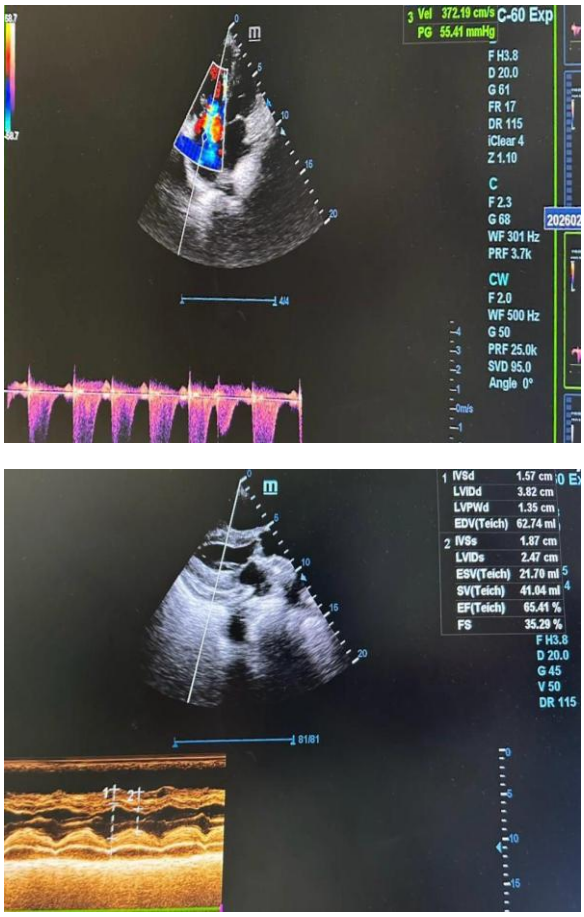

Figure 7 Echocardiography

Pulmonary function testing demonstrated severe mixed ventilator impairment with:

- Forced Vital Capacity (FVC): 33.8% predicted
- Forced Expiratory Volume in one second (FEV1): 34.7% predicted
- FEV1/FVC ratio: 81.24%

Autoimmune testing revealed positive antinuclear antibodies (ANA) and extractable nuclear antigen antibodies (ENA)

	Results	Reference values
ANA	1280	<160
ENA	7.30U/mL	<0.8
C3	110.0mg/dL	83-193
C4	22.9mg/dL	15-57

Genetic analysis demonstrated the following HLA profile:

- HLA-A02/A02
- HLA-B27/B39
- HLA-DRB111/DRB116

The presence of HLA-DRB1* has been associated with an increased risk of developing aggressive interstitial lung disease and pulmonary fibrosis in patients with systemic sclerosis.

The patient was treated with supplemental oxygen therapy, broad-spectrum antibiotics, prednisolone, nifedipine, azathioprine, and domperidone.

4. DISCUSSION AND CONCLUSIONS

Systemic sclerosis is a multisystem autoimmune disease characterized by vascular dysfunction, immune activation, and progressive fibrosis leading to excessive collagen deposition in the skin and internal organs. Pulmonary involvement represents one of the most significant complications and is a leading cause of mortality in affected patients. Systemic sclerosis-associated interstitial lung disease (SSc-ILD) develops in approximately 40-60% of patients and is a major determinant of long-term prognosis. (Fischer, et al. 2015)

In this case, the patient presented with progressive dyspnea, severe hypoxemia, and type I respiratory failure in the setting of known systemic sclerosis and poor therapeutic adherence. Progressive respiratory symptoms in patients with systemic sclerosis should raise suspicion for interstitial lung involvement and prompt comprehensive evaluation, including HRCT, pulmonary function testing, and immunological assessment.

Thoracic CT demonstrated fine reticular opacities with peripheral and lower-lobe predominance, findings consistent with fibrotic interstitial lung disease. This radiological pattern is most commonly associated with nonspecific interstitial pneumonia (NSIP), the predominant histopathological subtype observed in SSc-ILD, although features of usual interstitial pneumonia (UIP) may coexist.

Pulmonary function testing revealed severe impairment with markedly reduced FVC, consistent with advanced pulmonary parenchymal involvement. Furthermore, echocardiographic evidence of severe pulmonary hypertension likely contributed significantly to the patient’s clinical deterioration.

An additional noteworthy finding was the patient's HLA genotype. The HLA-DRB1*11* allele has been associated with susceptibility to systemic sclerosis and increased risk of pulmonary fibrosis. Previous studies have demonstrated an association between HLA-DRB1*11* and anti-topoisomerase I antibody positivity, which is strongly linked to progressive fibrotic lung disease. Proposed mechanisms include enhanced autoantigen presentation to CD4+ T lymphocytes, leading to activation of profibrotic pathways involving TGF-b, IL-6, and platelet-derived growth factor (PDGF), ultimately promoting fibroblast activation and collagen deposition within the pulmonary interstitium. (Raghu, et al. 2022)

Esophageal dilatation represented another important finding in this patient. Gastrointestinal involvement is common in systemic sclerosis and is primarily attributed to smooth muscle dysfunction and autonomic neuropathy. Chronic microaspiration resulting from esophageal dysmotility may further exacerbate pulmonary inflammation and fibrosis, contributing to disease progression. (Distler, et al. 2019)

Management of SSc- ILD requires a multidisciplinary approach focused on controlling inflammation and slowing fibrotic progression. Immunosuppressive therapies such as mycophenolate mofetil and azathioprine remain important therapeutic options, while antifibrotic agents such as nintedanib have demonstrated efficacy in reducing the rate of lung function decline. In this case, treatment consisted of oxygen supplementation, immunosuppressive therapy, and supportive measures aimed at stabilizing respiratory failure and controlling disease activity. (Tashkin, et al. 2016)

This case highlights the importance of early recognition and continuous multidisciplinary follow-up in patients with systemic sclerosis. Poor treatment adherence and inadequate monitoring may contribute significantly to disease progression and the development of severe pulmonary complications.

Pulmonary involvement in systemic sclerosis remains one of the most serious complications and a major determinant of mortality. This case illustrates the progression toward advanced pulmonary fibrosis in the context of inadequate disease monitoring and poor treatment adherence. The clinical, radiological, and functional findings were consistent with severe systemic sclerosis- associated interstitial lung disease.

Identification of genetic susceptibility factors, including the HLA-DRB1*11* allele, may contribute to a better understanding of disease heterogeneity and individual risk for pulmonary fibrotic complications. Nevertheless, diagnosis and management should be based on a comprehensive clinical, radiological, and functional assessment.

This case underscores the importance of early screening for interstitial lung disease in patients with systemic sclerosis, regular multidisciplinary follow-up, and implementation of standardized therapeutic strategies to improve prognosis and quality of life.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Effect Of Experimental Circadian Rhythm Disruption On Heart And Aorta Tissue In Postmenopausal Rats: The Role Of Hormone Replacement Therapy

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Abstract: The circadian rhythm is a fundamental biological mechanism that regulates numerous physiological processes, including cardiovascular functions. The effects of circadian rhythm disruption on heart and vascular health during the postmenopausal period remain incompletely elucidated. Citicoline is a neuroprotective compound known for its membrane-repairing and anti-apoptotic properties. This study aimed to investigate the protective role of citicoline supplementation on heart and aorta tissues in postmenopausal rats subjected to experimental circadian rhythm disruption, at both histopathological and immunohistochemical levels. Female Sprague Dawley rats in the postmenopausal stage were divided into three groups: control (Con), circadian rhythm disruption (CRD), and circadian rhythm disruption + citicoline (CRD+CT, 300 mg/kg/day by gavage). In the CRD groups, circadian rhythm disruption was induced over 21 days using variable light/dark cycles and 24-hour continuous light exposure. At the end of the experiment, heart and aorta tissues were examined histopathologically with hematoxylin-eosin staining, and the expressions of caspase-3 (Cas-3) and inducible nitric oxide synthase (iNOS) were evaluated immunohistochemically. Histopathological examination revealed normal tissue architecture in the control group, whereas the CRD group exhibited myocardial cell damage, microhemorrhages, marked hyperemia, and aortic endothelial sloughing. Citicoline treatment significantly reduced these pathological findings. Immunohistochemical analysis showed significant increases in Cas-3 (heart: 1.14±0.69; aorta: 1.28±0.48) and iNOS (heart: 0.57±0.20; aorta: 0.28±0.18) expressions in the CRD group compared to controls ($p<0.001$). Citicoline treatment completely reversed these elevations, bringing both markers to control levels (0.00±0.00). Circadian rhythm disruption leads to cardiovascular damage in postmenopausal rats via increased apoptosis and nitrosative stress in heart and aorta tissues. Citicoline, through its anti-apoptotic and anti-inflammatory effects, appears to be an effective protective agent against this damage.

Keywords: Circadian rhythm, citicoline, postmenopause, heart, aorta, caspase-3, iNOS, apoptosis.

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INTRODUCTION

The circadian rhythm is the fundamental biological clock governed by the suprachiasmatic nucleus of the hypothalamus, orchestrating the 24-hour regulation of numerous physiological functions, including those of the cardiovascular system [1]. Epidemiological evidence indicates that circadian rhythm disruption, as seen in shift work and chronic jet-lag, increases the risk of hypertension, coronary artery disease, and myocardial infarction [2,3]. Experimental studies have demonstrated that circadian rhythm disruption elevates blood pressure by shifting autonomic balance toward sympathetic dominance, while also triggering endothelial dysfunction and vascular inflammation [4,5]. Chronic circadian disruption has been associated with vascular stiffness and impaired endothelial signaling [6].

The postmenopausal period represents a critical life stage in which cardiovascular risk significantly increases due to estrogen deficiency [7]. Cardiovascular disease is the leading cause of death in postmenopausal women [8]. Estrogen exerts cardioprotective effects through activation of vascular endothelial nitric oxide synthase (eNOS), upregulation of antioxidant enzyme expression, and preservation of mitochondrial function [9]. In postmenopausal women, the circadian variation in endothelial function is lost, with important consequences for coronary heart disease incidence [10]. Estrogen replacement therapy has been shown to reduce blood pressure and restore the normal amplitude of the circadian blood pressure rhythm in postmenopausal hypertension [11]. The cardiovascular effects of menopausal hormone therapy vary according to the timing of initiation (the timing hypothesis), with therapy started close to menopause onset potentially conferring cardiovascular benefit [12,13]. Postmenopausal shift workers are at increased cardiometabolic risk due to the dual effects of estrogen decline and circadian misalignment [14].

Citicoline (CDP-choline) is an essential intermediate in the synthesis of membrane phospholipids and has long been recognized for its neuroprotective effects. Recent studies have shown that citicoline also possesses significant protective effects on the cardiovascular system. Citicoline protects the myocardium from ischemia/reperfusion injury by inhibiting mitochondrial permeability transition [15]. Additionally, it reduces oxidative stress, exerts anti-inflammatory effects, and

inhibits apoptosis [16,17]. Clinical studies have demonstrated that citicoline administration modifies the expression of cardioprotective miRNAs in patients with ST-segment elevation myocardial infarction [18]. The antioxidant and membrane-stabilizing properties of citicoline support its protective potential in cardiovascular pathologies associated with oxidative stress [19].

Caspase-3, the executioner caspase of apoptosis, is a reliable marker of myocardial cell death [20]. Inducible nitric oxide synthase (iNOS), on the other hand, generates excessive nitric oxide under pathological conditions, leading to peroxynitrite formation and exacerbating tissue damage through nitrosative stress [21]. Both markers are frequently co-activated in cardiovascular pathologies.

This study aimed to elucidate the histopathological changes and alterations in caspase-3 and iNOS expression induced by experimental circadian rhythm disruption in heart and aorta tissues of postmenopausal rats, as well as the potential protective role of citicoline treatment on these parameters.

Materials and Methods

Experimental Design

This study was initiated with the approval of the ethics committee of Mehmet Akif Ersoy University (MAKU) Animal Experiments Local Ethics Committee with decision number 29 March 2023/1058. In this study, 8-week-old female Spraque Dawley 24 rats (average 200-300 g) were used. The rats were obtained from Mehmet Akif Ersoy University Experimental Animal Production and Experimental Research Laboratory (MAKÜ-HÜDAL). All rats were provided with ad libitum access to feed and water during the experiment. Animals were kept at 21-23˚C and 55-60% humidity. The 31-day period was programmed as an adaptation period for the first 10 days and experimental period for 21 days. Rats were randomly divided into 3 groups. Except for the control group, the other groups were placed in special cages with adjustable light/dark cycles. Animals were subjected to standard food and drink during the 10-day adaptation period and to HRT addition to the standard diet except for the control and CRD groups during the 21-day experimental period. Except for the control group, the experimental groups whose circadian rhythm was planned to be disrupted by applying light/dark time change were placed in special cages with adjustable light/dark times after 10 days of normal light/dark 12/12 cycles. The program in Figure 1 was applied in the special cage for 21 days to create circadian rhythm disturbance. Circadian rhythm disturbance was induced with light/dark cycles for the first 3 days, continuous light for the next 24 hours, and 12/12 dark/light cycles for the next 3 days. For 21 days, citicoline (CT) were used [22].

Control group (n=6)

The gavage stress applied to the other groups was also applied to this group. Rats were given saline by gavage for 21 days. They were kept in normal light/dark cycle throughout the experiment.

CRD Group (n=8)

They were placed in special cages with adjustable light/dark cycle throughout the experiment. Saline was given by oral gavage for 21 days.

CRD + CT Group (n=8)

They were housed in special cages with adjustable light/dark cycles throughout the experiment. Hormone replacement therapy was administered by oral gavage at citicoline 300 mg/kg during the experiment [22].

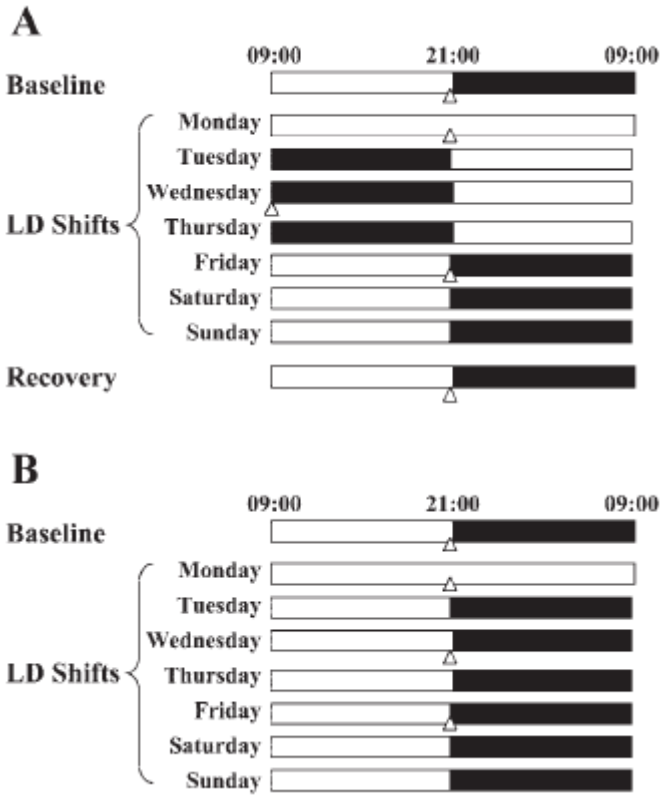

Fig. 1. Schematic representation of lighting schedule for experimental (LS) rats (A) and control (LC) rats (B). Blank horizontal rectangles indicate lights-on periods, and filled rectangles represent lights-off periods. The baseline period lasted at 10 days, the light-dark (LD) shift period 3 wk. Open triangles indicate the time when routine husbandry work was performed [23].

Histopathological analysis:

Samples of the heart and aorta were collected during the necropsy and preserved in 10% buffered formalin solution. Routine tissue processing was done using a completely automatic tissue processing machine (Leica ASP300S, Wetzlar, Germany) prior to the tissues being embedded in paraffin wax. Leica Microsystems, located in Wetzlar, Germany, manufactured a completely automatic rotating microtome that allowed for the cutting of paraffin block sections at a thickness of 5µm. Coverslips and hematoxylin-eosin (HE) stain were utilized for section analysis under a light microscope.

Immunohistochemical examination:

Three series of slices were cut from the paraffin blocks and stained on poly-L-lysine-coated slides for immunohistochemical examination. After that, sections were stained immunohistochemically using the streptavidin-biotin method as directed by the manufacturer to evaluate the expression of Cas-3 and iNOS. Primary anti-iNOS (Anti-iNOS antibody [RM1017] (ab283655)) and cas-3 (Anti-Caspase-3 antibody [EPR18297] (ab184787)) antibodies were used for this purpose. Primary antibodies were obtained from Abcam (Cambridge, UK) and used at a dilution of 1/100. After the primary antibodies were incubated for 60 minutes, the sections were subjected to immunohistochemistry using a biotinylated secondary antibody and streptavidin-alkaline phosphatase conjugate. The secondary antibody was the EXPOSE Mouse and Rabbit Specific HRP/DAB Detection IHC kit (ab80436) from Abcam (Cambridge, UK). Diaminobenzidine (DAB) was used as the chromogen. For negative controls instead of primary antibody step antigen dilution solution was applied. A specialized pathologist from another university conducted each evaluation on blinded samples.

Sections were inspected individually for the immunohistochemical analysis of each antibody. Semiquantitative analysis was performed to evaluate the degree of immunohistochemical reactivity of cells utilizing markers using a grading system from (0) to (3): Negative is denoted by (0), weak staining is represented by (1) focused, weak diffuse staining by (2), and notable diffuse staining by (3). Ten different areas were examined under 40X objective magnification for evaluation in each region. Morphometric analysis and microphotography were performed using the Database Manual Cell Sens Life Science Imaging Software System (Olympus Co., Tokyo, Japan). The results were kept after being subjected to statistics.

Statistical Analysis

To compare the groups' immunohistochemistry scores statistically, the Oneway ANOVA Duncan test from the SPSS-22.00 package program was used. The cutoff for significance was chosen at $P < 0.05$.

Results

Histopathological examination

Histopathological examination of slices of the heart and aorta revealed normal tissue histology in both the control group. Microhemorrhages, myocardial cell damage, and moderate hyperemia were all present in the RU group. Furthermore, endothelial cell sloughing was observed in this cohort. In contrast, the SU group's myocardial and aortic tissue showed less abnormal signs (Fig. 1).

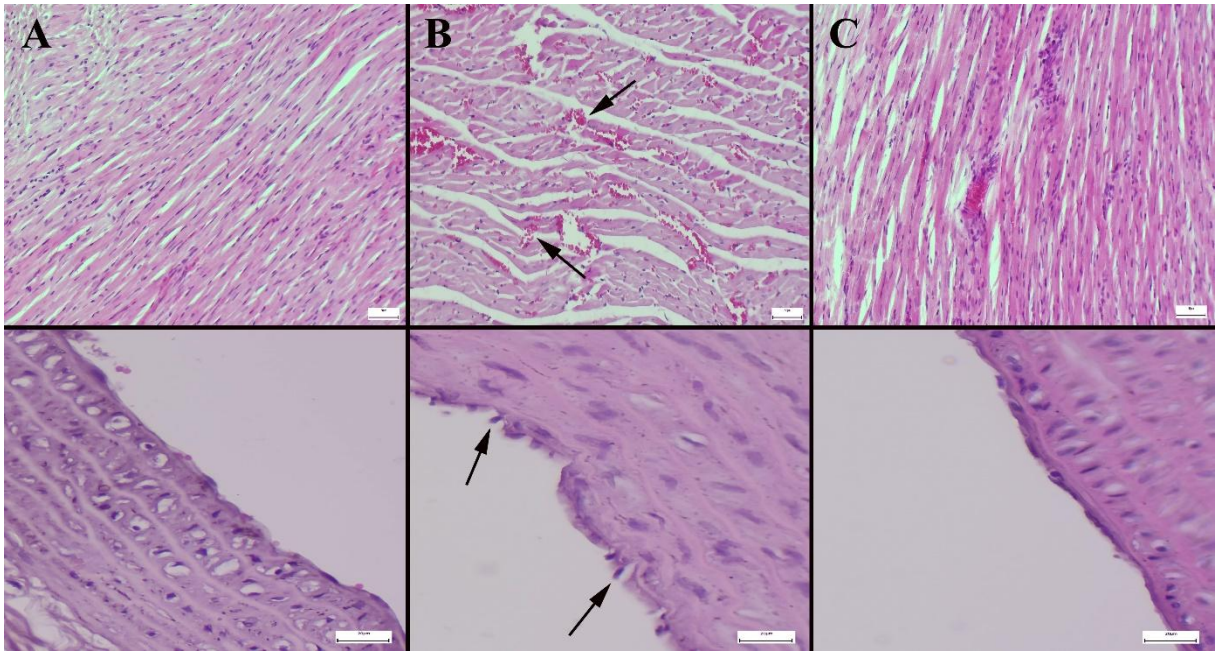

Figure 1. Representative histopathological figures of hearts (upper row) and aorta (below row) sections between the groups. (A) Normal tissue architecture in control group. (B) Myocardial damage, hyperemia and slight hemorrhage (arrows) in myocardium and endothelial sloughing in aortas (arrows) in RU group. (C) Decreased pathological findings in SU group, HE, scale bars=50µm.

Immunohistochemical examination

The control group's expressions of Cas-3 and iNOS were not detected in any of the markers according to immunohistochemical examination. Cas-3 and iNOS expressions in the aortic endothelium and myocardial cells increased slightly to moderately in the RU group. The HE group's expressions dropped as a result of the SU therapy (Fig. 2-3). Table 1 presents the statistical analysis's findings.

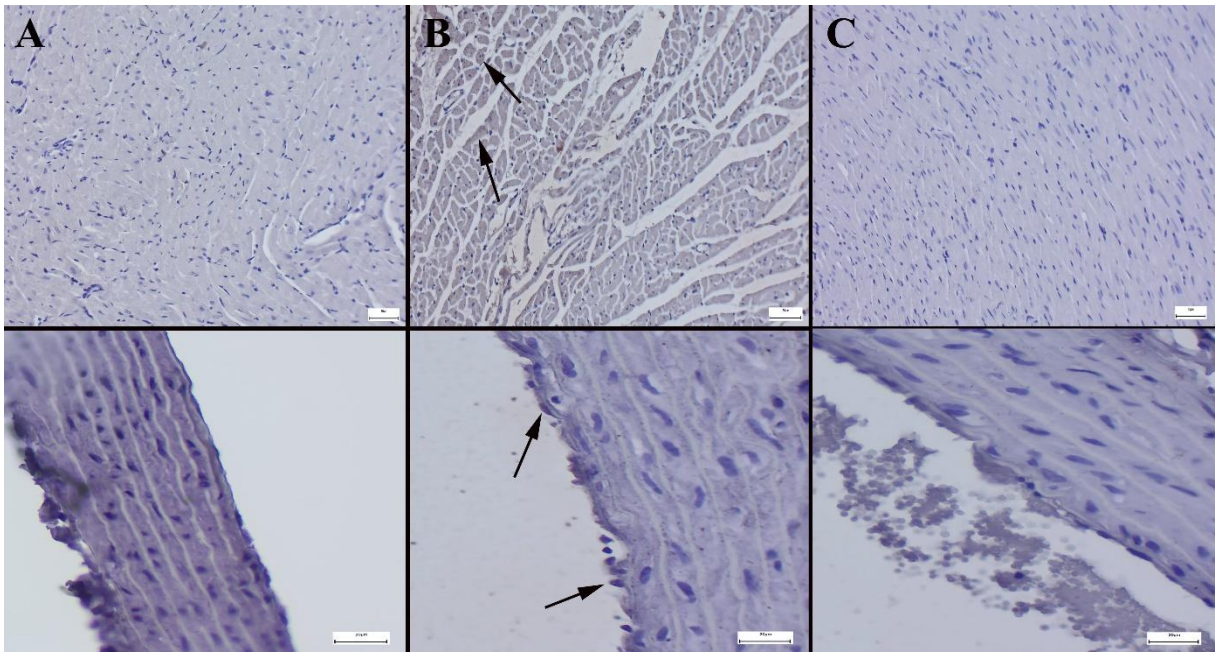

Figure 2. Cas-3 immunohistochemistry findings of hearts (upper row) and aortas (below row) between the groups. (A) Negative expression in Con group. (B) Marked expression in myocardial and endothelial cells (arrows) in RU group. (C) Negative expression in SU group, Streptavidin biotin peroxidase method, scale bars=50µm.

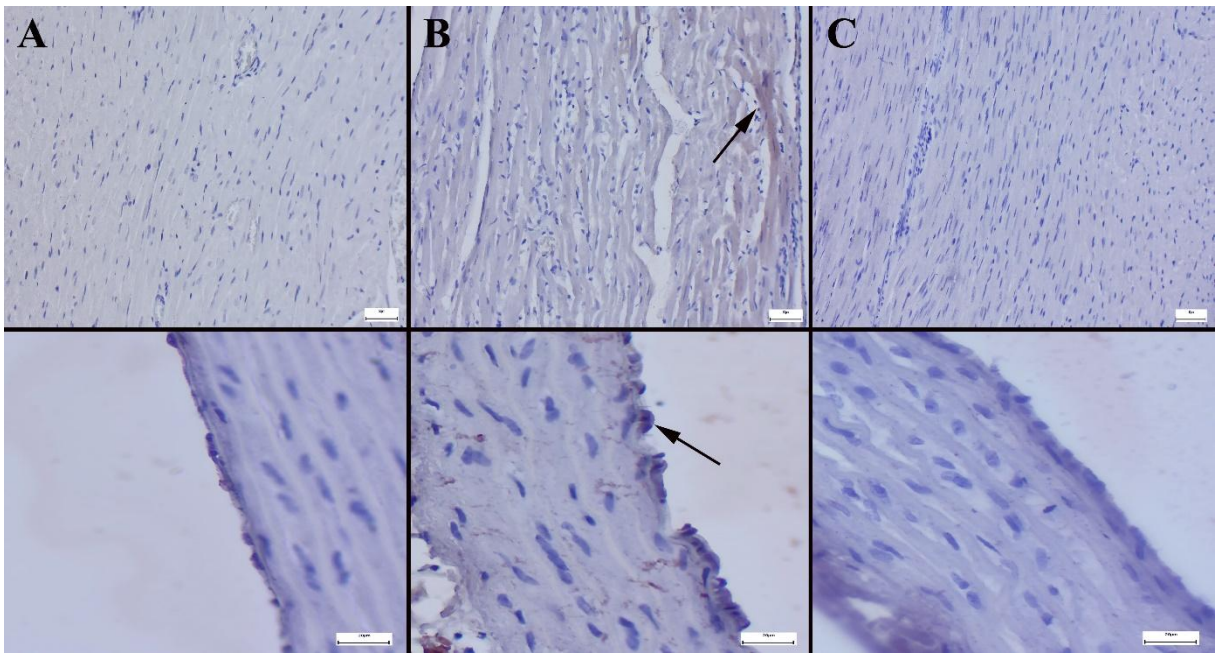

Figure 3. iNOS expressions of hearts (upper row) and aortas (below row) between the groups. (A) Negative expression in Con group. (B) Increase in expressions both myocardium and endothelial cells of the aorta (arrows) in RU group. (C) No expression SU group, Streptavidin biotin peroxidase method, scale bars=50µm.

Table 1. Statistical analysis result of immunohistochemical scores between the groups.

	Groups	Cas-3 scores	iNOS Scores
Heart	Control	0.00±0.00[a]	0.00±0.00[a]
	RU	1.14±0.69[b]	0.57±0.20[b]
	SU	0.00±0.00[a]	0.00±0.00[a]
Aorta	Control	0.00±0.00[a]	0.00±0.00[a]
	RU	1.28±0.48[b]	0.28±0.18[b]
	SU	0.00±0.00[a]	0.00±0.00[a]

Values with superscripts has statistically significant differences compared the control group, $P<0.01$. Data expressed mean ± standard deviation (SD). One-way ANOVA Duncan test.

The investigation's findings demonstrated that SU protects against RU-induced heart and aortic damage.

Discussion

This study demonstrated that experimental circadian rhythm disruption induces significant histopathological damage in heart and aorta tissues of a postmenopausal rat model, and that citicoline treatment markedly reversed this damage. Immunohistochemical findings revealed that circadian rhythm disruption caused significant increases in both apoptosis (caspase-3) and nitrosative stress/inflammation (iNOS) markers in the myocardium and aortic endothelium, while citicoline brought these molecular alterations back to control levels.

The adverse effects of circadian rhythm disruption on the cardiovascular system are increasingly well understood through both clinical and experimental studies. Large-scale epidemiological research on shift workers has shown that circadian dysfunction increases the risk of hypertension, coronary artery disease, and myocardial infarction by up to 40% [24]. The underlying mechanisms include a sympathetic shift in autonomic balance, endothelial dysfunction, chronic activation of inflammatory pathways, and development of metabolic syndrome [25]. Chronic circadian disruption has been associated with vascular stiffness and impaired endothelial signaling [26], and the structural disruption of the aortic endothelium observed in the CRD group in our study is consistent with these findings.

The cardiovascular effects of circadian rhythm disruption become even more pronounced during the postmenopausal period. In postmenopausal women, the circadian variation in endothelial function is lost, with important consequences for coronary heart disease incidence [27]. Experimental studies have shown that chronic phase shifts elevate systolic blood pressure and impair glucose tolerance independently of estrogen deficiency [28]. Postmenopausal shift workers are at increased cardiometabolic risk due to the dual effects of estrogen decline and circadian misalignment [28]. The marked cardiovascular damage induced by circadian rhythm disruption in our postmenopausal rat model supports these clinical observations.

iNOS produces excessive amounts of nitric oxide (NO) under pathological conditions, which reacts with superoxide anions to form peroxynitrite a potent oxidant [29]. Peroxynitrite triggers cell death through lipid peroxidation, protein nitration, and DNA damage. Increased iNOS expression is well documented in cardiovascular diseases, and this increase is associated with myocardial contractile dysfunction, endothelial damage, and vascular remodeling [30]. The elevated iNOS levels observed in the CRD group in our study suggest that circadian dysfunction triggers nitrosative stress in cardiovascular tissues.

Caspase-3, the executioner caspase of apoptosis, initiates the irreversible phase of cell death [31]. Caspase-3 activation has been demonstrated in various cardiovascular pathologies, including myocardial ischemia-reperfusion injury, dilated cardiomyopathy, and atherosclerotic plaque progression [32]. The significant increase in caspase-3 immunoreactivity in heart and aorta tissues of the CRD group indicates that circadian rhythm disruption induces apoptosis in cardiovascular tissues. This finding is important as it demonstrates that circadian rhythm disruption leads not only to functional but also to structural damage.

The cardiovascular protective effects of citicoline are increasingly well understood through recent studies. Citicoline (CDP-choline) protects the myocardium from ischemia/reperfusion injury by inhibiting mitochondrial permeability transition [33]. This effect is mediated through preservation of mitochondrial membrane potential, prevention of calcium

accumulation, and reduction of oxidative stress. Additionally, citicoline inhibits the production of reactive oxygen species and supports cell survival [34,35]. Clinical studies have shown that citicoline administration modifies the expression of cardioprotective miRNAs in patients with ST-segment elevation myocardial infarction, and alters exosome content to contribute to cardioprotection [36]. The antioxidant and membrane-stabilizing effects of citicoline support its protective potential in cardiovascular pathologies associated with oxidative stress [37].

In our study, the reduction of caspase-3 and iNOS expressions to control levels by citicoline treatment demonstrates that the anti-apoptotic and anti-inflammatory effects of citicoline are also valid in cardiovascular tissues. These findings suggest that citicoline may be a potential therapeutic agent in preventing cardiovascular damage due to circadian rhythm disruption. The mechanism of action of citicoline may involve membrane stabilization, preservation of mitochondrial function, reduction of oxidative stress, and inhibition of apoptotic pathways.

In the management of cardiovascular risk during the postmenopausal period, preservation of circadian rhythm integrity should be considered an important goal. In conditions characterized by circadian dysfunction, such as shift work, chronic insomnia, and sleep apnea, postmenopausal women may require closer cardiovascular monitoring. The evaluation of safe and well-tolerated neuroprotective/cardioprotective agents such as citicoline in this context may offer new treatment options in clinical practice.

Conclusion

This study demonstrated that experimental circadian rhythm disruption leads to significant histopathological damage and increased apoptosis (caspase-3) and nitrosative stress/inflammation (iNOS) in heart and aorta tissues of postmenopausal rats. Citicoline administration significantly suppressed these pathological changes, exerting a protective effect.

Significance and Valuable Findings of the Study

1. This study comprehensively demonstrates, for the first time, the adverse effects of circadian rhythm disruption on the cardiovascular system during the postmenopausal period at both histopathological and immunohistochemical levels.

2. The anti-apoptotic and anti-inflammatory effects of citicoline in cardiovascular tissues have been experimentally proven in this study. Citicoline exhibited a strong protective profile by reducing caspase-3 and iNOS expressions to control levels.

3. The findings emphasize that circadian rhythm disruption should be considered an independent cardiovascular risk factor during the postmenopausal period.

4. With its favorable safety profile and ease of administration, citicoline is a promising therapeutic candidate for preventing cardiovascular damage associated with circadian rhythm disruption in the postmenopausal period.

Directions for Future Studies

1. Dose-response studies comparing different citicoline doses and administration durations should be conducted.

2. More detailed investigation of the molecular pathways involved in the protective effects of citicoline (PI3K/Akt, MAPK/ERK, Nrf2/ARE, mitochondrial permeability transition) is needed.

3. Evaluation of biochemical parameters such as oxidative stress markers (MDA, SOD, GSH) and inflammatory cytokine profiles (TNF-α, IL-6, IL-1β) would enhance understanding of the protective mechanisms.

4. Studies measuring melatonin and corticosterone rhythms for objective confirmation of circadian rhythm disruption should be planned.

5. Inclusion of non-invasive cardiac function assessments (echocardiography, blood pressure telemetry) would contribute to demonstrating functional recovery.

6. These preclinical findings are expected to lay the groundwork for clinical trials investigating the cardioprotective effect of citicoline in postmenopausal women with circadian rhythm disruption.

Study Limitations

1. The evaluation was limited to histopathological and immunohistochemical parameters; oxidative stress markers (MDA, SOD, GSH), inflammatory cytokine profiles (TNF-α, IL-6, IL-1β), and cardiac function parameters (echocardiography, blood pressure measurement) were not assessed.

2. Citicoline was evaluated only at a single dose (300 mg/kg); the effects of different doses were not compared.

3. The experimental period was relatively short (21 days), and long-term effects of chronic citicoline administration could not be observed.

4. Biochemical markers such as melatonin or corticosterone rhythms were not measured to objectively confirm circadian rhythm disruption.

5. The study was conducted in an animal model, and extrapolation of the findings to humans is limited.

Despite these limitations, our study provides important preclinical evidence demonstrating the potential role of citicoline in preventing cardiovascular damage associated with circadian rhythm disruption during the postmenopausal period.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Effect Of Experimental Circadian Rhythm Disruption On Heart And Aorta Tissue In Postmenopausal Rats: The Role Of Hormone Replacement Therapy

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Abstract: This study aimed to investigate the histopathological and immunohistochemical changes in heart and aorta tissues in a postmenopausal rat model of experimental circadian rhythm disruption (CRD) and to evaluate the potential protective effects of hormone replacement therapy (HRT). Postmenopausal Sprague Dawley rats were divided into three groups: control, CRD, and CRD+HRT (drospirenone 0.033 mg/kg/day + estradiol 0.016 mg/kg/day). CRD was induced over 21 days using variable light/dark cycles and 24-hour continuous light exposure. At the end of the experiment, heart and aorta tissues were examined histopathologically with hematoxylin-eosin staining, and caspase-3 and iNOS expressions were evaluated immunohistochemically. Normal tissue architecture was observed in the control group, whereas the CRD group exhibited myocardial cell damage, mild hyperemia, microhemorrhages, and aortic endothelial sloughing. Immunohistochemical analysis revealed significantly increased caspase-3 and iNOS expressions in the heart and aorta of the CRD group compared to controls ($p<0.01$). In the HRT-treated group, histopathological findings were markedly attenuated, and caspase-3 and iNOS immunoreactivity returned to near-control levels. These findings indicate that CRD promotes cardiovascular damage in the postmenopausal period by increasing apoptosis and nitrosative stress in heart and aorta tissues, and that HRT effectively prevents this damage through anti-apoptotic and anti-inflammatory mechanisms.

Keywords: Circadian rhythm, hormone replacement therapy, postmenopause, heart, aorta, caspase-3, iNOS, apoptosis.

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38. INTRODUCTION

The circadian rhythm is the fundamental biological clock governed by the suprachiasmatic nucleus of the hypothalamus, orchestrating the 24-hour regulation of numerous physiological functions, including those of the cardiovascular system [1]. Epidemiological evidence indicates that circadian rhythm disruption (CRD), as seen in shift work and chronic jet-lag conditions, increases the risk of hypertension, coronary artery disease, and myocardial infarction [2]. Experimental studies have demonstrated that CRD elevates blood pressure by shifting autonomic balance toward sympathetic dominance, while also triggering endothelial dysfunction and vascular inflammation [3,4].

The postmenopausal period represents a life stage in which cardiovascular risk significantly increases due to estrogen deficiency [5]. Estrogen exerts cardioprotective effects through activation of vascular endothelial nitric oxide synthase (eNOS), upregulation of antioxidant enzyme expression, and preservation of mitochondrial function [6]. However, the effects of CRD on the cardiovascular system in postmenopausal women and the potential role of hormone replacement therapy (HRT) in this context remain insufficiently investigated.

Caspase-3, the executioner caspase of apoptosis, serves as a reliable marker of myocardial cell death [7]. Inducible nitric oxide synthase (iNOS), on the other hand, generates excessive nitric oxide under pathological conditions, leading to peroxynitrite formation and exacerbating tissue damage through nitrosative stress [8]. Both markers are frequently co-activated in cardiovascular pathologies.

The present study was designed to elucidate the histopathological alterations and changes in caspase-3 and iNOS expression induced by experimental CRD in heart and aorta tissues of postmenopausal rats, as well as the potential protective role of HRT on these parameters.

39. MATERIALS AND METHODS

Experimental Design

This study was initiated with the approval of the Ethics Committee of Mehmet Akif Ersoy University (MAKU) Animal Experiments Local Ethics Committee (decision no. 29 March 2023/1057). Eight-week-old female Sprague Dawley rats (n=29, average weight 200–300 g) were obtained from Mehmet Akif Ersoy University Experimental Animal Production and Experimental Research Laboratory (MAKÜ-HÜDAL). All rats were provided with ad libitum access to feed and

water throughout the experiment. Animals were maintained at 21–23°C and 55–60% humidity. The 31-day experimental period comprised a 10-day adaptation phase followed by a 21-day experimental phase. Rats were randomly divided into three groups. Except for the control group, animals were housed in specialized cages with adjustable light/dark cycles. During the 10-day adaptation period, all groups received standard diet; during the 21-day experimental period, HRT was added to the standard diet of the CRD+HRT group. For the CRD and CRD+HRT groups, following 10 days of normal 12/12-hour light/dark cycles, animals were placed in cages with adjustable light/dark schedules to induce circadian rhythm disruption using the protocol illustrated in Figure 1. CRD was induced through light/dark cycles for the first 3 days, followed by 24 hours of continuous light, and then 12/12-hour dark/light cycles for the subsequent 3 days, repeated over 21 days. HRT was administered throughout this period [9].

Control Group (n=6)

This group received the same gavage stress applied to the other groups. Rats were administered saline by oral gavage for 21 days and maintained under normal light/dark cycles throughout the experiment.

CRD Group (n=8)

These animals were housed in specialized cages with adjustable light/dark cycles for the duration of the experiment. Saline was administered by oral gavage for 21 days.

CRD + HRT Group (n=8)

Animals were housed in specialized cages with adjustable light/dark cycles. Hormone replacement therapy (drospirenone 0.033 mg/kg/day + estradiol 0.016 mg/kg/day) was administered by oral gavage throughout the 21-day experimental period [9].

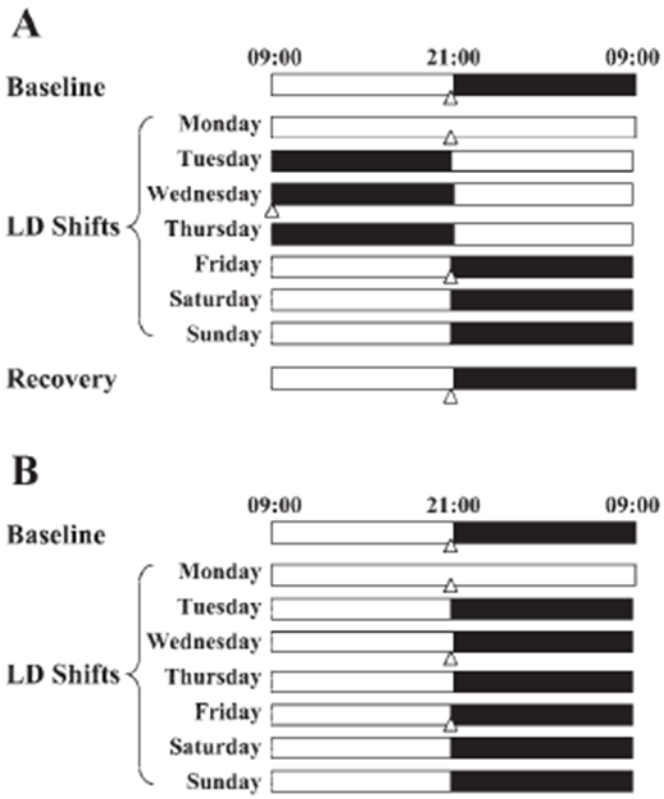

Fig. 1. Schematic representation of lighting schedule for experimental (LS) rats (A) and control (LC) rats (B). Blank horizontal rectangles indicate lights-on periods, and filled rectangles represent lights-off periods. The baseline period lasted 10 days; the light-dark (LD) shift period lasted 3 weeks. Open triangles indicate the time when routine husbandry work was performed [10].

Histopathological Analysis

During necropsy, samples of the heart and aorta were collected and fixed in 10% buffered formalin solution. Before embedding in paraffin wax, tissues underwent routine processing using a fully automatic tissue processor (Leica ASP300S, Wetzlar, Germany). Paraffin block sections were cut at 5 µm thickness using a fully automatic rotary

microtome (Leica RM2155, Leica Microsystems, Wetzlar, Germany). Hematoxylin-eosin (HE) staining and coverslips were used for light microscopic examination.

Immunohistochemical Examination

For immunohistochemical analysis, three series of sections were cut from paraffin blocks and mounted on poly-L-lysine-coated slides. Sections were stained immunohistochemically using the streptavidin-biotin method according to the manufacturer's instructions to evaluate caspase-3 and iNOS expression. Primary antibodies used were anti-caspase-3 (Anti-Caspase-3 antibody [EPR18297] (ab184787)) and anti-iNOS (Anti-iNOS antibody [RM1017] (ab283655)), both purchased from Abcam (Cambridge, UK) and used at 1/100 dilution. Following 60-minute incubation with primary antibodies, sections were processed using a biotinylated secondary antibody and streptavidin-alkaline phosphatase conjugate. The secondary antibody used was the EXPOSE Mouse and Rabbit Specific HRP/DAB Detection IHC kit (ab80436) from Abcam (Cambridge, UK). Diaminobenzidine (DAB) served as the chromogen. For negative controls, antigen dilution solution was applied instead of primary antibody. All evaluations were performed by a specialized pathologist from another university on blinded samples.

For immunohistochemical analysis, sections were examined separately for each antibody. Semiquantitative analysis was performed using a grading scale from 0 to 3: 0 = negative, 1 = weak focal staining, 2 = weak diffuse staining, and 3 = marked diffuse staining. Ten distinct areas were examined under 40× objective magnification in each section. Morphometric analysis and microphotography were performed using the Database Manual Cell Sens Life Science Imaging Software System (Olympus Co., Tokyo, Japan). Results were recorded and subjected to statistical analysis.

Statistical Analysis

Statistical comparisons of immunohistochemistry scores between groups were performed using One-way ANOVA with Duncan's post-hoc test from the SPSS-22.0 software package. The significance threshold was set at $p < 0.05$.

40. RESULTS

Histopathological Examination

Histopathological examination of heart and aorta sections revealed normal tissue architecture in the control group. The CRD group exhibited mild hyperemia, microhemorrhages, and myocardial cell injury. Additionally, endothelial cell sloughing was observed in this group. The HRT-treated group showed reduced pathological findings in both myocardial and aortic tissues (Fig. 1).

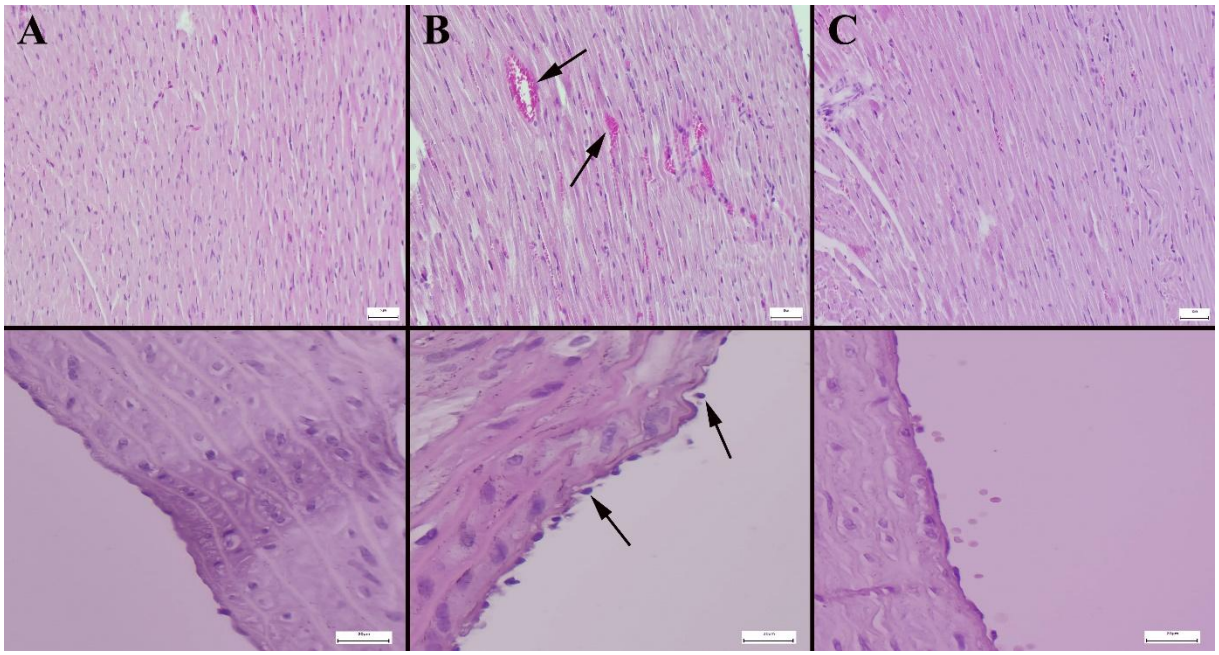

****Figure 1.**** Representative histopathological figures of heart (upper row) and aorta (lower row) sections from each group. (A) Normal tissue architecture in the control group. (B) Myocardial damage, hyperemia, and slight hemorrhage (arrows) in myocardium and endothelial sloughing in aorta (arrows) in the CRD group. (C) Decreased pathological findings in the HRT group. HE, scale bars = 50 μm.

Immunohistochemical Examination

Immunohistochemical analysis revealed no expression of caspase-3 or iNOS in the control group. In the CRD group, mild to moderate increases in caspase-3 and iNOS expressions were observed in myocardial cells and aortic endothelium. HRT treatment resulted in decreased expressions in the treatment group (Fig. 2–3). Statistical analysis results are presented in Table 1.

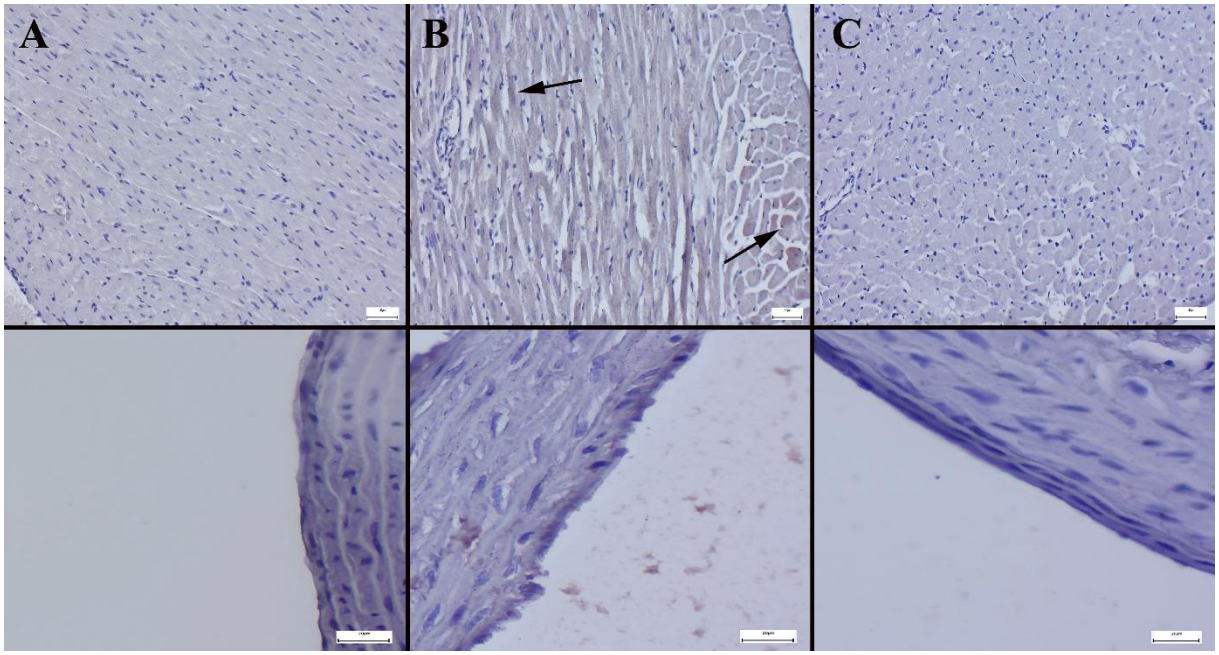

Figure 2. Caspase-3 immunohistochemistry findings in heart (upper row) and aorta (lower row) sections from each group. (A) Negative expression in the control group. (B) Marked expression in myocardial and endothelial cells (arrows) in the CRD group. (C) Negative expression in the HRT group. Streptavidin-biotin peroxidase method, scale bars = 50 µm.

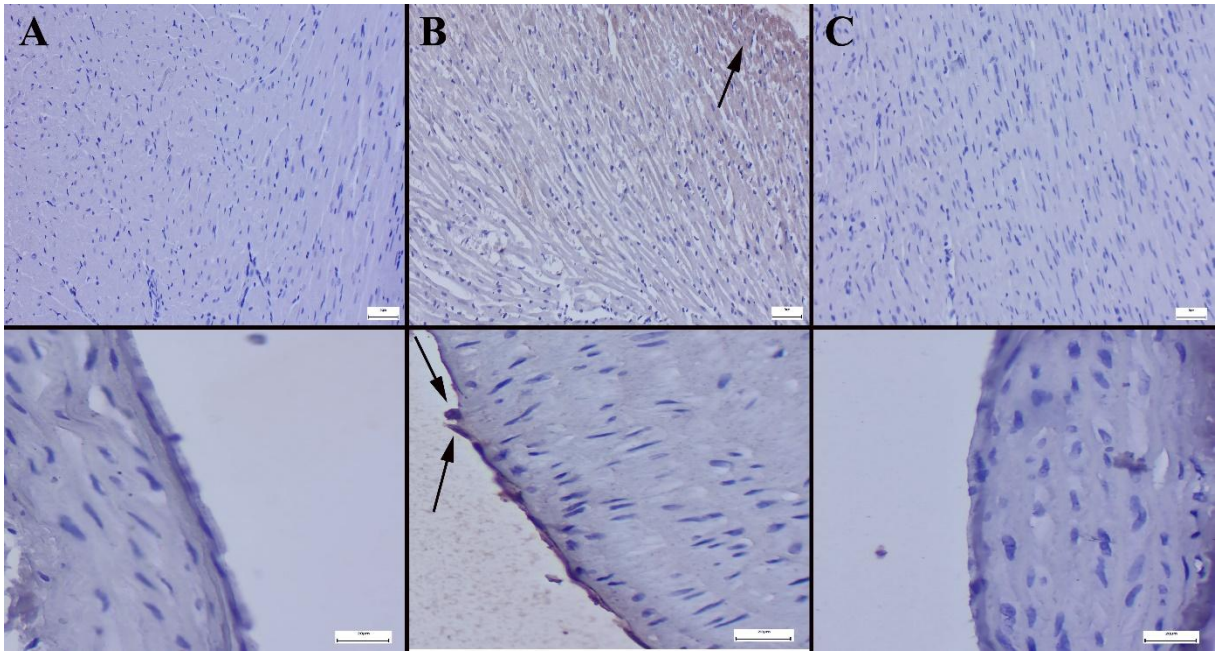

Figure 3. iNOS expressions in heart (upper row) and aorta (lower row) sections from each group. (A) Negative expression in the control group. (B) Increased expression in both myocardium and aortic endothelial cells (arrows) in the CRD group. (C) No expression in the HRT group. Streptavidin-biotin peroxidase method, scale bars = 50 µm.

Table 1. Statistical analysis results of immunohistochemical scores between groups.

	Groups	Cas-3 scores	iNOS Scores
Heart	Control	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}
	RE	1.71 ± 0.48^{b}	1.14 ± 0.69^{b}
	HE	0.12 ± 0.12^{a}	0.12 ± 0.12^{a}
Aorta	Control	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}
	RE	1.57 ± 0.53^{b}	1.14 ± 0.89^{b}
	HE	0.12 ± 0.12^{a}	0.12 ± 0.12^{a}

Values with different superscripts indicate statistically significant differences compared to the control group ($p < 0.01$). Data expressed as mean ± standard deviation (SD). One-way ANOVA with Duncan's post-hoc test.

The results of this investigation demonstrated that HRT exerts a protective effect against heart and aortic damage induced by CRD.

41. DISCUSSION

This study demonstrated that experimental circadian rhythm disruption (CRD) induces significant histopathological damage in heart and aorta tissues in a postmenopausal rat model, and that hormone replacement therapy (HRT) markedly reverses this damage. Immunohistochemical findings revealed that CRD caused significant increases in both apoptosis (caspase-3) and nitrosative stress/inflammation (iNOS) markers in the myocardium and aortic endothelium, while HRT brought these molecular alterations close to control levels.

The adverse effects of CRD on the cardiovascular system are increasingly well understood through both clinical and experimental studies. Large-scale epidemiological research on shift workers has shown that circadian dysfunction increases the risk of hypertension, coronary artery disease, and myocardial infarction by up to 40% [2]. The underlying mechanisms include sympathetic shift in autonomic balance, endothelial dysfunction, chronic activation of inflammatory pathways, and development of metabolic syndrome [3]. The myocardial cell damage, hyperemia, microhemorrhages, and aortic endothelial sloughing observed in the CRD group in our study can be interpreted as experimental correlates of these clinical findings.

In experimental models, disruption of the light/dark cycle has been shown to shift cardiac autonomic balance toward sympathetic predominance, reduce baroreflex sensitivity, and increase myocardial oxygen consumption [10]. Similarly, in mice subjected to chronic jet-lag models, decreased eNOS phosphorylation in the aortic endothelium, enhanced vascular inflammatory responses, and impaired endothelium-dependent vasodilation have been reported [4]. The structural disruption of the aortic endothelium and increased iNOS expression observed in our findings are the histopathological and molecular correlates of this endothelial damage.

iNOS produces excessive amounts of nitric oxide (NO) under pathological conditions, which reacts with superoxide anions to form peroxynitrite, a potent oxidant [8]. Peroxynitrite triggers cell death through lipid peroxidation, protein nitration, and DNA damage. Increased iNOS expression is well documented in cardiovascular diseases, and this increase is associated with myocardial contractile dysfunction, endothelial damage, and vascular remodeling [11]. The elevated iNOS levels observed in the CRD group in our study suggest that circadian dysfunction triggers nitrosative stress in cardiovascular tissues.

Caspase-3, the executioner caspase of apoptosis, initiates the irreversible phase of cell death [7]. Caspase-3 activation has been demonstrated in various cardiovascular pathologies, including myocardial ischemia-reperfusion injury, dilated cardiomyopathy, and atherosclerotic plaque progression [12]. The significant increase in caspase-3 immunoreactivity in heart and aorta tissues of the CRD group indicates that circadian rhythm disruption induces apoptosis in cardiovascular tissues. This finding is important as it demonstrates that CRD leads not only to functional but also to structural damage.

The postmenopausal period is characterized by a marked increase in cardiovascular risk due to estrogen deficiency. Epidemiological data indicate a 2- to 4-fold increase in cardiovascular disease incidence in postmenopausal women compared to the premenopausal period [5]. Estrogen exerts cardioprotective effects through eNOS activation in vascular endothelial cells, upregulation of antioxidant enzyme expression, preservation of mitochondrial function, and suppression of pro-inflammatory cytokine production [6]. The loss of these protective mechanisms with menopause renders the cardiovascular system more vulnerable to environmental stressors.

Sleep disorders are significantly more prevalent in postmenopausal women compared to the premenopausal period. Vasomotor symptoms (hot flashes, night sweats) lead to sleep fragmentation, disrupting circadian rhythm balance [13]. This suggests a bidirectional interaction between CRD and cardiovascular risk in the postmenopausal period. The marked cardiovascular damage induced by CRD in our postmenopausal rat model indicates that estrogen deficiency exacerbates the adverse effects of CRD.

Whether HRT provides cardiovascular protection in the postmenopausal period has been a subject of debate in recent years. The initial results of the Women's Health Initiative (WHI) study suggested that HRT increases coronary heart disease risk; however, subsequent analyses have demonstrated that the age at treatment initiation and time since menopause (the timing hypothesis) are critical determinants of outcomes [14,15]. Growing evidence supports that HRT initiated in the early postmenopausal period may reduce cardiovascular event risk [16]. In our study, the control-level expression of caspase-3 and iNOS in HRT-treated postmenopausal rats supports the anti-apoptotic and anti-inflammatory effects of HRT in cardiovascular tissues.

The molecular protective mechanisms of estrogen include suppression of apoptosis through preservation of mitochondrial membrane potential, upregulation of Bcl-2 family anti-apoptotic proteins, and inhibition of cytochrome c release [17]. Additionally, estrogen suppresses iNOS and other pro-inflammatory gene transcription by inhibiting the NF-κB signaling pathway [18]. Our findings, showing that caspase-3 and iNOS immunoreactivity approached control levels in the HRT group, are consistent with these mechanisms.

Drospirenone, a spironolactone-derived progestin, may exhibit antihypertensive and vascular protective effects through mineralocorticoid receptor antagonism [19]. Aldosterone is known to promote vascular inflammation, fibrosis, and oxidative stress; thus, mineralocorticoid receptor blockade by drospirenone may mitigate these adverse effects [20]. The drospirenone + estradiol combination used in our study may have suppressed cardiovascular damage through these dual protective mechanisms.

Our findings suggest that circadian rhythm disruption may be an independent risk factor for cardiovascular disease development in postmenopausal women. Conditions characterized by circadian dysfunctio, such as shift work, chronic insomnia, and sleep apnea, may warrant closer cardiovascular monitoring in postmenopausal women. HRT should be considered as a potential protective strategy in this context, within the framework of individualized treatment approaches aligned with the timing hypothesis.

Study Limitations

The main limitations of this study include: (i) evaluation was limited to histopathological and immunohistochemical parameters; oxidative stress markers (MDA, SOD, GSH), inflammatory cytokine profiles (TNF-α, IL-6, IL-1β), and cardiac function parameters (echocardiography, blood pressure measurement) were not assessed; (ii) only a single dose combination of HRT was evaluated; (iii) the relatively short experimental period precluded observation of chronic effects; (iv) biochemical markers such as melatonin or corticosterone rhythms were not measured to objectively confirm circadian rhythm disruption.

Future Directions

Future studies should compare the effects of different HRT regimens (various estrogen/progestin combinations and doses), investigate the role of treatment timing (early vs. late postmenopausal period) on cardiovascular protective efficacy, incorporate non-invasive cardiac function assessments (echocardiography, blood pressure telemetry), and examine the dose-response relationship between severity of circadian rhythm disruption and cardiovascular damage. Furthermore, detailed investigation of the molecular pathways involved in the protective effects of HRT (PI3K/Akt, MAPK/ERK, Nrf2/ARE) would contribute to identifying potential therapeutic targets. The findings of this study provide a preclinical evidence base for future clinical trials investigating the role of HRT in preventing cardiovascular damage associated with circadian rhythm disruption during the postmenopausal period.

42. CONCLUSION

This study demonstrated that experimental circadian rhythm disruption leads to significant histopathological damage and increased apoptosis (caspase-3) and nitrosative stress/inflammation (iNOS) in heart and aorta tissues of postmenopausal rats. HRT administration significantly suppressed these pathological changes, exerting a protective effect. These findings

indicate that preservation of circadian rhythm integrity is critical for cardiovascular health during the postmenopausal period, and that HRT may exert cardioprotective effects through anti-apoptotic and anti-inflammatory mechanisms.

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Ethics Committee Approval

None.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Beyond Borders: The New Patient Journey How Patients Are Rethinking Where And How They Access Dental Care

ORION MUCAJ

Abstract: Dental tourism has quietly grown from a niche cost-cutting workaround into one of the most structurally significant shifts in global healthcare behaviour. Today, approximately 1.2 million Americans and 750,000 Europeans cross international borders every year in search of oral healthcare — and the numbers keep rising. This article proposes and validates a seven-stage model of the New Patient Journey in dental tourism: Trigger, Search, Evaluation, Commitment, Treatment, Recovery, and Reintegration. The model is grounded in a systematic review of 31 peer-reviewed studies, supplemented by industry market data and patient satisfaction surveys. The findings confirm that cost savings of 50–80% remain the dominant driver of dental tourism demand. But they also reveal something less obvious: that digital facilitation, quality convergence between origin and destination markets, and peer-driven social media content are reshaping every stage of the journey in ways that go far beyond simple price arbitrage. The most urgent unresolved challenge is what this paper terms the Reintegration Gap — the systematic absence of post-return clinical support that leaves patients without institutional follow-up during precisely the period when complications are most likely to emerge. The article closes with five concrete policy recommendations targeting continuity-of-care protocols, standardised discharge documentation, and bilateral health agreements between origin and destination states.

Keywords: dental tourism, patient journey, health consumerism, teledentistry, continuity of care, cross-border healthcare, patient decision-making, medical travel

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1. INTRODUCTION

There is a moment that almost every dental tourist describes in almost exactly the same way. They are sitting in a dental chair in a foreign country — Tirana, Budapest, Bangkok, Tijuana — and they feel a sudden flicker of doubt. Not about the dentist, who is professional and reassuring. Not about the equipment, which is modern and familiar. But about the system itself: what happens if something goes wrong after I go home? That moment of doubt is the most important insight in this paper. It is the crack in an otherwise compelling value proposition, and it marks the point at which the New Patient Journey most urgently needs structural support that, right now, does not exist.

Dental tourism is no longer a marginal phenomenon. The global dental tourism market was valued at approximately $6.6 billion in 2023 and is projected to reach $20.3 billion by 2030, growing at a compound annual rate of 17.5% (Global Market Insights, 2024). In the United States, where roughly 74 million adults lack dental insurance and average implant costs exceed $4,500 per tooth, cross-border dental care has become a mainstream consumer decision rather than an exotic workaround (American Dental Association, 2023). In the United Kingdom, the near-collapse of NHS dentistry — with an estimated 7.6 million patients unable to access an NHS appointment in 2022–2023 (NHS England, 2023) — has pushed hundreds of thousands of British patients toward Eastern Europe, Turkey, and beyond. Across Western Europe more broadly, dental out-of-pocket expenditure averages €650 per adult per year (Eurostat, 2023), sustaining a persistent and growing pool of price-sensitive demand.

What the literature has not adequately captured is not the scale of this movement, but the shape of it. Existing research tends to focus on aggregate market data, destination country economics, or post-treatment satisfaction scores. Very few studies have mapped the patient experience as a sequential journey — a series of stages that begins long before the flight is booked and ends long after the patient returns home. This is a significant gap. The decisions patients make at each stage of that journey — and the support, or lack of support, they receive along the way — determine not just whether they are satisfied, but whether they are safe.

This paper addresses that gap directly. It proposes and validates a seven-stage model of the New Patient Journey in dental tourism, identifies the critical friction points and support deficits at each stage, and draws on systematic evidence to propose policy interventions that could make cross-border dental care safer, more transparent, and more clinically continuous. The argument throughout is not that dental tourism is dangerous — the evidence does not support that conclusion. The argument is that the infrastructure surrounding the patient journey has not kept pace with the journey itself, and that closing that gap is both achievable and urgent.

2. LITERATURE REVIEW

2.1 The Evolution of Dental Tourism Research

The academic study of dental tourism has moved through three broad phases. The first, running roughly from 2005 to 2012, was largely descriptive: researchers were mapping the phenomenon, establishing its scale, and debating whether it constituted a genuine healthcare trend or a temporary arbitrage strategy. Carrera and Bridges (2006) provided the foundational definition of medical tourism as cross-border travel motivated by cost, access, or quality considerations, and early studies applied this framework to explain why patients from high-income countries were travelling to lower-cost destinations. The consensus from this period was that cost savings — typically 50–70% compared to home country prices — were the overwhelmingly dominant driver (Horowitz, Rosenberg, & Kleinman, 2007; Connell, 2006).

The second phase, from roughly 2012 to 2020, shifted the focus toward consequences — for patients, for destination country health systems, and for the emerging regulatory frameworks attempting to govern cross-border care. Lunt et al. (2011) produced what remains the most comprehensive scoping review of the field, identifying both the economic multiplier effects of medical tourism and its equity risks. Crooks et al. (2011) began to examine what happened to patients after they returned home — an understudied phase that this paper addresses directly.

The third and current phase, accelerating since 2020, reflects a sector transformed by digital platforms, teledentistry, and post-pandemic shifts in consumer health behaviour. Turner (2021) documented the explosion of dental tourism facilitator platforms — websites, apps, and social media communities that now mediate almost every stage of the patient journey. Petersen and Kwan (2022) examined the role of peer review content in destination selection, finding that patients rated social media recommendations above professional accreditation bodies as trust signals. Vujicic et al. (2023) confirmed that the post-pandemic demand surge in dental tourism was structurally driven — not merely pent-up demand, but a permanent shift in how a growing segment of the population thinks about where to access care.

2.2 What the Literature Has Missed: The Journey Framework

Despite this rich body of work, the literature has a structural gap: it rarely examines dental tourism as an end-to-end patient experience. Studies tend to isolate single stages — the decision to travel, the treatment experience, the economic impact on host countries — without connecting them into a coherent sequential model. This matters for two reasons. First, the patient's experience is profoundly shaped by what happens between stages: the anxiety between Search and Commitment, the vulnerability between treatment completion and the flight home, the isolation of the post-return period when complications are most likely to emerge. Second, policy interventions designed to address only one stage — typically treatment quality through accreditation — miss the systemic failures that occur at transitions between stages.

The closest existing framework is Crooks et al.'s (2013) four-stage model of medical tourism decision-making: awareness, decision, travel, and return. While useful, this model is too coarse for the dental tourism journey specifically. It collapses what are actually three distinct post-decision stages — Commitment, Treatment, and Recovery — into a single travel phase, and treats Return as a conclusion rather than a beginning. The seven-stage model proposed in this paper is designed to address these limitations.

2.3 The Reintegration Problem

The most consistently underexamined aspect of dental tourism in the existing literature is what happens when the patient comes home. Crooks et al. (2011) were among the first to flag this as a clinical risk: patients returning from dental procedures abroad frequently face difficulties accessing follow-up care from domestic providers, whether due to professional reluctance to treat another dentist's work, lack of standardised documentation, or simple unfamiliarity with the materials and techniques used. A survey of UK general dental practitioners by the British Dental Association (2019) found that 68% reported treating patients for complications arising from dental tourism procedures, and that 43% said they had insufficient clinical information to manage those complications effectively. This paper terms this structural failure the Reintegration Gap, and positions it as the most urgent policy challenge in dental tourism today.

3. METHODOLOGY

3.1 Research Design

This study employs a systematic review methodology combined with a conceptual framework development approach. The goal is not to generate new primary data on dental tourism patients, but to synthesise the existing evidence base in a way that produces a validated, stage-specific model of the patient journey — one that is grounded in the literature, consistent with available market data, and actionable for policymakers and healthcare providers.

3.2 Literature Search Protocol

A systematic search of peer-reviewed literature was conducted across four databases: PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar. Search terms included combinations of: "dental tourism," "medical tourism," "cross-border dental care," "patient journey," "health consumerism," "teledentistry," "continuity of care," and "medical travel." The search was limited to English-language publications between 2006 and 2024. Initial screening yielded 187 potentially relevant articles; after applying inclusion and exclusion criteria, a final corpus of 31 studies was identified for systematic review. Industry market data from the Global Market Insights Dental Tourism Report (2024), the Medical Tourism Association Global Index (2024), and national health survey data from the United States, United Kingdom, Germany, and Australia were incorporated to provide quantitative grounding for the model's stage descriptions.

3.3 Framework Development

The seven-stage model was developed through an iterative process of thematic coding of the 31 reviewed studies, mapping reported patient experiences and behaviours to discrete journey stages. Initial coding identified recurring experiential moments — the moment of financial shock at a domestic dental quote, the first online search for alternatives, the first clinic contact — that clustered into natural stages. The model was refined through comparison with existing frameworks (Crooks et al., 2013; Cohen, 2010) and validated against patient satisfaction data from the Medical Tourism Association (2024) and dental tourism facilitator platforms.

3.4 Limitations

This study is subject to the limitations inherent in systematic review methodology: the findings are dependent on the quality and representativeness of the source literature, which remains weighted toward English-language, Western-patient-perspective studies. The model is proposed as a general framework for dental tourism across destination markets; its specific applicability to any given country pairing will vary and warrants further primary research. Estimates of patient volumes and cost savings are derived from industry sources and national surveys, which use varying methodologies and should be treated as indicative rather than definitive.

4. THE SEVEN-STAGE MODEL OF THE NEW PATIENT JOURNEY

The patient who eventually settles into a dental chair in a foreign clinic did not arrive there by accident. Their journey began weeks, months, sometimes years earlier — with a piece of paper, a number, a feeling. Understanding each stage of that journey is the prerequisite for improving it.

Stage 1: The Trigger

Every dental tourism journey starts with a trigger — a moment of rupture between what the patient needs and what their home healthcare system can offer. In the majority of cases, that trigger is financial. A systematic analysis of patient motivation studies confirms that cost is cited as the primary driver by 76–84% of dental tourists (Lunt et al., 2011; Medical Tourism Association, 2024; Horowitz et al., 2007). The specific financial moment varies: it might be a treatment quote that exceeds a patient's savings, an insurance claim denial, or simply the accumulated realisation that routine dental maintenance has become unaffordable.

But the trigger is not always purely financial. A growing minority of patients — estimated at 18–24% — cite access as the primary driver: NHS waiting lists, specialist shortages, geographic remoteness from dental services (British Dental Association, 2022). A smaller but growing segment, approximately 8–12%, are driven primarily by quality — seeking a specific technique, material, or specialist unavailable in their home market (Global Market Insights, 2024). Understanding which trigger is operating matters: financially-motivated patients are more price-sensitive at the Evaluation stage; access-motivated patients are often more time-pressured; quality-motivated patients require more sophisticated clinical information. What all three share is the Trigger's defining emotional register: frustration giving way, for the first time, to agency.

Stage 2: The Search

The Search stage is where the modern dental tourism journey diverges most sharply from its predecessors of fifteen years ago. In 2010, a patient searching for overseas dental care might have relied on a travel agent, a word-of-mouth recommendation, or a classified advertisement. In 2024, they enter a sophisticated digital ecosystem of facilitator platforms, review aggregators, social media communities, and clinic websites that has fundamentally changed both what information is available and how patients evaluate it.

Research by Petersen and Kwan (2022) found that 91% of dental tourists now conduct their primary research online, with the average patient visiting 7–12 different digital sources before making an initial clinic contact. The most trusted information sources, ranked by patient-reported influence, are: peer review platforms and dental tourism forums (rated

highly influential by 67% of patients); social media content from previous patients (58%); clinic websites (51%); dental tourism facilitator platforms (44%); and formal accreditation databases (29%). The relatively low ranking of formal accreditation is significant: it suggests that current quality assurance mechanisms are not communicating effectively to the patients they are designed to protect. For European patients, the Balkan region and Turkey dominate the shortlist; for North American patients, Mexico and Costa Rica are primary; for Australians, Thailand and Malaysia feature prominently (Connell, 2006; Zaimi, 2022).

Stage 3: The Evaluation

If the Search stage is about gathering information, the Evaluation stage is about making sense of it — and managing the anxiety that comes with making a major healthcare decision in an unfamiliar context. This is the stage where patients are most cognitively active, most emotionally ambivalent, and most susceptible to both good and bad information. Patient decision-making research consistently identifies three core evaluation criteria: price (the dominant factor for most patients); quality signals (interpreted through clinic photographs, equipment descriptions, dentist credentials, and before-and-after social media content); and trust (built through patient testimonials, response quality from clinic staff, and professionalism of digital communication).

A critical dynamic at this stage is what researchers call "quality convergence anxiety" — the concern that lower prices necessarily imply lower standards. Survey data from the Medical Tourism Association (2024) indicate that 71% of first-time dental tourists report significant concern about quality before travelling, compared to just 23% of repeat dental tourists. That drop — from 71% to 23% — is one of the most important data points in the dental tourism literature. It tells us that quality concern is largely a pre-experience perception, not a post-experience reality, and that patients who have made the journey once almost universally report that their quality fears were unfounded. The Evaluation stage typically concludes with direct clinic contact — an initial inquiry that marks the transition from passive research to active engagement.

Stage 4: The Commitment

The Commitment stage is where the decision crystallises and practical logistics take shape. It is also one of the most underexamined stages in the literature. Patients at this stage are managing multiple simultaneous tasks: confirming treatment plans and costs; booking flights and accommodation; arranging cover for work and domestic responsibilities; managing the reactions of family members (research by Turner, 2021, found that 44% of dental tourists reported opposition or concern from a family member before their first trip); and navigating the administrative gap between their home dentist and their overseas clinic.

That administrative gap is significant. Only 34% of dental tourists report sharing their dental records with their overseas clinic before travelling (Medical Tourism Association, 2024). This means that the treating dentist overseas frequently has no access to the patient's clinical history, prior imaging, or existing treatment records — a gap that creates real clinical risk, particularly for patients with complex medical histories, allergies, or prior restorative work. The financial commitment at this stage is also notable: 61% of dental tourists in the UK paid deposits of 20–50% of total treatment cost before travelling, with limited formal recourse if the treatment did not proceed as planned (British Dental Association, 2022).

Stage 5: The Treatment

The Treatment stage is, in most respects, the part of the dental tourism journey that works best. Patient satisfaction data are consistently high: the Medical Tourism Association (2024) reports overall satisfaction rates of 88–93% across destination markets, with clinical outcome satisfaction specifically running at 85–91%. These figures are broadly comparable to satisfaction rates in domestic dental care in high-income countries — a finding that directly challenges the assumption that overseas treatment necessarily implies quality compromise.

What patients at this stage report most positively, beyond clinical outcomes, are: the time investment made by clinical staff (overseas appointments tend to be longer and less rushed than domestic equivalents); the quality of communication and patient education; the accessibility of senior clinicians; and the overall experience of feeling like a valued patient rather than a number on a waiting list. A recurring theme in qualitative patient narratives is surprise — surprise at how professional, modern, and attentive the overseas clinic was compared to expectations formed during the Evaluation stage (Petersen & Kwan, 2022; Turner, 2021). Multi-stage treatments requiring osseointegration periods of 3–6 months are managed through sophisticated multi-visit protocols, increasingly supplemented by teledentistry monitoring between trips.

Stage 6: The Recovery

Recovery — the period immediately after treatment completion and before the patient boards their return flight — is one of the most clinically significant and least discussed stages of the dental tourism journey. Surgical procedures carry

specific post-operative risks in the 24–72 hours following treatment: swelling, infection, dry socket, and acute pain are all more likely to surface during this window than at any later point (Scully & Ettinger, 2007). The challenge is that this high-risk window typically coincides with the patient's departure preparation — patients managing post-operative discomfort while simultaneously packing their bags, navigating an unfamiliar city, and anticipating a long-haul flight are not in optimal conditions for recognising and responding to warning signs.

Available data suggest that approximately 12–18% of dental tourists experience some form of post-treatment complication — ranging from minor discomfort to more significant clinical issues (Lunt et al., 2011; British Dental Association, 2022). The Recovery stage is also where the quality of clinic discharge protocols varies most widely. Best-practice clinics provide detailed written post-operative instructions, emergency contact information, and a documented treatment summary. Many do not. The standardisation of discharge documentation — including a clinical summary in a format readable by the patient's home dentist — is one of the highest-leverage interventions available for improving dental tourism safety.

Stage 7: The Reintegration

The Reintegration stage is the New Patient Journey's most significant failure point, and the stage the existing literature is least equipped to address. When the dental tourist lands at home, they re-enter a domestic healthcare system that was not designed to receive them. Their home dentist may have no record of what was done. The documentation they carry, if any, may be in a foreign language or use unfamiliar clinical terminology. If they experience a complication — an infection, a failed implant, a bite that has been altered in ways they cannot describe — they must navigate a system that, at best, is unprepared for them and, at worst, is actively unwilling to help.

The evidence on this is sobering. The British Dental Association (2019) survey found that 68% of UK general dental practitioners had treated patients presenting with complications from overseas dental work. The most common barriers to effective management were: lack of clinical documentation (43% of practitioners); unfamiliarity with materials used (31%); and professional reluctance to assume liability for another provider's work (27%). In the United States, 52% of dentists reported difficulty in providing continuity of care for dental tourism patients, with documentation gaps as the most frequently cited obstacle (American Dental Association, 2023). This is the Reintegration Gap. It is not a problem of clinical quality in destination countries — the treatment, in most cases, was delivered competently. It is a problem of systemic continuity: the absence of information transfer, professional handover, and institutional support that would allow the home healthcare system to complete the patient's care journey effectively.

Table 1. The Seven-Stage New Patient Journey: Overview, Risks, and Policy Leverage Points

Stage	**Core Patient Activity**	**Key Risk / Gap**	**Policy Leverage**
1. Trigger	Financial shock; first consideration of alternatives	Unmet need goes unaddressed	Domestic access reform
2. Search	Online research across 7–12 digital sources	Unregulated information; misinformation risk	Platform disclosure standards
3. Evaluation	Comparing price, quality signals, trust	Quality convergence anxiety (71% of first-timers)	Accreditation communication
4. Commitment	Booking; financial deposit; pre-travel admin	Only 34% share records with overseas clinic	Standardised pre-travel records
5. Treatment	Clinical procedures; patient experience	Compressed timelines for multi-stage work	Multi-visit protocol standards
6. Recovery	Post-operative period before return flight	12–18% experience complications; high-risk departure window	Discharge documentation mandate
7. Reintegration	Return home; follow-up with domestic provider	Reintegration Gap; 68% of UK GDPs treat complications	Bilateral care agreements

5. RESULTS AND FINDINGS

The systematic review of 31 studies, combined with market data and patient survey evidence, produces five core findings that the seven-stage model helps to illuminate.

5.1 Cost Remains Dominant But Is No Longer the Whole Story

Cost savings of 50–80% compared to home country prices remain the most powerful driver of dental tourism demand — but they are no longer the complete picture. Patients who have made the journey once return for reasons that go beyond price: they trust their overseas provider, they value the clinical experience, and they appreciate the particular combination of healthcare and travel. Survey data from repeat dental tourists indicate that only 41% of second-trip patients cite cost as their primary motivation, compared to 79% of first-time patients (Medical Tourism Association, 2024). This shift suggests that dental tourism is transitioning from a price-driven transaction to a relationship-driven healthcare behaviour — a transition with significant implications for how clinics should think about patient retention and long-term communication strategies.

5.2 Digital Facilitation Has Transformed the Search and Evaluation Stages

The digitalisation of the dental tourism patient journey is not merely a convenience improvement — it is a structural transformation. Facilitator platforms, social media communities, and teledentistry tools have collectively reduced the information asymmetry that made dental tourism risky for uninformed consumers fifteen years ago. Patients can now access procedure-specific cost comparisons, verified clinic reviews, before-and-after documentation, and direct video consultations with overseas clinicians before committing to travel. The challenge is that this digital ecosystem is largely unregulated: platform incentives do not always align with patient interests, sponsored content is not always clearly disclosed, and the quality of information varies enormously between sources.

5.3 Quality Convergence Is Real But Unevenly Distributed

One of the most important findings from the reviewed literature is that the quality gap between dental tourism destinations and high-income country dental care has narrowed substantially and, in some dimensions, closed entirely. Clinics in Budapest, Tirana, Warsaw, and Bangkok that serve international patients regularly are equipped with technology and staffed with clinicians who match or exceed the standards of mid-range domestic providers in Western Europe or North America. Patient satisfaction data confirm this: overall satisfaction rates of 88–93% are not the mark of a compromise experience. However, this quality convergence is concentrated. It applies to internationally-facing clinics in established dental tourism markets — not uniformly to the broader domestic dental sector in those countries. This distinction is critical for regulators designing quality assurance frameworks.

5.4 The Reintegration Gap Is the Sector's Most Serious Unresolved Problem

The evidence reviewed in this study consistently points to the Reintegration stage as the point of greatest systematic failure in the dental tourism patient journey. The data are consistent across source countries (UK, US, Germany, Australia) and destination regions: patients return without adequate clinical documentation, domestic providers are ill-equipped to provide continuity of care, and the post-return period — which carries the highest clinical risk for many procedures — is characterised by institutional abandonment rather than institutional support. The interventions required are neither technically complex nor financially prohibitive — standardised treatment documentation, multilingual discharge summaries, teledentistry follow-up protocols — but they require a level of coordination between origin and destination healthcare systems that does not currently exist at scale.

5.5 Teledentistry Is the Most Underutilised Tool in the Patient Journey

The COVID-19 pandemic accelerated the adoption of teledentistry globally, and the dental tourism sector has begun to recognise its potential — but uptake remains far below what the technology could support. Remote consultations are now offered by approximately 62% of major dental tourism facilitator clinics (Medical Tourism Association, 2024), but post-treatment teledentistry follow-up — structured check-ins to monitor recovery, assess complications, and provide clinical support after the patient returns home — is offered by fewer than 28%. This is a significant missed opportunity. Teledentistry follow-up cannot replace in-person care for patients who develop serious complications, but it can triage effectively, provide reassurance to anxious patients, and dramatically reduce the clinical isolation that characterises the Reintegration stage for most dental tourists today.

6. DISCUSSION

6.1 What the Seven-Stage Model Changes

Most existing analysis of dental tourism focuses on the destination — the clinic, the country, the cost differential — without adequately examining the patient as a moving, experiencing subject whose journey through the system shapes every outcome. The seven-stage model proposed in this paper shifts that analytical focus. By mapping the patient journey as a sequence of distinct stages, each with its own information environment, emotional register, clinical risks, and policy leverage points, the model reveals failure patterns that a destination-focused analysis would miss entirely. The most important of these patterns is temporal: the stages that carry the highest clinical risk — Recovery and Reintegration — are precisely the stages that receive the least institutional attention. Closing this gap requires a level of coordination between origin and destination healthcare systems that has rarely been seriously attempted in the dental tourism context.

6.2 The Case for Bilateral Health Agreements

The most structurally ambitious — and most important — recommendation that follows from this analysis is the development of bilateral or multilateral health agreements between major origin and destination countries, specifically designed to govern the continuity-of-care needs of dental tourists. Such agreements would establish common standards for treatment documentation; mutual recognition of clinical records and imaging; professional liability frameworks that clarify responsibility for complications arising from cross-border treatment; and designated referral pathways for returning patients. The EU's Cross-Border Healthcare Directive (2011/24/EU) provides a partial framework, but has been implemented unevenly and does not cover non-EU country pairings. A bilateral agreement between the UK and Albania, for example — two countries with significant dental tourism flows between them — would be practically achievable, mutually beneficial, and could serve as a template for broader regional adoption.

6.3 The Role of Technology in Closing the Gap

The Reintegration Gap is partly a documentation problem and partly a communication problem — and technology offers cost-effective solutions to both. Standardised digital treatment passports, accessible to the patient and shareable with any clinician worldwide, would resolve the documentation gap overnight. Teledentistry follow-up protocols — structured check-ins at 48 hours, 7 days, and 30 days post-treatment — would provide clinical support precisely during the period when patients are most isolated and complications most likely to emerge. Neither of these solutions is technically complex. What they require is coordination: between clinics, between professional associations, between healthcare systems, and between the technology platforms already embedded in most patients' digital lives.

6.4 The Ethics of a System That Serves Some Patients Better Than Others

No analysis of dental tourism can be complete without acknowledging its distributional dimensions. The patients who benefit most from dental tourism are those with sufficient resources, information, and mobility to navigate the system effectively — a profile that skews toward higher-income, better-educated, more mobile individuals. The patients who remain trapped in inadequate domestic dental systems are disproportionately those with fewer resources: the elderly, the poor, the geographically isolated. Dental tourism does not create this inequality, but it benefits from it, and a comprehensive policy response must include domestic dental access reform alongside the cross-border continuity-of-care interventions this paper prioritises.

7. POLICY RECOMMENDATIONS

The following recommendations are directed at three audiences: national health policymakers in origin countries; regulatory and professional bodies in destination countries; and the dental tourism industry itself.

Recommendation 1 — Standardise treatment documentation

Destination country dental associations, working with international bodies, should adopt a common standard for treatment summary documents provided to dental tourists at discharge. This document should include: procedure performed; materials and implant systems used; post-operative instructions; emergency contact details; and a clinical summary formatted for reception by a general dental practitioner in the patient's home country.

Recommendation 2 — Mandate teledentistry follow-up for surgical procedures

Clinics performing implant surgery, bone grafting, full-arch reconstructions, or other surgical procedures on dental tourists should be required — as a condition of accreditation or licensing — to provide structured teledentistry follow-up at 48 hours, 7 days, and 30 days post-procedure.

Recommendation 3 — Develop bilateral continuity-of-care agreements

Governments in major origin countries (UK, Germany, USA, Australia) should negotiate bilateral healthcare agreements with key dental tourism destination countries, establishing shared documentation standards, mutual recognition of clinical records, and designated referral protocols for returning patients.

Recommendation 4 — Regulate facilitator platforms

Online dental tourism facilitator platforms should be subject to disclosure requirements regarding commercial relationships with listed clinics, minimum standards for clinic vetting, and clear information about patient rights and recourse options.

Recommendation 5 — Fund patient journey research

National health research agencies should commission prospective longitudinal studies of dental tourist outcomes — tracking patients from trigger through reintegration — to provide the primary evidence base that the field currently lacks. Only four of the 31 studies reviewed for this paper followed dental tourism patients beyond the treatment stage; this is an extraordinary evidence gap for a sector of this scale and clinical significance.

8. CONCLUSION

The patient who boards a flight to a foreign dental clinic is, in one sense, voting with their feet. They are expressing — through a practical, costly, time-consuming decision — a verdict on the healthcare system they were supposed to be able to rely on. They are saying: the price is too high, the wait is too long, the access is too difficult. And they are backing that verdict with action.

In most cases, the dental care they receive abroad is good. It is often excellent. Patient satisfaction data, consistently running above 88%, confirm that the treatment stage of the journey generally delivers on its promise. What fails is the system around the treatment. The information environment in the Search stage is sophisticated but unregulated. The administrative infrastructure in the Commitment stage is fragmented and underdocumented. The Recovery stage is under-supported during the highest-risk hours. And the Reintegration stage — the stage that connects the overseas treatment to the patient's ongoing healthcare life back home — is, in most cases, systemically absent.

The seven-stage model proposed in this paper is a tool for fixing that. By disaggregating the patient journey into its constituent stages, it allows policy interventions to be targeted precisely — at the documentation gap in Commitment, at the discharge protocols in Recovery, at the continuity infrastructure in Reintegration. These are not expensive fixes. They do not require fundamental restructuring of international healthcare systems. They require coordination, standards, and the political will to treat the dental tourist not as an anomaly to be managed, but as a patient with rights, needs, and a journey that does not end when the plane touches down.

The New Patient Journey is real. It is growing. It processes millions of patients a year through a system that has no institutional owner and no end-to-end accountability. That is not sustainable — and with the tools now available, it is not necessary. The infrastructure this journey deserves is within reach. The question is whether the will to build it exists before the gap between what dental tourism promises and what it delivers becomes a crisis rather than an opportunity.

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Ethics Committee Approval

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Hiv/Aids Knowledge Among Health Sciences Students In Kosovo: A Cross-Sectional Survey

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Abstract: This study assessed the level of HIV/AIDS knowledge among health sciences students at AMECC Rezonanca, Kosovo.A cross-sectional survey administered a 45-item true/false questionnaire to 43 students from programs including Nursing, Dentistry, and Pharmacy. Results revealed strong knowledge on basic HIV facts (e.g., condom efficacy: 86%) but significant misconceptions on hygiene-based prevention myths, with fewer than 3% correctly identifying that healthy eating does not prevent HIV. These findings underscore the need for reinforced, evidence-based HIV/AIDS education within pre-service health training curricula in Kosovo.

Keywords: HIV/AIDS knowledge, health sciences students, Kosovo, nursing education, sexual health literacy

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1. INTRODUCTION

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) remain major global public health concerns. Accurate knowledge among healthcare professionals and students is essential for effective prevention, early detection, and patient counseling. In the Western Balkans, including Kosovo, epidemiological surveillance data suggest low but potentially underreported HIV prevalence, making health education efforts critically important (UNAIDS, 2023). Health sciences students represent a key target population, as their foundational knowledge directly impacts future clinical practice and community health promotion.

Studies across Sub-Saharan Africa, South Asia, and Eastern Europe consistently demonstrate that even health professions students harbor significant misconceptions about HIV transmission and prevention, particularly regarding folk-remedy beliefs (Tuchinda et al., 2012). Kosovo, as a post-conflict society undergoing rapid health system reform, has limited published data on this topic. This study aimed to evaluate current HIV/AIDS knowledge among health sciences students in Kosovo and to identify prevalent misconceptions.

2. MATERIAL AND METHOD

A cross-sectional, self-administered survey was conducted in March 2026 at Rezonanca University College, Kosovo. The instrument consisted of 45 true/false items covering HIV transmission routes, prevention strategies, symptoms, treatment, and common myths, adapted from the HIV Knowledge Questionnaire (Carey et al., 1997). A convenience sample of 43 students responded across multiple health sciences programs. Data were analyzed descriptively, computing the proportion of correct responses per item. The study received institutional ethics clearance.

3. RESULTS

Table 1 presents participant demographics. The sample (N = 43) included students predominantly from Nursing (37.2%) and Dentistry (30.2%) programs across Years 1–4.

Table 1 Participant Characteristics by Program (N = 43)

Program	n	%	Study Year (Mode)
Nursing	16	37.2	Year 3
Dentistry	13	30.2	Year 1
Pharmacy	4	9.3	Year 3
Diagnostic Radiology	4	9.3	Year 3
Other health programs	6	14.0	Mixed
Total	43	100.0	–

Note. Study years ranged from Year 1 to Year 4. University affiliation: Rezonanca University College and affiliates (93%).

Table 2 presents correct-response rates for selected key items. Performance was strongest on the item about condom efficacy (86.0%) and weakest on questions involving hygiene-based myths. Fewer than 3% correctly identified that eating healthy food cannot prevent HIV, and only 7.0% correctly rejected the notion that a vaccine exists to prevent HIV in adults.

Table 2 Correct Response Rates on Selected HIV/AIDS Knowledge Items (N = 43)

Statement	Correct Answer	Correct n	% Correct
HIV and AIDS are the same thing	False	31	72.1
There is a cure for AIDS	False	33	76.7
HIV can be transmitted from toilet seats	False	27	62.8
Coughing/sneezing does not spread HIV	True	30	69.8
HIV can be spread by mosquitoes	False	25	58.1
AIDS causes HIV	False	25	58.1
Latex condom reduces HIV transmission risk	True	37	86.0
A person with HIV can look and feel healthy	True	7	16.3
A vaccine exists to prevent HIV in adults	False	3	7.0
Washing genitals after sex prevents HIV	False	9	20.9
Eating healthy food prevents HIV infection	False	1	2.3
Donating blood can transmit HIV	False	31	72.1

Note. Items selected from the 45-item questionnaire to illustrate range of performance. 'Correct Answer' reflects scientifically accurate response (True/False).

4. DISCUSSION AND CONCLUSIONS

The findings align with international literature indicating that students in health professions often possess foundational HIV knowledge but retain culturally embedded myths about prevention (Deribe et al., 2008; Tura, 2008). The particularly low correct-response rates on hygiene-related items—such as post-coital washing (20.9%) and healthy eating (2.3%)—suggest that curriculum content does not adequately address these persistent misconceptions. Performance on mosquito transmission (58.1%) also indicates continued confusion between blood-borne and vector-borne routes.

The high correct-response rate for condom efficacy (86.0%) reflects likely exposure to general public health messaging. However, the critical item about HIV-positive individuals appearing healthy was answered correctly by only 16.3%, a finding with direct implications for clinical practice and stigma reduction. Given that nurses and other health professionals are expected to provide accurate patient education, such gaps are clinically significant.

Health sciences students in Kosovo demonstrate heterogeneous HIV/AIDS knowledge, with notable strengths in basic transmission facts and significant gaps regarding non-effective prevention strategies. Educational programs must be revised to target and correct persistent misconceptions, particularly those rooted in hygiene myths and folk beliefs. Future research should employ validated instruments with larger, multi-institution samples to enable generalization across Kosovo's health education sector.

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Knowledge, Attitudes, And Practices Regarding Sexually Transmitted Infections Among University Students In Kosovo

HASAN GASHI[1], BEKİM SEJDIU[2]

Abstract: Sexually transmitted infections (STIs) pose a significant public health burden among young adults globally. This study examined knowledge, attitudes, and preventive practices regarding STIs among 89 university students in Kosovo. A structured questionnaire addressed STI identification, symptom awareness, perceived risk, and contraceptive behaviors. While most participants recognized HIV (96.6%) and genital herpes (71.9%), fewer identified chlamydia (57.3%) and trichomoniasis (25.8%). Only 47.2% reported condom use. Additionally, nearly one third of respondents identified non-evidence-based methods as preventive. These findings suggest critical gaps in comprehensive STI literacy and preventive practice among young students in Kosovo.

Keywords: Sexually transmitted infections, STI knowledge, University students, Kosovo, sexual health

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1. INTRODUCTION

Sexually transmitted infections represent a major global health challenge, with young adults aged 15–24 accounting for a disproportionate share of new cases (WHO, 2023). Knowledge of STIs, their symptoms, and prevention strategies is fundamental to reducing transmission rates. In Kosovo, sexual health education remains limited within formal curricula, and cultural taboos can impede open discussion of sexual health topics (UNFPA, 2021). University students in health sciences may hold incomplete knowledge and engage in risky behaviors despite their professional training context.

European studies confirm that deficits in STI knowledge are common among young adults, even in health-related programs (Lazarus et al., 2019). Kosovo presents a particularly underexplored context where such data are scarce. This study aimed to assess STI-related knowledge, attitudes, and practices among a convenience sample of Kosovar university students, with the objective of informing curriculum improvements.

2. MATERIAL AND METHOD

A cross-sectional survey was administered online in March 2026 to students at Rezonanca University College, Kosovo. The questionnaire, developed for regional surveillance purposes, covered: STI type identification, symptom recognition, risk group perceptions, prevention methods, STI consequences, condom use, and contraceptive practices. Respondents included 89 students after removal of incomplete records. Data were analyzed using descriptive statistics with frequency distributions. The study was conducted in accordance with institutional ethics guidelines.

3. RESULTS

Table 1 presents the demographic profile of participants. The sample was predominantly female (87.6%), young (72.4% aged 18–20), and largely enrolled in university-level programs (61.8%).

Table 1 Demographic Characteristics of Participants (N = 89)

Characteristic	Category	n	%
Gender	Female	78	87.6
	Male	11	12.4
Age (years)	18	22	24.7
	19	24	27.0
	20	22	24.7
	21	15	16.9
	≥22	6	6.7

Education	University	55	61.8
	College/Specialty	29	32.6
	Secondary	5	5.6
Marital status	Single	80	89.9
	Other	9	10.1

Note. Multiple categories are shown within demographic variables. Percentages are calculated on valid responses per variable.

Table 2 summarizes STI knowledge and key behavioral indicators. HIV was the most recognized STI (96.6%), while trichomoniasis was identified by only 25.8% of respondents. Regarding consequences, 84.3% acknowledged STI-related female infertility and 78.7% recognized male infertility risk. Condom use was reported by 47.2% of respondents.

Table 2 STI Recognition, Consequences, and Preventive Behavior (N = 89)

Variable	**n**	**%**	**Category**
STIs identified (multiple response allowed)			
HIV	86	96.6	STI recognition
Genital herpes	64	71.9	STI recognition
Gonorrhea	55	61.8	STI recognition
Syphilis	53	59.6	STI recognition
Hepatitis B	53	59.6	STI recognition
Chlamydia	51	57.3	STI recognition
Trichomoniasis	23	25.8	STI recognition
Condom use			
Yes	42	47.2	Preventive behavior
No	39	43.8	Preventive behavior
STIs can cause female infertility			
Yes	75	84.3	Knowledge of consequences
No	13	14.6	Knowledge of consequences
STIs can cause male infertility			
Yes	70	78.7	Knowledge of consequences
No	18	20.2	Knowledge of consequences

Note. STI identification items were multiple-response. Condom use and infertility items reflect single-response yes/no questions.

Table 3 presents prevention methods identified by participants. Condoms were correctly identified as effective by 86.5%, and abstinence by 53.9%. However, 31.5% cited post-coital washing and 16.9% cited withdrawal as preventive, both of which are not evidence-based methods for STI prevention.

Table 3 Prevention Methods Identified by Participants (Multiple Response, N = 89)

Prevention Method Identified	**n**	**%**	**Scientifically Valid?**
Condoms	77	86.5	Yes
Abstinence	48	53.9	Yes
Post-coital washing	28	31.5	No
Withdrawal method	15	16.9	No
Antiseptic douching	12	13.5	No

Note. 'Scientifically Valid' indicates whether the method constitutes evidence-based STI prevention according to WHO (2023) guidelines.

4. DISCUSSION AND CONCLUSIONS

The high recognition of HIV as an STI likely reflects broader public health messaging, while lower recognition of bacterial infections such as chlamydia and trichomoniasis mirrors patterns reported in other Balkan and Southeast European studies (Lazarus et al., 2019; Simbar et al., 2012). The relatively low condom use rate (47.2%) among health sciences students is concerning given that this population will be responsible for patient education in clinical practice.

Particularly worrying is the endorsement of post-coital washing (31.5%) and withdrawal (16.9%) as STI prevention strategies—methods that carry no evidence-based efficacy for infection prevention (WHO, 2023). These misconceptions may stem from cultural beliefs and insufficient sexual health education at secondary and tertiary levels. Comprehensive, destigmatizing sexual health education programs at the university level are urgently needed.

Kosovar university students demonstrate variable STI knowledge, with stronger awareness of viral infections and weaker recognition of bacterial STIs. Preventive behavior remains suboptimal, and misconceptions about non-effective prevention strategies are prevalent. Health sciences curricula and university health promotion programs should be enhanced to address these gaps, with emphasis on comprehensive STI literacy, risk perception, and consistent evidence-based preventive practices.

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Ethics Committee Approval
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Conflict of Interest
The authors have no conflicts of interest to declare.

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Motivations And Attitudes Toward Nursing Education Among Students In Kosovo: A Cross-Sectional Study

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Abstract: Understanding the motivations and attitudes of nursing students is essential for improving enrollment, retention, and professional preparation. This study examined attitudes and motivations toward nursing education among 106 bachelor-level nursing students in Kosovo using a 34-item Likert-scale questionnaire. Participants were predominantly female (93.4%) across Years I–III. Results revealed strong intrinsic motivation (M = 4.51, SD = 0.56), high perceived self-efficacy (M = 4.84, SD = 0.37 for caring ability), and positive professional outlook. Peer and parental pressure played minimal roles. These findings inform curriculum design and student support strategies in the Kosovo nursing education context.

Keywords: nursing education, student motivation, Kosovo, nursing attitudes, professional identity

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1. INTRODUCTION

Nursing workforce shortages are a persistent challenge across healthcare systems globally, with the Western Balkans region being no exception (WHO Europe, 2020). Understanding why students choose nursing—and what shapes their professional attitudes—is critical for designing effective recruitment, education, and retention strategies (Miers et al., 2007). Research from multiple contexts indicates that intrinsic motivation and caring values are the dominant drivers of nursing career choice, while financial incentives and peer influence play secondary roles (Mooney et al., 2008).

In Kosovo, nursing education has undergone significant reforms in alignment with European standards, yet limited empirical data exist on nursing students' motivations and professional self-concept. This study aimed to examine the attitudes and motivational factors of nursing students at a private health sciences college in Kosovo using a validated attitudinal framework, addressing this evidence gap and providing a baseline for future longitudinal investigation.

2. MATERIAL AND METHOD

A cross-sectional survey was conducted in March 2026 at Rezonanca University College, Kosovo. The instrument comprised 34 items measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), organized across four domains: intrinsic motivation, self-efficacy, career and academic outlook, and social influence (parental and peer). Items marked (R) were reverse-scored. Participants included 106 nursing bachelor's students. Descriptive statistics (mean, standard deviation) were calculated per item. Ethical clearance was obtained from the institutional review board.

3. RESULTS

Table 1 presents participant demographics. The sample was predominantly female (93.4%), with Year III students comprising the majority (54.7%).

Table 1 Participant Demographic Characteristics (N = 106)

Characteristic	Category	n	%
Gender	Female	99	93.4
	Male	6	5.7
	Not reported	1	0.9
Study Year	Year I	16	15.1
	Year II	32	30.2
	Year III	58	54.7
Institution	Rezonanca University College	106	100.0

Note. Study years reflect the Kosovo bachelor's nursing program structure. One participant did not report gender.

Table 2 presents mean scores and standard deviations for the 18 representative items across four motivational domains. Items related to self-efficacy and career preparation received the highest ratings. Social influence items—particularly parental and peer occupational influence—received the lowest scores.

Table 2 Means and Standard Deviations for Motivational and Attitudinal Items by Domain (N = 101–106)

Item	Domain	M	SD	n
I always wanted to become a nurse	Intrinsic	4.51	0.56	105
I enjoy meeting people	Intrinsic	4.58	0.57	106
I am satisfied with my educational choice	Intrinsic	4.16	0.90	104
I am able to care for and help others	Self-efficacy	4.84	0.37	105
I am able to understand others in need	Self-efficacy	4.71	0.47	105
I can cope in a demanding/stressful environment	Self-efficacy	4.26	0.70	103
I have good interpersonal skills	Self-efficacy	4.43	0.64	103
Nursing prepares me for my chosen career	Career outlook	4.80	0.40	104
Nursing offers wide employment opportunities	Career outlook	4.38	0.77	104
Positive about career advancement in nursing	Career outlook	4.58	0.58	105
Nursing is a caring and useful profession	Career outlook	4.74	0.46	103
Nursing is a challenging and exciting profession	Career outlook	4.70	0.56	104
Nursing offers professional growth opportunities	Career outlook	4.70	0.50	105
Nursing provides job security	Career outlook	4.00	0.91	103
Nursing is a low-paid profession (R)	Career outlook	3.83	1.05	103
Parents are positive about nursing education	Social influence	4.61	0.53	104
Parents believe nursing is a rewarding career	Social influence	4.01	1.00	105
I chose nursing because my parent works in it	Social influence	1.75	1.22	104
I chose nursing because my friend is in it	Social influence	1.73	1.21	101

Note. Scale: 1 = Strongly Disagree to 5 = Strongly Agree. (R) = reverse-scored item. M = mean; SD = standard deviation. Sample sizes vary due to missing responses.

4. DISCUSSION AND CONCLUSIONS

The strong intrinsic motivation observed among Kosovo nursing students aligns with European and international studies, where caring values and vocational calling are primary drivers of nursing career choice (Watt & Richardson, 2007; Mooney et al., 2008). The high self-efficacy score for caring ('I am able to care for and help others': M = 4.84) is particularly encouraging, as perceived self-efficacy is associated with academic persistence and clinical competence development (Bandura, 1997).

The moderate concern about nursing salaries (M = 3.83 for 'Nursing is a low-paid profession') is consistent with Kosovo's healthcare sector, where remuneration challenges affect workforce retention (WHO Europe, 2020). Notably, peer and parental occupational influence showed the lowest scores across all items (M = 1.73–1.75), suggesting that students' educational choices are predominantly self-determined—a positive indicator for professional commitment and long-term retention.

Nursing students in Kosovo demonstrate high intrinsic motivation, strong caring values, and a positive professional identity. These assets can be leveraged to improve educational engagement and long-term workforce retention. Concerns about salary and limited peer support for the profession should be addressed through career guidance and institutional communication strategies. Longitudinal studies tracking motivation across study years are recommended to identify at-risk students early.

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Innovative Technology-Enhanced Methods For Teaching, Learning And Clinical Simulation In The Medical Technical Sciences: A Digital Clinical Simulation Laboratory Model

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Abstract: The Faculty of Medical Technical Sciences (FSHMT) at the University of Medicine, Tirana, delivers six health-profession programmes medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy with approximately 3,000 enrolled students. Although clinical placement remains indispensable, high student numbers, variable clinical case exposure, patient-safety constraints and limited opportunities for repeated supervised practice make it difficult to ensure the equal, measurable and standardised acquisition of practical competencies. This article presents an evidence-informed model for the design and implementation of a Digital Clinical Simulation Laboratory at FSHMT–UMT, conceived as a shared infrastructure for technology-enhanced clinical education, competency-based assessment and applied research. A structured narrative review of international evidence on simulation-based education, virtual patients, immersive virtual reality, 3D anatomy, OSCE-based assessment, debriefing and digital-health competency frameworks was combined with the institutional needs and infrastructure plan of FSHMT. The proposed model translates this evidence into a four-stage competency pathway aligned with Miller's pyramid: knowledge acquisition, clinical reasoning through screen-based simulation, demonstrable performance through VR and OSCE, and transfer to supervised clinical practice. The laboratory is organised into three functional zones: a desktop simulation zone with PC workstations, an immersive simulation zone with five VR stations, and an interaction/debriefing and assessment zone supported by audio-visual and analytics infrastructure. The model combines shared cross-cutting modules with programme-specific simulation scenarios for all six FSHMT programmes, for imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy. International evidence indicates that high-quality simulation, when delivered by trained faculty and supported by structured debriefing, can improve confidence, technical accuracy, decision-making, teamwork and readiness for practice, and may substitute part of traditional clinical hours under defined quality conditions. The proposed laboratory therefore offers a practical, scalable and measurable route for modernising clinical teaching, strengthening patient safety, supporting the future Master's programme in Digital Health, and positioning FSHMT as a national reference centre for simulation-based education in the medical technical sciences.

Keywords: clinical simulation; simulation-based education; virtual reality; OSCE; competency-based education; medical technical sciences; digital health.

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1. INTRODUCTION

Health-profession education in the medical technical sciences is fundamentally competence-based. Graduates are expected not only to understand clinical concepts, protocols and professional standards, but also to perform safely, accurately and consistently in real clinical environments. A medical imaging student must position patients correctly, select appropriate exposure parameters and evaluate image quality; a nursing student must administer medication safely and recognise clinical deterioration; a midwifery student must respond effectively to obstetric emergencies; a laboratory technology student must manage the pre-analytical, analytical and post-analytical phases of testing; a physiotherapy student must assess functional limitations and design rehabilitation interventions; and a speech therapy student must conduct structured assessment and therapeutic communication. These competencies require repeated practice, feedback, reflection and progressive exposure to increasingly complex clinical situations.

Traditional clinical placement remains essential because it exposes students to real patients, authentic workflows and professional responsibilities. However, clinical placement alone cannot always guarantee equivalent learning opportunities for all students. Case availability varies across services and time periods, some procedures are too rare or too risky to be left to chance, and patient-safety requirements limit the extent to which novice students can practise repeatedly on real patients. In high-volume faculties, these limitations become even more pronounced. The Faculty of Medical Technical Sciences (FSHMT) of the University of Medicine, Tirana, educates approximately 3,000 students across six programmes: medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy.

At this scale, it is difficult to ensure that every student receives the same exposure to essential clinical scenarios, the same opportunity for controlled repetition and the same standardised assessment of practical competence.

This challenge is not only institutional but also systemic. Health systems face rising demand for qualified professionals, while clinical services are under pressure to maintain efficiency, quality and patient safety. The World Health Organization projects a shortfall of roughly 10–11 million health workers by 2030, particularly affecting low- and middle-income countries [18,19]. In this context, universities must develop training models that expand practical learning capacity without compromising clinical safety or educational quality. The central problem is therefore not simply how to provide more clinical hours, but how to provide better structured, measurable and equitable practical preparation before students enter real clinical environments.

Simulation-based education offers a well-established response to this challenge. By recreating clinical situations in a controlled environment, simulation allows students to practise decision-making, technical skills, communication, teamwork and error management without exposing patients to avoidable risk. It also enables repeated practice of rare or high-risk events, such as obstetric emergencies, medication errors, biosafety incidents or imaging procedures involving radiation protection principles. In the context of medical imaging, for example, simulation is particularly important because students cannot ethically repeat radiographic exposures on real patients for training purposes. Simulation therefore supports both educational quality and patient safety by allowing “safe errors” that can be analysed through structured debriefing.

International evidence increasingly supports simulation as a core component of health-profession education. When designed with clear objectives, appropriate fidelity, trained facilitators and structured debriefing, simulation improves knowledge, confidence, clinical reasoning, technical accuracy, teamwork and readiness for practice [1,3,13]. Landmark evidence from nursing education indicates that a substantial proportion of traditional clinical hours can be substituted with simulation, under rigorous quality conditions, without reducing competence or readiness for practice [1]. Virtual patients, screen-based scenarios, immersive virtual reality, 3D anatomy and OSCE-based assessment are widely used to strengthen clinical reasoning, procedural rehearsal and objective competence evaluation [3–8,14]. At the same time, the healthcare environment is changing rapidly: digital records, telemedicine, remote monitoring, clinical decision support, artificial intelligence and data-driven workflows are becoming routine. Graduates therefore require not only clinical skills but also digital competencies, data literacy, ethical awareness and the ability to interact critically with technology-supported systems [10,12]. For faculties such as FSHMT, technology-enhanced simulation thus serves two purposes: it strengthens practical clinical training and prepares students for the digital transformation of healthcare.



Figure 1: a). Anatomy Laboratory Unit, Faculty of Medicine, b). Digital image processing laboratory, Faculty of Medical Technical Sciences, University of Medicine, Tirana

The planned Digital Clinical Simulation Laboratory at FSHMT–UMT responds directly to these educational and professional needs. Conceived as a shared infrastructure for all six programmes, the laboratory is designed to combine desktop-based simulation, virtual patients, immersive VR, 3D anatomy, OSCE-based assessment, structured debriefing and learning analytics. The planned infrastructure includes approximately 100 m² of dedicated space organised into three functional zones: a work zone with PC stations for screen-based clinical simulation and decision-making exercises; an immersive simulation zone with VR stations for procedural, anatomical and scenario-based training; and an interaction, debriefing and assessment zone supported by audio-visual infrastructure. This structure allows the laboratory to support large-group teaching, small-group immersive practice, standardised assessment and applied educational research.

The aim of this work is to present an evidence-informed model for the design and implementation of the FSHMT Digital Clinical Simulation Laboratory. Specifically, we examine why simulation is important for the medical technical sciences, review international best practice in technology-enhanced clinical education, map simulation modalities to competency development, and translate this evidence into a practical laboratory model adapted to the needs of FSHMT. The proposed model is organised around a four-stage competency pathway aligned with Miller’s pyramid: foundational knowledge, clinical reasoning through screen-based simulation, demonstrable performance through VR and OSCE, and transfer to

supervised clinical practice. In doing so, we position the laboratory not only as an equipment investment, but as a pedagogical, assessment and research infrastructure for modernising clinical education.

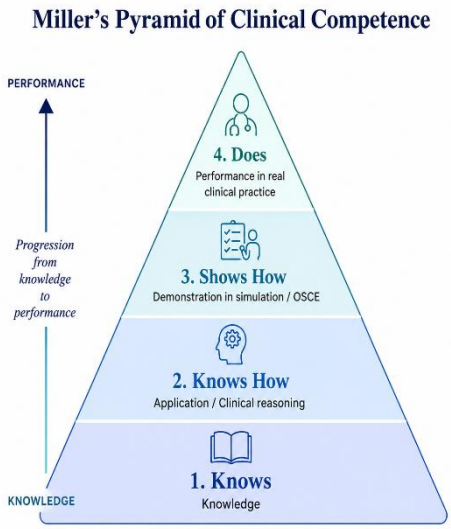


Figure 2: Miller's Pyramid of Clinical competences

Conceptually, the proposal aligns strong international evidence on simulation-based education, digital-health competencies and competency-based assessment with the specific requirements of the medical technical sciences. Practically, it offers a scalable and resource-conscious laboratory design that can be implemented, evaluated and progressively expanded within the institutional context of FSHMT–UMT. By integrating simulation, structured debriefing, OSCE assessment, learning analytics and open-access governance, the laboratory has the potential to improve the quality and standardisation of practical training, support patient safety, strengthen research in health-profession education and contribute to the future development of digital-health programmes in Albania.

2. MATERIAL AND METHOD

The laboratory model was developed as an evidence-informed design analysis adapted to the institutional context of FSHMT–UMT, combining three sources of evidence: the existing practical-training infrastructure of FSHMT, the identified needs of its six study programmes, and recent international developments in simulation-based health-profession education.

First, the current FSHMT context was analysed. The faculty already has a functional laboratory infrastructure mainly based on traditional practical training methods, with recent steps toward modernisation through digital imaging and automated mannequin-based training. However, the increasing number of students, the need for repeated clinical practice, the variability of clinical placement exposure and the requirement for standardised assessment indicate the need for a more integrated simulation-based model.

Second, the project proposal for the Digital Clinical Simulation Laboratory was used as the institutional design material. The proposed infrastructure consists of a dedicated laboratory space of approximately 100 m², organised into three functional zones: a desktop simulation area with PC stations, an immersive simulation area with VR stations, and an interaction/debriefing area with audio-visual equipment. The planned software and digital components include virtual-patient scenarios, 3D anatomy, VR-based simulation, OSCE/assessment tools, learning analytics and programme-specific modules for medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy.

Third, recent international evidence and best practices were reviewed to define the pedagogical and technical principles of the model. The review focused on simulation-based education, virtual patients, immersive VR, 3D anatomy, OSCE, structured debriefing, learning analytics, digital-health competencies and AI-supported clinical education. The selected evidence was used to identify which methods are most suitable for large-group learning, small-group immersive practice, clinical reasoning, technical skills, communication, teamwork and assessment.

Finally, these elements were translated into a FSHMT-adapted design model. Miller's pyramid was used to organise the learning pathway from knowledge to clinical performance; international simulation standards were used to define quality requirements such as clear objectives, appropriate fidelity, trained facilitation and structured debriefing; and the laboratory layout was modelled to match FSHMT's needs: PC-based simulation for scalable practice, VR for immersive procedural and anatomical training, and OSCE/debriefing for measurable competence assessment. Below we show the proposal

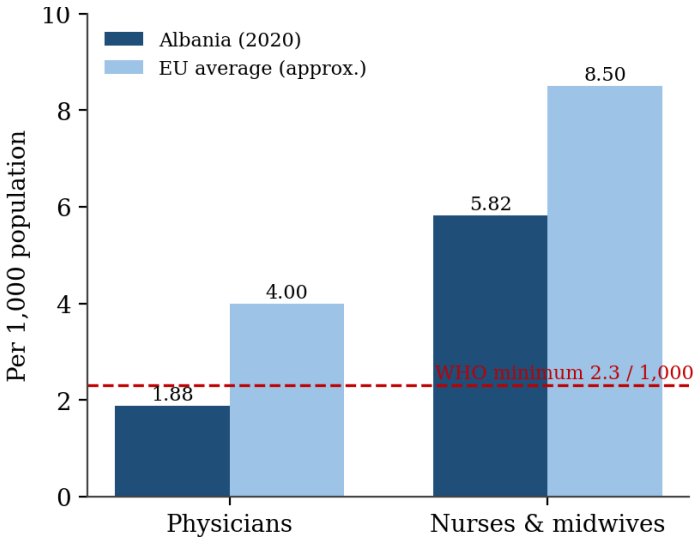
output as a practical design framework supported by institutional data, international evidence, capacity indicators, diagrams and implementation logic.

3. RESULTS, DISCUSSION AND CONCLUSIONS

3.1. Why clinical simulation matters in the medical technical sciences

Clinical simulation is not an optional technological addition to the curriculum of the medical technical sciences; it is a necessary educational response to the nature of these professions. The programmes offered by FSHMT medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy require students to develop observable, practical and safety-sensitive competencies. These competencies cannot be fully achieved through theoretical teaching alone, because professional performance depends on the integration of knowledge, technical skill, clinical reasoning, communication, ethical judgement and decision-making under realistic conditions.

Figure 3: *Health workforce density: Albania vs EU average based on WHO statistics*



The first argument for simulation is the competence gap between "knowing" and "doing". A student may correctly describe a radiographic protocol, a medication procedure, an obstetric emergency pathway, a laboratory quality-control step, a rehabilitation plan or a speech-therapy assessment, but still fail to perform it safely in practice. Miller's pyramid of clinical competence explains this progression clearly: lectures and written tests mainly address the "Knows" and "Knows How" levels, while clinical competence requires students to demonstrate what they can do at the "Shows How" and "Does" levels [11]. The proposed FSHMT laboratory is designed precisely to fill this middle layer of competence by allowing students to practise, repeat, demonstrate and be assessed before entering real clinical settings.

The second argument is patient safety. Learning directly on real patients is ethically limited, particularly when procedures involve potential harm, discomfort, radiation exposure, biological risk, emergency decision-making or sensitive communication. This is especially relevant for FSHMT programmes.

– In medical imaging, repeated patient positioning for training may lead to unnecessary exposure and conflicts with ALARA principles.

– In nursing, medication administration and deterioration recognition require safe rehearsal before real patient contact.

– In midwifery, rare but critical events such as postpartum haemorrhage or shoulder dystocia cannot be left to chance during placement.

– In laboratory technology, pre-analytical errors, mislabelled samples and biosafety incidents can have serious consequences.

– In physiotherapy and speech therapy, students need structured practice in assessment, therapeutic communication and patient-centred decision-making.

Simulation creates a safe environment where errors can occur without patient harm and can be transformed into learning through structured debriefing [2].

The third argument is scale and equity of exposure. FSHMT trains approximately 3,000 students across six programmes, while clinical placement opportunities are naturally variable. Not every student encounters the same number, type or complexity of cases during practice. Some students may observe many relevant situations, while others may complete placement without exposure to key scenarios. This variability makes it difficult to guarantee equal practical preparation and standardised competence assessment. The proposed laboratory responds to this problem through a mixed-capacity model:

PC stations support large-group screen-based simulation, virtual patients, clinical reasoning and documentation exercises, while VR stations support small-group immersive training through planned rotations. Based on the student population, the indicative planning ratios are approximately 100 students per PC station and 600 students per VR station. These ratios justify the use of PC-based simulation for scalable exposure and VR for targeted, high-value procedural and anatomical training.

The fourth argument is that simulation is particularly suitable for the medical technical sciences because these professions are equipment-dependent, protocol-driven and strongly linked to standard operating procedures. Medical imaging requires positioning, protocol selection, image appraisal and radiation safety. Nursing requires procedural accuracy, medication safety and emergency response. Midwifery requires rapid decision-making in mother fetus care. Laboratory technology requires control of pre-analytical, analytical and post-analytical processes. Physiotherapy requires functional assessment and rehabilitation planning. Speech therapy requires structured assessment, intervention planning and sensitive patient–family communication. These activities can be converted into standardised scenarios, checklists, rubrics and OSCE stations, making them appropriate for simulation-based teaching and objective assessment.

The fifth argument is supported by international evidence. The NCSBN National Simulation Study showed that high-quality simulation can replace up to 50% of traditional clinical hours in prelicensure nursing education without reducing knowledge, clinical competence, licensure pass rates or readiness for practice, provided that simulation is delivered by trained faculty and supported by structured debriefing [1,2]. Studies in virtual patients, immersive VR, radiography simulation and 3D anatomy also report improvements in confidence, technical accuracy, decision-making, spatial understanding and preparedness for clinical practice [3–8]. These findings do not mean that simulation should replace clinical placement, but they confirm that simulation can prepare students more safely and more consistently before they perform in real clinical environments.

For FSHMT, the importance of simulation is also institutional. The Digital Clinical Simulation Laboratory does not replace existing teaching laboratories; it connects and upgrades them by adding standardised, measurable and digitally supported practical training, combining desktop simulation, virtual patients, immersive VR, 3D anatomy, OSCE-based assessment, debriefing and learning analytics in a shared infrastructure for all six programmes.

A further advantage is measurability. Traditional clinical placement is difficult to document in a uniform way because students encounter different cases under different supervisors. Simulation, by contrast, can generate structured evidence: number of sessions delivered, number of students trained, scenarios completed, checklist scores, OSCE results, errors identified, debriefing outcomes, confidence changes and progression over time. These indicators convert practical training from an experience-based process into an evidence-generating educational system. They also create a basis for quality assurance, accreditation, curriculum improvement and research in health-profession education.

In summary, the need for clinical simulation at FSHMT follows a clear logic: high student volume, six diverse programmes, variable placement exposure and patient-safety constraints create the need; the proposed PC stations, VR stations and debriefing/assessment zone provide the capacity; structured simulation, OSCE and debriefing provide the educational process; and improved competence, safer placement preparation, standardised assessment and research output represent the expected impact. This makes the laboratory a strategic academic infrastructure rather than a simple technological investment.

3.2. A short taxonomy of clinical simulation

Clinical simulation should not be understood as a single technology, but as a continuum of educational methods that differ in fidelity, interactivity, cost, scalability and assessment value. For this reason, the selection of each simulation modality must be guided by the learning objective, the expected competence level and the profile of the study programme.

At the lower end of the spectrum, part-task trainers, phantoms and models are used to practise isolated technical skills. Examples include x-ray positioning phantoms for medical imaging, venepuncture arms for nursing, obstetric models for midwifery, laboratory workflow models, functional-assessment tools for physiotherapy and anatomical or communication models for speech therapy. These tools are useful when the objective is repeated practice of a defined procedure or movement pattern.

Standardised or simulated patients are used when the main objective is communication, history-taking, counselling, ethical decision-making or patient-centred interaction. They are particularly relevant for nursing, midwifery, physiotherapy and speech therapy, but also for medical imaging and laboratory technology, where patient identification, informed communication and professional behaviour are essential. This modality is also central to OSCE-based assessment, where the same scenario, checklist and scoring rubric can be applied to all students.

Screen-based simulation and virtual-patient systems represent a scalable modality for large groups. They allow students to work through branching clinical scenarios, make decisions, document actions, receive feedback and repeat cases. In the FSHMT model, this modality is especially important because the laboratory will include PC stations, making it suitable for large-cohort teaching across all six programmes. Screen-based simulation is appropriate for clinical reasoning, workflow training, protocol application, documentation, triage, quality control and preparation for OSCE.

Immersive virtual reality adds spatial presence and three-dimensional interaction. It is most useful when the learning outcome requires anatomical orientation, procedural rehearsal, spatial reasoning or realistic scenario engagement. In the FSHMT laboratory, the VR stations are intended for small-group rotation rather than whole-class teaching. Their role is therefore selective and high-value: 3D anatomy, radiographic positioning, emergency scenarios, rehabilitation movements, communication situations and procedural rehearsal that benefit from immersion.

Manikin-based and automated mannequin simulation is particularly useful for physiological response, emergency care and team-based scenarios. This modality is relevant to nursing and midwifery, but can also support interprofessional training involving imaging, laboratory, physiotherapy and communication-related decision-making. Since FSHMT has already taken steps toward automated mannequin-based training, the proposed Digital Clinical Simulation Laboratory should be seen as an extension and integration of existing simulation capacity rather than a separate initiative.

Hybrid simulation combines two or more modalities, such as a virtual patient followed by VR practice and OSCE assessment, or a simulated patient combined with digital documentation and debriefing. This is the most appropriate model for FSHMT because the faculty serves six different professional profiles. A single modality cannot meet all needs; therefore, the laboratory must operate as an integrated ecosystem: PC-based simulation for reasoning and scalable exposure, VR for immersive procedural and anatomical practice, standardised patients and OSCE for communication and competence assessment, and structured debriefing for reflection and improvement.

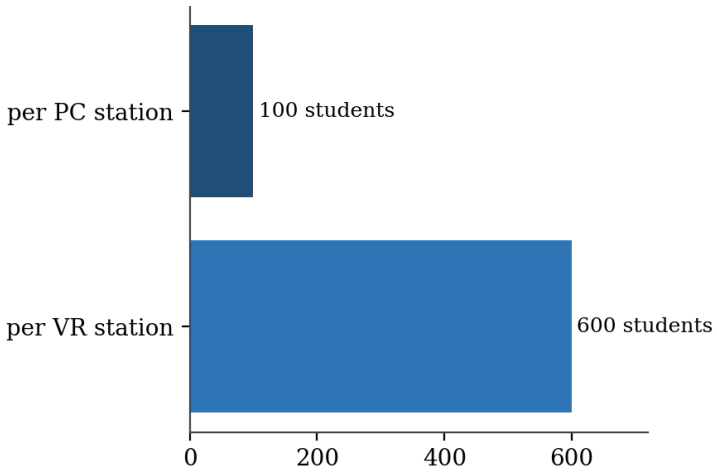


Figure 4: Laboratory capacity at first phase: 6 study fields, 18 study programs (fist and second cycle) and 3000 students

A key principle from international simulation standards is that fidelity should be appropriate rather than maximal [13]. High-fidelity simulation is not automatically better: a simple screen-based scenario may be more effective for teaching decision-making, while immersive VR may be justified for spatial anatomy or procedural rehearsal, and a well-designed OSCE station may provide stronger assessment evidence than an expensive but poorly structured simulation. The effectiveness of simulation depends less on the technology itself than on clear objectives, trained facilitators, valid assessment rubrics and structured debriefing.

Accordingly, the FSHMT model deliberately spans the simulation spectrum. It uses desktop simulation to reach large student groups, VR to support targeted immersive training, standardised assessment to document competence and debriefing to transform performance into learning. This taxonomy provides the basis for matching each modality with the specific needs of medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy.

3.3. Evidence on technology-enhanced teaching methods

The evidence reviewed for this study supports the use of technology-enhanced teaching not as a replacement for clinical education, but as a structured method for improving preparation before clinical placement. The most relevant finding for FSHMT is that different technologies contribute to different dimensions of competence: screen-based simulation strengthens clinical reasoning at scale; immersive VR supports spatial and procedural learning; OSCE enables standardised assessment; interprofessional and tele-simulation support teamwork and access; and analytics make progress measurable.

Screen-based simulation and virtual-patient systems are especially relevant for high-volume programmes because they allow many students to practise the same clinical scenarios under comparable conditions. These systems are suitable for case analysis, triage, documentation, workflow training, protocol application and decision-making. For FSHMT, the PC stations provide the core capacity for this type of activity across all six programmes. A nursing student may work through a deteriorating-patient scenario; a laboratory technology student may identify errors in sample handling; a physiotherapy student may select an assessment pathway; and an imaging student may choose an appropriate protocol before moving to practical demonstration. The educational value lies in structured repetition, immediate feedback and comparable exposure to essential cases.

Immersive VR and 3D anatomy add value when the learning objective requires spatial understanding, procedural rehearsal or realistic interaction with equipment and anatomy. Evidence from radiography and radiation-therapy education suggests that virtual environments can improve preparedness, confidence, image-appraisal ability and technical performance, with reported technical-skill gains ranging from 11% to 36% in some studies compared with conventional role-play [5–8]. In the FSHMT model, VR should therefore be used selectively for high-impact activities: radiographic positioning, anatomical orientation, emergency scenarios, rehabilitation movements, communication situations and procedures that benefit from immersion. Because the laboratory includes VR stations, this modality is best organised through small-group rotation rather than whole-class delivery.

OSCE and checklist-based assessment provide the bridge between training and certification of competence [14]. Their value is not technological but methodological: they transform practical performance into observable, comparable and auditable evidence. For FSHMT, OSCE stations can be adapted to each programme: image-positioning and radiation-safety tasks for medical imaging; medication and emergency-response scenarios for nursing; obstetric-emergency stations for midwifery; biosafety and quality-control stations for laboratory technology; functional-assessment stations for physiotherapy; and communication or assessment stations for speech therapy. This makes practical assessment more transparent and less dependent on variable clinical-placement exposure.

Interprofessional simulation is relevant because FSHMT graduates will work in clinical environments where patient care depends on coordination between professions [15,16]. Joint scenarios can develop role clarity, communication, escalation, teamwork and patient-safety behaviour — for example, emergency response involving nursing and imaging, rehabilitation planning involving physiotherapy and nursing, or laboratory-related decision-making involving clinical communication and safety procedures. Tele-simulation and hybrid sessions can further extend access to partner institutions, external professionals and continuing professional development activities.

Learning analytics and digital assessment tools provide the evidence layer of the laboratory. By recording participation, scenario completion, checklist results, OSCE scores, errors, feedback and progression over time, the laboratory can generate objective indicators of educational performance. These data can support curriculum improvement, accreditation evidence, staff reflection, student remediation and research in health-profession education. This is particularly important for a faculty that aims to use the laboratory not only for teaching, but also as a research infrastructure.

Artificial intelligence should be introduced with caution and clear educational purpose [9]. AI can support virtual-patient interaction, feedback generation, scenario development and analysis of performance data, but students must also learn to evaluate AI outputs critically. For the medical technical sciences, AI literacy is increasingly important in imaging, laboratory systems, clinical documentation, rehabilitation technologies and digital-health workflows. The laboratory should therefore use AI not as an automatic decision-maker, but as a teaching object and supervised support tool within a framework of ethics, privacy and professional responsibility.

Across all technologies, the strongest determinant of educational quality remains structured debriefing [13]. The evidence consistently shows that learning is consolidated when students analyse what happened, why it happened and how performance can improve. For this reason, the debriefing and assessment zone is not secondary to the PC and VR zones; it is the pedagogical centre of the laboratory. Without trained facilitators, clear objectives and debriefing, simulation risks becoming mere technological demonstration; with them, it becomes a measurable method for competence development.

Table 1. Evidence-based role of technology-enhanced teaching methods in the FSHMT simulation model

Method	Main educational function	Best use in FSHMT	Main indicators
Screen-based simulation / virtual patients	Clinical reasoning, workflow, decision-making	Large-group scenarios across all six programmes	Sessions delivered, cases completed, scores, feedback
3D anatomy / immersive VR	Spatial learning, procedural rehearsal, scenario immersion	Small-group rotation for imaging, anatomy, emergency and rehabilitation scenarios	VR utilisation, skill scores, confidence change
OSCE / checklist assessment	Standardised demonstration of competence	Practical assessment adapted to each programme	OSCE score, pass rate, checklist performance
Interprofessional / tele-simulation	Teamwork, communication, access expansion	Joint scenarios and partner-based training	Number of joint sessions, participant feedback
Learning analytics	Monitoring, quality assurance, research	Tracking performance and curriculum impact	Progression data, error patterns, reports
AI-supported tools	Digital-health literacy, feedback, scenario support	Supervised use in virtual patients, imaging, analytics and digital health	AI-use cases, critical appraisal tasks
Structured debriefing	Reflection and learning consolidation	Required after PC, VR and OSCE sessions	Debriefing completion, student reflection, improvement plans

3.4. The FSHMT Digital Clinical Simulation Laboratory: an integrated model

The proposed FSHMT Digital Clinical Simulation Laboratory is conceived as an integrated educational, assessment and research infrastructure, rather than as a simple collection of digital devices. Its design responds to a specific institutional problem: how to provide structured, repeated and measurable practical training for approximately 3,000 students distributed across six health-profession programmes. The model therefore combines physical infrastructure, digital simulation platforms, competency-based pedagogy, OSCE assessment, debriefing and learning analytics into one coherent system.

The laboratory is organised into three functional zones.

The first is the desktop simulation zone, composed of PC stations. This zone is intended for large-group activities such as virtual-patient scenarios, clinical reasoning exercises, documentation tasks, workflow simulations, quizzes, OSCE preparation and digital case analysis. It provides the main scalable component of the laboratory and is particularly important for ensuring that all students, regardless of placement variability, are exposed to the same core clinical scenarios.

The second is the immersive simulation zone, composed of VR stations with VR-ready computers, headsets, controllers and hygiene/safety protocols. Because the number of VR stations is limited, this area is designed for small-group rotation rather than simultaneous whole-cohort teaching. Its function is to support high-value learning activities that benefit from spatial presence and three-dimensional interaction, including anatomy, procedural rehearsal, positioning, emergency response, rehabilitation movement, clinical communication and scenario-based decision-making.

The third is the interaction, debriefing and assessment zone. This area includes audio-visual and presentation equipment and functions as the pedagogical centre of the laboratory. It supports structured debriefing, group discussion, performance review, OSCE stations, tele-simulation and hybrid teaching. In the proposed model, learning is not completed when a simulation ends; it is consolidated through feedback, reflection, analysis of errors and planning for improvement. For this reason, the debriefing zone is as important as the PC and VR zones.

These three zones are supported by a common IT and software layer. The planned infrastructure includes a managed network, secure internet access, central administration, storage/backup, cybersecurity measures and controlled user access. The software environment includes virtual-patient and clinical-scenario platforms, 3D anatomy on PC and VR, simulation-management and analytics tools, OSCE/assessment modules, scenario-authoring capacity and programme-specific simulation modules for medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech

therapy. A data and research environment based on tools such as Python/R and MATLAB supports student projects, diploma work, doctoral research and applied studies in simulation-based education.

The educational logic of the laboratory follows a four-stage competency pathway aligned with Miller's pyramid. At the first level, students acquire foundational knowledge, anatomy, protocols, digital literacy and ethical principles. At the second level, they apply this knowledge through screen-based simulation, virtual patients, workflow exercises and case-based decision-making. At the third level, they demonstrate performance through immersive VR, standardised scenarios, OSCE stations, checklists and rubrics. At the fourth level, they transfer these competencies to supervised clinical placement, where real patient care remains essential.

A central advantage of the model is that one shared infrastructure can serve all six FSHMT programmes while still allowing programme-specific adaptation. The common layer includes 3D anatomy, patient safety, communication, digital-health literacy, clinical reasoning, OSCE assessment and learning analytics. On this common foundation, each programme can develop its own scenario bank, assessment rubrics and practical activities. This makes the laboratory both efficient and flexible: efficient because the same infrastructure is used across the faculty, and flexible because each programme can adapt the content to its professional profile.

Table 2. Programme-specific use of the FSHMT Digital Clinical Simulation Laboratory

Programme	Main simulation focus	Suitable laboratory zone	Examples of measurable indicators
Medical imaging	Imaging workflow, patient positioning, protocol selection, image appraisal, ALARA and radiation safety	PC simulation, VR, OSCE/debriefing	Protocol accuracy, positioning score, image-appraisal score, radiation-safety checklist
Nursing	Medication administration, deteriorating patient, emergency response, communication and patient safety	PC simulation, mannequin/VR, OSCE/debriefing	Checklist score, response time, escalation accuracy, medication-safety score
Midwifery	Obstetric scenarios, mother–fetus care, emergency decision-making and teamwork	VR/mannequin simulation, OSCE/debriefing	Emergency-response score, teamwork score, protocol adherence
Laboratory technology	Pre-analytical, analytical and post-analytical workflow, biosafety, quality control and error detection	PC simulation, OSCE/debriefing	Sample-identification accuracy, biosafety checklist, quality-control score
Physiotherapy	Functional assessment, range of motion, gait, balance, rehabilitation planning and patient education	PC simulation, VR, OSCE/debriefing	Assessment accuracy, rehabilitation-plan quality, communication score
Speech therapy	Communication assessment, therapeutic interaction, patient–family counselling and intervention planning	PC simulation, standardised patient/OSCE, debriefing	Assessment rubric, intervention-plan score, communication performance

In practical terms, the model can be illustrated through a medical imaging scenario. A student first studies thoracic anatomy, imaging protocols and radiation-safety principles. The student then completes a screen-based chest radiography case, selecting projection, centring, exposure parameters and patient-preparation steps. In the VR zone, the student rehearses positioning and spatial orientation without exposing a real patient to radiation. The same competence is then assessed through an OSCE station using a positioning and image-quality rubric. The performance data are recorded, discussed during debriefing and used to guide improvement before the student applies the skill during supervised clinical placement.

The same logic applies across the other programmes. A nursing student may rehearse medication safety and clinical deterioration; a midwifery student may practise postpartum haemorrhage management; a laboratory technology student

may identify a mislabelled sample or biosafety error; a physiotherapy student may perform functional assessment and rehabilitation planning; and a speech therapy student may practise structured communication and intervention planning. In each case, the laboratory provides a controlled environment for practice, feedback, assessment and progressive preparation for real clinical work.

The proposed model therefore positions the FSHMT Digital Clinical Simulation Laboratory as a shared faculty platform for competence development. Its value lies not only in the availability of PC and VR technologies, but in the way these technologies are connected to curriculum needs, standardised scenarios, trained facilitators, OSCE assessment, debriefing, learning analytics and research. This integration is what transforms the laboratory from an infrastructure investment into a sustainable academic model for modernising practical training in the medical technical sciences.

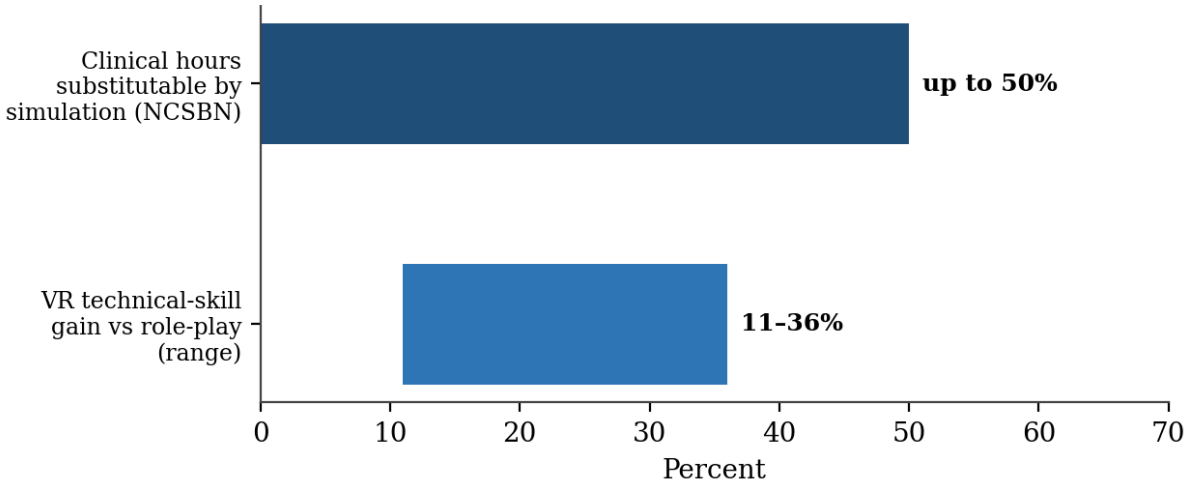


Figure 5: Evidence at glance: what to expect

3.5. Implementation, sustainability and open-access governance

The implementation of the FSHMT Digital Clinical Simulation Laboratory should be understood as a staged academic transformation process, not only as a procurement and installation activity. The sustainability of the model depends on four connected pillars: phased deployment of infrastructure, development of human capacity, integration into curricula and establishment of a clear governance framework.

Implementation is planned as an incremental process. In the first phase, priority is given to the operationalisation of the physical and digital infrastructure: preparation of the laboratory space, installation of the managed network, configuration of the PC stations, integration of the VR stations, activation of simulation software and establishment of cybersecurity, backup and access-control procedures. This phase creates the technical foundation for large-group desktop simulation, small-group immersive training and debriefing-based learning. In the second phase, the focus shifts from infrastructure to educational use: staff training, development of standardised scenarios, OSCE/checklist design, pilot sessions and integration of simulation activities into selected modules of the six study programmes.

A central condition for successful implementation is the train-the-trainer model. Evidence from simulation-based education shows that technology alone does not improve competence unless it is supported by trained facilitators, clear objectives, appropriate scenario design and structured debriefing. For this reason, academic and operational staff should be trained not only in the technical use of PC and VR platforms, but also in scenario facilitation, debriefing, OSCE assessment, rubric-based scoring, student feedback, data protection and safe management of simulation sessions. This creates internal capacity and reduces dependence on external vendors after the initial installation period.

The laboratory should be governed through a formal operational framework. This framework should define roles and responsibilities for the laboratory coordinator, IT staff, academic facilitators, programme coordinators and external users. It should include standard operating procedures for booking, access, equipment use, hygiene protocols for VR devices, cybersecurity, user authentication, data storage, incident reporting, maintenance and periodic review. The use of an inventory register, incident register and service log are essential for protecting the investment and ensuring traceability of technical and educational operations.

Curricular integration is the main mechanism through which the laboratory becomes sustainable. Simulation should not remain an occasional demonstration activity, but should be embedded into the annual teaching plans of medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy.

Each programme should identify core modules where simulation adds measurable value and should develop a minimum set of standard scenarios, checklists and OSCE stations. A shared scenario bank should be version-controlled and periodically updated, allowing common scenarios across programmes and profile-specific scenarios for each discipline.

The proposed laboratory also requires a defined financial sustainability plan. Recurring costs include software licences, platform subscriptions, maintenance, consumables, VR hygiene materials, equipment replacement, IT support and dedicated personnel time.

The project model addresses this challenge by using a shared infrastructure across six programmes, leading with scalable PC-based simulation and reserving VR for high-value activities that justify immersive use. This reduces duplication of equipment, increases utilisation and distributes the cost across multiple academic and research functions.

The expected outputs should be monitored through a set of measurable indicators. At infrastructure level, indicators include number of operational PC stations, number of operational VR stations, uptime, licence status, maintenance interventions and cybersecurity incidents. At educational level, indicators include number of simulation sessions, number of students trained by programme, number of staff trained, number of standardised scenarios developed, number of OSCE stations implemented, PC and VR utilisation rates, student performance in checklists and rubrics, and pre–post changes in confidence or perceived readiness. At research level, indicators include diploma topics, doctoral projects, conference presentations, scientific articles, methodological reports and datasets generated from anonymised simulation activity.

The laboratory should also function as a platform for applied research and quality improvement. Learning analytics can be used to identify common errors, compare performance across cohorts, evaluate the effectiveness of simulation activities and support evidence-based curriculum revision. OSCE results and rubric scores can provide structured data for psychometric analysis, validation of assessment tools and longitudinal monitoring of competence development. In this way, the laboratory becomes both a teaching environment and a research infrastructure for health-profession education.

Open-access governance is another strategic component of the model. In line with open-science principles, the laboratory should provide controlled and transparent access to external users, including other UMT faculties, partner health institutions, professional organisations and continuing professional development providers. Access should be based on published criteria, booking procedures, safety rules, data-protection requirements and institutional agreements. The principle should be “as open as possible, as closed as necessary”: educational resources and methodological outputs can be shared when possible, while student performance data, personal information and sensitive institutional data must remain protected, anonymised and ethically governed.

The institutional position of FSHMT within the wider UMT and QSUT environment gives the laboratory additional relevance. Beyond serving FSHMT students and staff, the infrastructure can support interfaculty collaboration, clinical partner training, professional development activities and standardised practical assessment for external users such as the Order of Nurses of Albania. This wider use increases the return on investment and positions the laboratory as a potential national reference point for simulation-based education in the medical technical sciences.

Cost-effectiveness should therefore be assessed not only through the initial cost of equipment, but through long-term educational value. A shared laboratory that serves six programmes, supports thousands of students, enables OSCE-based assessment, reduces variability in practical preparation, strengthens patient-safety culture and generates research output offers greater institutional value than fragmented programme-specific investments. The main determinant of long-term success will not be the number of devices installed, but the quality of governance, staff training, scenario development, curricular integration and continuous evaluation.

3.6. Challenges and limitations

The proposed FSHMT Digital Clinical Simulation Laboratory offers a structured route for modernising practical training, but several challenges must be recognised from the beginning. The first limitation is that the model is still in the design and implementation phase; therefore, the article does not yet report local post-implementation data on student performance, OSCE outcomes, clinical-placement transfer or cost-effectiveness. The evidence base is drawn mainly from international studies and must be validated within the specific institutional, curricular and clinical context of FSHMT.

A second challenge concerns capacity and utilisation. Although the planned PC stations provide a scalable platform for large-group screen-based simulation, the VR stations require careful scheduling through small-group rotation. Without a structured timetable, clear booking rules and programme-level planning, there is a risk that VR use becomes fragmented, uneven or limited to demonstration sessions. For this reason, the laboratory must be integrated into annual teaching plans rather than used as an occasional supplementary activity.

A third limitation is related to staff workload and pedagogical readiness. Simulation requires more than equipment: it requires scenario design, facilitation, observation, feedback, debriefing and assessment. These activities demand time and specific academic competencies. If staff are not trained, simulation may become technology-centred rather than learning-

centred. The proposed train-the-trainer model, shared scenario bank, standardised rubrics and community of practice are therefore essential mitigation measures.

Fidelity also represents a methodological challenge. High-fidelity simulation is not always educationally superior, and low-fidelity simulation is not automatically inadequate. The risk lies in mismatching technology with learning objectives. A VR scenario may be justified for spatial anatomy, radiographic positioning or emergency rehearsal, but a screen-based case may be more efficient for protocol selection, workflow analysis or clinical reasoning. The effectiveness of the laboratory will depend on choosing the appropriate modality for each competence, rather than maximising technological complexity.

Another limitation concerns assessment validity. OSCE stations, checklists and rubrics can standardise competence assessment, but only if they are carefully designed, tested and moderated. Poorly constructed rubrics may produce unreliable scores or assess superficial performance rather than integrated competence. The laboratory will therefore need a continuous process of rubric validation, examiner training, inter-rater reliability checks and periodic revision of assessment tools.

Digital governance is a further challenge. Simulation-management systems, learning analytics, OSCE platforms and AI-supported tools can generate valuable data, but they also create responsibilities related to privacy, cybersecurity, informed use, anonymisation and access control. Student performance data should not be treated as ordinary administrative data; it must be protected, used ethically and interpreted carefully. AI-supported tools require additional caution because they may encourage over-reliance, reduce critical reasoning or produce feedback that appears authoritative but is not clinically validated.

There is also a risk of overestimating what simulation can replace. Simulation can prepare students for practice, standardise exposure and reduce avoidable patient risk, but it cannot reproduce the full complexity of real clinical environments. Clinical placement remains indispensable for professional identity, real patient interaction, service workflow, unpredictability and supervised responsibility. The most appropriate model for FSHMT is therefore complementary: simulation before and alongside placement, not simulation instead of clinical reality.

Finally, the international evidence on simulation has its own limitations. Many studies measure short-term outcomes such as confidence, satisfaction or perceived readiness, while fewer studies measure long-term retention, workplace performance or patient outcomes. This reinforces the need for FSHMT to generate its own evidence through learning analytics, OSCE data, pre–post comparisons, placement feedback and longitudinal monitoring.

3.7. Future directions and research agenda

Once operational, the Digital Clinical Simulation Laboratory should become a research infrastructure as well as a teaching facility. The first priority should be local validation of the model. FSHMT should evaluate whether simulation-based activities improve student competence, confidence, decision-making, communication, teamwork and preparedness for clinical placement across all six programmes. Initial studies may use pre–post designs, cohort comparisons and mixed-methods evaluation combining OSCE scores, checklist performance, student feedback and facilitator observations.

A second research direction should focus on programme-specific effectiveness. Each study programme has different competence requirements, and the laboratory should generate evidence for each profile. In medical imaging, research can examine positioning accuracy, protocol selection, image appraisal and radiation-safety behaviour. In nursing and midwifery, studies can assess emergency response, medication safety, escalation and teamwork. In laboratory technology, research can evaluate biosafety, sample-identification accuracy and error detection. In physiotherapy and speech therapy, studies can examine assessment reasoning, rehabilitation planning, communication and therapeutic decision-making.

A third priority is the validation of OSCE stations, checklists and rubrics. The laboratory provides an opportunity to develop a standardised assessment culture at FSHMT. Future work should test reliability, inter-rater agreement, content validity, pass/fail thresholds and progression of competence over time. This would support both internal quality assurance and external accreditation evidence.

A fourth research line should address learning analytics and educational dashboards. The laboratory can generate structured indicators such as number of sessions, student participation, scenario completion, OSCE performance, error patterns, feedback themes, VR utilisation and improvement over repeated attempts. These indicators can be used to identify weak competence areas, guide remediation, compare cohorts and inform curriculum revision.

A fifth direction is human technology interaction. VR and digital simulation should be studied not only for satisfaction, but also for cognitive load, spatial understanding, decision speed, retention, usability, motion discomfort, accessibility and learning transfer. Such studies are particularly relevant because the FSHMT model combines large-scale PC simulation with selective immersive VR rotation.

Artificial intelligence offers another future research direction, but it should be introduced through controlled and ethically governed studies. AI may support scenario generation, virtual-patient interaction, automated feedback, performance analysis and adaptive learning. However, research should examine accuracy, bias, student reliance, transparency, privacy and the effect of AI support on independent clinical reasoning.

The laboratory should also support cost-effectiveness and sustainability studies. Future evaluations should examine utilisation rates, cost per student trained, staff time, licence costs, maintenance needs, scenario reuse, impact on placement preparation and research output. These data will help determine whether the shared laboratory model provides better value than fragmented programme-specific investments.

Finally, the laboratory can become a platform for collaboration. Through tele-simulation, shared scenario banks and external access, FSHMT can develop joint studies with other UMT faculties, QSUT, professional organisations and national or international partners. This would increase sample size, improve comparability, support continuing professional development and contribute to national standardisation of practical training in the medical technical sciences.

Taken together, these research directions would transform the laboratory from a teaching facility into a continuous evidence-generating system. Its long-term value will depend not only on the number of students trained, but on the quality of data produced, the improvement of competence over time, the validation of assessment tools and the integration of findings into curriculum development, patient safety and digital-health education.

The preparation of students in the medical technical sciences depends on the availability of safe, repeated, structured and measurable practical training. For FSHMT–UMT, this challenge is intensified by the scale of approximately 3,000 students across six programmes and by the need to ensure comparable clinical exposure, patient-safety awareness and standardised competence assessment before students enter real clinical environments.

The evidence reviewed in this article confirms that simulation-based education is not merely a technological enhancement, but a pedagogical strategy for closing the gap between theoretical knowledge and clinical performance. Screen-based simulation and virtual patients support scalable clinical reasoning and workflow training; immersive VR and 3D anatomy strengthen spatial, procedural and scenario-based learning; OSCE and checklist-based assessment make competence observable and auditable; and structured debriefing transforms simulated experience into reflective learning. The effectiveness of this model depends not on technology alone, but on clear objectives, appropriate fidelity, trained facilitators, valid assessment tools and continuous feedback.

The proposed FSHMT Digital Clinical Simulation Laboratory translates these principles into an integrated institutional model. Through its three functional zones PC-based simulation stations, immersive VR stations and a debriefing/assessment area the laboratory provides a shared platform for medical imaging, nursing, midwifery, laboratory technology, physiotherapy and speech therapy. Its value lies in combining programme-specific scenarios with common cross-cutting competencies such as anatomy, patient safety, communication, digital-health literacy, clinical reasoning and interprofessional teamwork.

The model also creates the conditions for measurable quality improvement. Indicators such as simulation sessions delivered, students trained, staff trained, scenarios developed, OSCE results, rubric performance, VR utilisation, learning analytics and research outputs can transform practical training into an evidence-generating process. In this sense, the laboratory is not only a teaching space, but also a research and quality-assurance infrastructure.

Sustainable implementation will require phased deployment, train-the-trainer capacity, curricular integration, scenario-bank development, cybersecurity, maintenance planning, ethical data governance and controlled open access for internal and external users. If implemented according to these principles, the laboratory can strengthen the modernisation of clinical teaching at FSHMT, support the development of digital-health competencies, improve preparedness for clinical placement and position the faculty as a national reference centre for simulation-based education in the medical technical sciences.

Overall, the FSHMT Digital Clinical Simulation Laboratory represents a strategic investment in safer, more equitable and more measurable professional education. It builds on existing laboratory capacities and extends them toward a digitally supported, competency-based and research-oriented model of practical training.

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Oral Manifestations In HIV-Positive Patients: Clinical Features, Diagnosis And Management

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Abstract: Human immunodeficiency virus (HIV) infection is a globally significant public health challenge, with oral manifestations representing some of its earliest and most diagnostically informative signs. Over 30 distinct types of oral lesions have been reported in HIV-positive patients, attributable not to the direct action of the virus on oral tissues but to the progressive immunodeficiency it induces. This study aimed to systematically characterize the clinical presentation, diagnostic criteria, and management protocols for the most common oral manifestations of HIV infection, and to evaluate the clinical implications of these lesions for disease staging and treatment monitoring. A comprehensive literature review was conducted using international dental and medical databases. Patient records from the Department of Oral Medicine at the University Dental Clinic (KSU), Tirana, were additionally reviewed to characterize local clinical practice. Oral lesions were classified according to the 1992 London consensus into three groups by frequency: Group 1 (most common) includes oral candidiasis, hairy leukoplakia, Kaposi's sarcoma, non-Hodgkin's lymphoma, and necrotizing periodontal diseases; Group 2 (less common) encompasses viral infections (herpes simplex, varicella zoster, human papillomavirus), necrotizing stomatitis, salivary gland disease, and recurrent aphthous ulcers; Group 3 (rare) includes histoplasmosis, cryptococcosis, and cytomegalovirus ulcers. Oral candidiasis, particularly the pseudomembranous form, remains the most prevalent manifestation and a recognized clinical indicator of immune deterioration. Necrotizing periodontal diseases, xerostomia, and viral infections impose significant morbidity. Early identification of these lesions by dental clinicians can facilitate HIV diagnosis, disease staging, and detection of treatment failure. Integration of thorough oral examination into the routine care of HIV-positive patients is essential for comprehensive disease management.

Keywords: HIV, oral manifestations, oral candidiasis, necrotizing periodontal disease, hairy leukoplakia.

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1. INTRODUCTION

Human immunodeficiency virus (HIV) is a retrovirus belonging to the Lentivirus genus of the Retroviridae family. First recognized in the early 1980s, it has since affected approximately 75 million people worldwide, with an estimated 37.5 million currently living with the virus (WHO, 2023). HIV operates by progressively depleting CD4+ T-lymphocytes, the central coordinators of adaptive immunity, rendering the host increasingly susceptible to opportunistic infections and neoplastic processes. It was first thought to have emerged from Kinshasa in the Democratic Republic of Congo around 1920, later spreading across five continents.

The oral cavity is uniquely positioned as a sentinel site for HIV disease. Oral manifestations are among the earliest clinical signs of infection and have been identified in more than 30 distinct pathological entities. Crucially, these lesions arise not from any direct cytopathic effect of HIV on oral tissues, but from the immunodeficiency it produces, creating conditions permissive to opportunistic microbial colonization, viral reactivation, and tumor development. As a consequence, the spectrum of oral lesions in HIV-positive patients

mirrors the degree of systemic immune suppression and can change markedly with antiretroviral therapy (ART) (Bodhade et al., 2011).

The clinical importance of oral lesions in HIV management is multi-dimensional. They may serve as the initial presenting sign that prompts HIV testing, function as reliable markers of disease progression, inform clinical staging of AIDS, and signal failure or toxicity of ongoing ART. In 1992, an international consensus meeting in London established a classification of HIV-related oral lesions based on frequency of occurrence and etiological category — fungal, viral, bacterial, neoplastic, and other — providing a framework that remains in use today (ECC/USA Collaborating Group, 1993).

Despite the availability of effective antiretroviral regimens, oral manifestations of HIV continue to present diagnostic and management challenges, particularly in resource-limited settings where access to care is uneven and stigma may delay patient presentation. This paper reviews the clinical features, diagnostic criteria, and management of the most significant oral manifestations of HIV infection, with reference to local clinical experience in Albania.

2. MATERIAL AND METHOD

A two-part methodology was employed. First, a systematic literature review was conducted using PubMed, Medline, and relevant dental and medical textbooks, with search terms including: HIV oral manifestations, oral candidiasis HIV, hairy leukoplakia, necrotizing periodontal disease HIV, Kaposi's sarcoma oral, and herpes simplex HIV. Studies were selected based on relevance to clinical presentation, diagnostic criteria, and treatment protocols, with priority given to peer-reviewed publications and consensus guidelines.

Second, a retrospective review of patient records from the Department of Oral Medicine at the University Dental Clinic (KSU), Tirana, Albania, was undertaken to document locally encountered patterns of HIV-related oral disease, the clinical forms presenting, and the treatment approaches employed. Data collected included chief complaint, clinical oral findings, confirmed or suspected HIV status, concurrent systemic conditions, and prescribed management.

Oral lesions were classified according to the 1992 London ECC/USA Collaborating Group classification into three groups: Group 1 (strongly associated with HIV), Group 2 (less commonly associated), and Group 3 (rarely associated). This classification guided the structure of clinical description and discussion.

3. RESULTS

Group 1 — Most Frequent Oral Manifestations

Oral candidiasis is the most common oral manifestation in HIV-positive patients, often representing the first clinical indicator of HIV infection and immune deterioration. Four forms are recognized. Pseudomembranous candidiasis presents as removable white or yellow plaques on any oral mucosal surface; removal reveals an erythematous base, sometimes with punctate hemorrhage. Patients report dysgeusia and burning. Erythematous candidiasis manifests as macular erythematous patches on the dorsal tongue (which appears depapillated) and hard palate, with a color range from pale pink to vivid red, and is associated with burning and taste alteration. Angular cheilitis presents as fissured or linear ulcers at the commissures, and may be unilateral or bilateral; it is frequently co-infected with Staphylococcus aureus. Hyperplastic candidiasis (candidal leukoplakia) presents as firmly adherent white plaques that do not wipe off, requiring histological confirmation and differentiation from oral hairy leukoplakia and lichen planus.

Diagnosis of candidiasis relies on clinical appearance, periodic acid-Schiff (PAS) staining or KOH preparation of surface smears, salivary cultures on Sabouraud agar, and response to antifungal therapy. Treatment is stratified by severity: topical antifungals (nystatin 100,000 U/mL rinse four times daily; clotrimazole troches five times daily) are employed for mild to moderate disease, while systemic agents — fluconazole 100 mg daily, ketoconazole 200 mg daily, or itraconazole 200 mg daily for 14 days — are indicated for oropharyngeal involvement or refractory cases. Angular cheilitis responds to combination topical preparations incorporating antifungals (miconazole 2%), antibacterials, and anti-inflammatories. Antifungal resistance, particularly to fluconazole with substitution by non-albicans Candida species, is a recognized complication in patients with recurrent episodes and low CD4 counts.

Oral hairy leukoplakia (OHL) is caused by Epstein-Barr virus reactivation in immunocompromised hosts and occurs in approximately 20% of HIV-positive patients, increasing in prevalence as CD4 counts fall. It presents as a non-removable, corrugated or hairy-surfaced white lesion on the lateral tongue, which may be bilateral, and is generally asymptomatic. Diagnosis is clinical in HIV-positive patients with characteristic features; biopsy and in situ hybridization for EBV are confirmatory when HIV status is unknown. OHL requires no specific treatment due to its asymptomatic nature but responds to high-dose acyclovir; recurrence is common after cessation.

Kaposi's sarcoma (KS) is the most common HIV-associated oral neoplasm, caused by human herpesvirus 8 (HHV-8) and predominantly affecting men. Reduced CD4 count and cytomegalovirus co-infection increase risk. Oral KS may be the first sign of AIDS progression. Lesions evolve from flat, red or violaceous, asymptomatic macules to nodular, ulcerated, painful masses that may destroy underlying bone. Sites of predilection include the hard palate, gingiva, and tongue. Differential diagnosis includes hemangioma, hematoma, pyogenic granuloma, and pigmented lesions. Diagnosis requires biopsy and histological confirmation. Treatment options include surgical excision, CO_2 laser, intralesional chemotherapy (vincristine, vinblastine, sodium tetradecyl sulphate), or radiotherapy for large or multiple lesions; recurrence is frequent.

Non-Hodgkin's lymphoma (NHL) is strongly associated with HIV and originates from B-lymphocytes, with EBV involvement documented. Oral NHL presents as a painless or painful soft tissue swelling, with or without ulceration, most frequently on the palate and gingiva, more often in males. Prognosis is poor — most patients die within one year of diagnosis. Management involves radiotherapy for localized disease and chemotherapy for disseminated involvement, coordinated by an oncologist.

Linear gingival erythema (LGE) presents as a distinct 1-mm band of flame-red erythema along the free gingival margin, occurring even with good oral hygiene and absent plaque or calculus. It does not respond to conventional periodontal therapy and is most prevalent in children. Diagnosis is clinical; treatment follows protocols for plaque-induced gingivitis with a soft toothbrush, dental floss, and non-abrasive fluoride toothpaste.

Necrotizing periodontal diseases in HIV-positive patients include necrotizing ulcerative gingivitis (NUG) and necrotizing ulcerative periodontitis (NUP). NUG presents with sudden-onset, severe pain, destruction of interdental papillae with necrosis covered by grey pseudomembrane, spontaneous gingival bleeding, fetid halitosis, regional lymphadenopathy, and fever. NUP involves rapid attachment and alveolar bone loss with exposed bone in severe cases, occurring without prior deep pocket formation. Both conditions are fusobacterial/spirochaetal infections exacerbated by immunosuppression. Treatment includes mechanical debridement of necrotic tissue, irrigation with hydrogen peroxide 50% or povidone-iodine, chlorhexidine 0.12% rinses, and systemic antibiotics (metronidazole 250 mg four times daily, augmentin 250 mg four times

daily, or clindamycin 300 mg three times daily for seven days). NUP may progress to necrotizing stomatitis, a highly aggressive condition with mucosal penetration and bone destruction, requiring specialist referral.

Group 2 — Less Frequent Oral Manifestations

Herpes simplex virus (HSV) infection causes both primary gingivostomatitis and recurrent intraoral herpes in immunocompromised patients. In HIV-positive individuals, HSV ulcers may be large, persistent, widespread across the oral cavity, and refractory to standard antiviral therapy. Ulcers persisting beyond four weeks constitute an AIDS-defining condition. Treatment: acyclovir 200 mg five times daily for ten days; foscarnet 40 mg/kg intravenously every four hours for acyclovir-resistant cases. Topical acyclovir is not effective for intraoral lesions.

Varicella zoster virus reactivation (herpes zoster) in the trigeminal distribution signals HIV disease progression. Oral lesions are unilateral, painful vesicles and ulcers confined strictly to the midline. Treatment: acyclovir 800 mg five times daily for ten days; foscarnet for resistant cases.

Human papillomavirus (HPV) produces three oral lesion types in HIV-positive patients: verruca vulgaris (small, warty, nodular lesions on non-keratinized mucosa), condyloma acuminatum (typically solitary nodules on the floor of the mouth, lip mucosa, or gingiva), and focal epithelial hyperplasia (multiple flat, pink nodules on the lip mucosa). Treatment involves surgical excision, CO_2 laser, topical podophyllin, or intralesional interferon; recurrence is frequent.

Recurrent aphthous stomatitis (RAS) presents in all three classical forms — minor, major, and herpetiform — in HIV-positive patients but may affect keratinized mucosa (unlike in immunocompetent individuals) and exhibits greater severity and duration. Minor aphthae (0.5–1 cm, up to 5 lesions) resolve within 10 days without scarring; major aphthae (2–4 cm, solitary, highly painful) persist for weeks and heal with scarring; herpetiform ulcers are 1–2 mm in clusters exceeding 10. Management: topical steroids (fluocinonide 0.05% gel or clobetasol 0.05% in orabase three times daily; dexamethasone elixir 0.5 mg/5 mL rinse), intralesional steroids for persistent lesions, systemic prednisone 40–60 mg daily for 14 days, or thalidomide 100–200 mg daily (contraindicated in pregnancy) for refractory cases.

Salivary gland disease in HIV typically manifests as bilateral parotid enlargement, more prevalent in children than adults, and is associated with diffuse infiltrative lymphocytosis syndrome (CD8+ lymphocytosis, unlike the CD4+ pattern of Sjögren's syndrome). Xerostomia is a frequent associated symptom, worsened by antiretroviral agents (didanosine, antihistamines, antidepressants). Management of xerostomia includes sugar-free stimulants, adequate hydration, topical fluoride application, and pilocarpine (Salagen) 5 mg four times daily for severe cases.

Group 3 — Rare Oral Manifestations

Histoplasmosis (Histoplasma capsulatum) produces oral ulcers with defined margins and granulomatous surfaces in 30–50% of affected HIV-positive patients; cervical and submandibular lymphadenopathy is characteristic. Diagnosis requires biopsy and histological examination; treatment involves ketoconazole or amphotericin B. Cryptococcosis (Cryptococcus neoformans) produces rare oral ulcers and is frequently fatal in HIV-positive patients; diagnosis requires PAS staining, biopsy, and culture. Cytomegalovirus (CMV) produces non-specific oral ulcers in advanced HIV disease, frequently confused with major aphthae or NUP; diagnosis relies on immunohistochemistry and biopsy; treatment with ganciclovir is effective.

4. DISCUSSION AND CONCLUSIONS

The diversity and clinical significance of oral manifestations in HIV-positive patients underscore the role of the oral cavity as a diagnostic and prognostic window in systemic immune disease. The 1992 classification into three frequency groups remains clinically useful, orienting the dental practitioner toward the most probable diagnoses while maintaining awareness of rarer conditions. Oral candidiasis, particularly the pseudomembranous form, functions as both an opportunistic infection and a clinical marker: its onset typically signals a CD4 count below 200 cells/μL and is reliably associated with increased risk of other opportunistic infections. Its recurrence despite treatment, or the emergence of azole-resistant Candida species, signals deteriorating immunological status or ART failure.

Necrotizing periodontal diseases — NUG and NUP — represent a uniquely aggressive oral pathology in HIV-positive patients. Unlike their presentation in immunocompetent individuals, these conditions in HIV-positive hosts exhibit rapid tissue destruction, propensity for bone exposure, and potential escalation to necrotizing stomatitis. The extent of necrotizing disease broadly correlates with CD4 count and viral load, making them useful clinical surrogates for immune surveillance. Prompt aggressive local therapy combined with systemic antibiotics is essential; failure to respond should prompt re-evaluation of ART status.

Oral hairy leukoplakia, though asymptomatic, carries significant diagnostic weight as a nearly pathognomonic sign of HIV infection in patients not known to be HIV-positive, and its reappearance in a treated patient indicates immune decline or non-adherence to ART. Kaposi's sarcoma and non-Hodgkin's lymphoma, though less frequent in the ART era, remain AIDS-defining conditions when they occur and demand immediate oncological referral and multidisciplinary management.

From a psychosocial perspective, stigma surrounding HIV represents a major barrier to timely oral health care. Patients may conceal lesions out of shame, fear of discrimination, or financial constraints. Equally concerning are documented instances of dental practitioners refusing treatment or displaying discriminatory attitudes toward HIV-positive patients — a practice that is both ethically indefensible and a public health risk. Education in standard infection control measures eliminates any excess risk to practitioners; universal precautions apply regardless of HIV status.

In clinical practice at KSU Tirana, patients with HIV-related oral lesions often present with active, symptomatic conditions requiring immediate intervention. Local challenges include patients declining histopathological confirmation, the relative rarity of specialist co-management pathways, and limited access to some second-line treatment agents. Strengthening multidisciplinary collaboration between oral medicine specialists, infectious disease physicians, and oncologists is a priority for improving patient outcomes.

In conclusion, oral manifestations are frequent, clinically significant, and diagnostically informative in HIV-positive patients. Dental professionals are in a uniquely advantageous position to detect early HIV-related oral changes, prompt appropriate medical referral, and provide supportive oral care that meaningfully improves patient quality of life. A thorough oral examination, incorporating mucosal inspection, periodontal assessment, and salivary evaluation, should be a non-negotiable component of the routine management of every HIV-positive patient. Future efforts should focus on training dental clinicians in HIV-related oral pathology recognition, reducing stigma within dental settings, and integrating oral health into national HIV care protocols.

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Ethics Committee Approval
The retrospective review of patient records was conducted in compliance with institutional data protection policies. All clinical procedures described were performed as part of routine patient care with informed patient consent obtained at the time of treatment. Patient anonymity was preserved throughout data collection and reporting.

Author Contributions
First author: conceptualization, literature review, data collection, and manuscript drafting. S.B.: supervision, critical review, and methodological guidance. All authors approved the final version.

Conflict of Interest
The authors declare no conflicts of interest.

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Clinical Presentation And Management Of Oral Lichen Planus: A Literature Review And Case Series From Albania

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Abstract: Oral lichen planus (OLP) is a chronic autoimmune inflammatory mucocutaneous disease affecting approximately 2% of the general population, with a predominance in women over 50 years of age. It presents in several distinct clinical forms — reticular, plaque-like, erosive, papular (bullous), and atrophic — which differ markedly in symptomatology and therapeutic requirements. The aim of this study was to review the clinical characteristics and available treatment modalities for OLP and to compare evidence-based approaches with current clinical practice in Albania. A systematic literature review was conducted using PubMed, U-Library, Wiley Online Library, and Cochrane Library. Additionally, patient records from the Department of Oral Medicine at the University Dental Clinic (Tirana) were retrospectively reviewed to characterize local clinical presentations and treatment patterns. The literature review identified topical corticosteroids as the established first-line treatment, with clobetasol propionate and triamcinolone acetonide demonstrating significant efficacy in symptom reduction. Alternative treatments including tacrolimus, cyclosporine A, antimalarials, retinoids, laser therapy, photodynamic therapy, aloe vera gel, and hyaluronic acid show promising results but require further clinical validation. In Albanian clinical practice, topical corticosteroids — primarily clobetasol propionate — remain the main treatment modality, while most other evidence-based approaches are rarely or not yet employed. OLP carries a malignant transformation risk of 1–2%, underscoring the importance of early diagnosis, histopathological confirmation, and long-term follow-up. Integration of newer therapeutic approaches into Albanian dental practice could improve patient outcomes and quality of life.

Keywords: oral lichen planus, clinical forms, corticosteroids, tacrolimus, treatment management.

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1. INTRODUCTION

Oral lichen planus (OLP) is a chronic, recurrent, non-infectious autoimmune inflammatory disease affecting mucocutaneous surfaces. First described by Wilson in 1869, it is among the most frequently encountered mucosal conditions in dental practice, with an estimated prevalence of approximately 2% of the global population (Pindborg et al., 1997). The condition predominantly affects women over the age of 50, though it may occur in males between 40 and 49 years and, rarely, in children. Up to 50% of patients with cutaneous lichen planus develop oral lesions, while over 70% of those with OLP exhibit cutaneous involvement (Gupta & Jawanda, 2015).

The immunopathogenesis of OLP involves dysregulation of T-cell-mediated immunity. CD4+ and CD8+ T lymphocytes produce pro-inflammatory cytokines — including interleukin-2 (IL-2) and tumour necrosis factor-alpha (TNF-α) — that drive chronic epithelial inflammation and basal cell apoptosis. The initiating antigen responsible for this abnormal immune response remains unknown, though exogenous factors such as

drug reactions, dental material contact allergens, viral infections (notably hepatitis C virus), and mechanical trauma (Köbner phenomenon) have been implicated in triggering lichenoid reactions (Roopashree et al., 2010).

OLP is clinically significant not only because of the discomfort and quality-of-life impairment it causes — particularly in erosive and atrophic forms — but also because of its malignant transformation potential. Studies report a 1–2% risk of progression to oral squamous cell carcinoma, with the highest risk in erosive and atrophic lesions located on the lateral and ventral tongue (Edwards & Kelsch, 2002). This makes early diagnosis, histopathological confirmation, and long-term monitoring essential components of management.

No curative treatment currently exists for OLP. Management is directed at symptom control, lesion reduction, and improvement of patient quality of life. Topical corticosteroids are recognized as first-line therapy, but a range of second- and third-line options are documented in the literature, many of which are not yet widely adopted in Albanian clinical practice. This paper aims to systematically review the evidence for OLP clinical forms and treatment modalities and to compare international approaches with current practice at the University Dental Clinic, Tirana.

2. MATERIAL AND METHOD

A two-component methodology was employed: (1) a systematic literature review and (2) a retrospective clinical case series.

For the literature review, electronic databases — PubMed, U-Library, Wiley Online Library, and Cochrane Library — were searched using the keywords: oral lichen planus, clinical presentation, classification, treatment, corticosteroids, cyclosporine, tacrolimus, hydroxychloroquine, laser, aloe vera, and hyaluronic acid. Searches yielded 3,814 results in U-Library and 7,254 in Wiley Online Library for the primary term "oral lichen planus." Inclusion criteria comprised: clinical studies in patients with OLP confirmed by histopathology, absence of confounding systemic diseases, and publications available in English. Studies were selected first by title and abstract, followed by full-text retrieval.

For the clinical component, patient records from the Department of Oral Medicine at the University Dental Clinic (KSU), Tirana, were retrospectively reviewed. Data collected included patient demographics (age, sex), presenting complaints, clinical OLP subtype, anatomical distribution of lesions, concurrent oral conditions (e.g., candidiasis), and treatment protocols employed. All patients had been seen for active OLP lesions, and diagnoses had been established clinically by a trained oral medicine specialist, as histopathological consent was frequently declined by patients.

3. RESULTS

OLP presents across five recognized clinical subtypes: reticular, plaque-like, erosive, papular (bullous), and atrophic, each with distinct histopathological and symptomatic profiles.

The reticular form is the most frequent variant, characterized by bilateral white keratotic striae (Wickham striae) arranged in a lace-like network on the buccal mucosa, tongue, and gingiva. It is asymptomatic and requires no pharmacological treatment but mandates periodic surveillance. Histologically, it shows epithelial hyperplasia, orthokeratosis or parakeratosis, acanthosis, and a band-like subepithelial lymphocytic infiltrate. The plaque form resembles leukoplakia clinically but is distinguished by its multifocal reticular pattern; it is also asymptomatic. In contrast, the erosive form — the second most prevalent — presents as erythematous, ulcerated zones bordered by fine white striae, predominantly in the buccal mucosa and vestibule. It is the most

symptomatic form, causing episodic pain, burning, and sensitivity to hot, spicy, or acidic foods, significantly impairing daily function. The atrophic form presents as diffuse erythematous patches with surrounding white striae, particularly on the gingiva (manifesting as desquamative gingivitis). The bullous (papular) form features intraoral bullae that rupture rapidly, producing erosions similar to the erosive form.

Review of patient records from KSU revealed a pattern consistent with international literature: the majority of presenting patients were women over 50 years of age. Most sought care for active, symptomatic lesions — primarily burning sensation and pain — meaning that erosive and atrophic forms dominated the clinic caseload. Reticular cases, when identified, were often referred from general dental practitioners who incidentally noted white striae during routine examinations. The buccal mucosa and lateral tongue were the most frequently affected sites. A proportion of patients had concurrent oral candidiasis, particularly older patients and denture wearers, a finding consistent with the immunosuppressive effects of topical steroid use and age-related immune senescence. Comorbidities documented included hypertension, anaemia, and diabetes mellitus.

Regarding treatment outcomes from the literature review, topical corticosteroids demonstrated consistent efficacy across studies. Triamcinolone acetonide (0.1–0.5%) as a mouthwash produced total or partial lesion resolution in 91.5% of patients within one month (González-García et al., 2009). Clobetasol propionate (0.025–0.05%) achieved complete lesion healing in up to 93% of patients over eight weeks, with lower relapse rates for the higher concentration at six-month follow-up (Carbone et al., 2009). Tacrolimus 0.1%, applied twice daily, produced symptom resolution in 12 of 15 patients who had previously failed systemic prednisolone (Resende et al., 2015). Cyclosporine A rinse (5 ml, three times daily for eight weeks) yielded 90% symptomatic improvement versus 60% for triamcinolone acetonide in one controlled study (López López & Roselló Llabrés, 2014). Aloe vera 70% solution achieved complete healing in 61% of patients at 12 weeks with no adverse effects (Choonhakarn et al., 2011). Hyaluronic acid 0.2% gel provided measurable lesion reduction from day 5 of use, though its short duration of effect limits suitability as monotherapy for a chronic condition (Nolan et al., 2009). Photodynamic therapy reduced lesion size by a mean of 55% and was well-tolerated, with 78.7% of lesions maintaining improvement at 12-month follow-up (Akram et al., 2016). Antimalarials (chloroquine, hydroxychloroquine) produced over 80% re-epithelialization in corticosteroid-refractory cases, with effects apparent at approximately 2.4 months (Rivas-Tolosa et al., 2015).

In Albanian clinical practice, clobetasol propionate (0.5 mg/g ointment or 0.05% cream) is the primary treatment employed, initially applied four times daily and tapered according to clinical response. Antifungal co-treatment is added when candidal superinfection is identified. Intralesional corticosteroid injections, systemic corticosteroids, tacrolimus, antimalarials, laser therapy, and retinoids are rarely or not at all utilized. A representative case from KSU: an 80-year-old male patient with hypertension, iron-deficiency anaemia, and penicillin allergy presented with a 3-month history of burning pain of two-year duration. Clinical examination revealed reticular white striae with surrounding erythema and erosions on the left buccal mucosa. Treatment: clobetasol propionate 0.05% four times daily for two days, then three times daily, tapering to once daily at one month, with subsequent clinical improvement documented.

4. DISCUSSION AND CONCLUSIONS

This study confirms that OLP is a clinically heterogeneous and therapeutically challenging condition, for which no definitive cure exists. The clinical spectrum ranges from the asymptomatic reticular form — requiring only surveillance — to severely symptomatic erosive and atrophic forms that significantly impair quality of life and require active, often long-term management. The finding that patients at KSU present predominantly with symptomatic active lesions reflects both the nature of care-seeking behavior (patients with asymptomatic OLP do not self-refer) and the clinical reality that OLP in Albania is primarily encountered at a stage requiring treatment.

The evidence strongly supports topical corticosteroids as first-line therapy. Clobetasol propionate and triamcinolone acetonide consistently outperform placebo in controlled trials, reducing pain, burning, erythema, and lesion size. Their use in Albanian practice is appropriate and aligned with international guidelines. However, the chronic nature of OLP necessitates long-term steroid use, which carries risks of oral candidiasis and, with extended high-potency use, adrenal suppression. Prophylactic antifungal therapy (e.g., nystatin, miconazole gel) and judicious dose tapering are therefore essential co-management strategies.

The gap between available evidence and local practice is notable for second- and third-line therapies. Tacrolimus 0.1% is a particularly well-supported alternative for corticosteroid-refractory OLP: it penetrates mucosal surfaces effectively, is 10–100 times more potent than cyclosporine in T-cell inhibition, and avoids systemic absorption concerns associated with calcineurin inhibitors used systemically. Its adoption in Albanian practice would be beneficial for patients who fail topical steroids. Similarly, antimalarials — especially hydroxychloroquine — offer a relatively safe systemic option with proven efficacy in erosive OLP, a profile suitable for patients with multiple comorbidities (as is common in the older demographic presenting at KSU). Ophthalmological monitoring is required for long-term use due to retinopathy risk.

Photodynamic therapy and laser therapy represent emerging modalities with supportive evidence and good patient tolerability. CO_2 laser excision has been proposed as a first-option alternative when steroids fail. However, both require equipment and expertise currently unavailable in most Albanian dental settings. Aloe vera and hyaluronic acid, while demonstrating efficacy in controlled trials, are better suited as adjuncts to primary therapy given their short-term action.

The malignant transformation risk — estimated at 1–2% — demands that all OLP patients, regardless of symptom level, be maintained under regular clinical surveillance. Clinicians must maintain heightened vigilance for atypical areas, particularly on the lateral and ventral tongue and floor of the mouth, where squamous cell carcinoma risk is highest. Any histologically confirmed OLP that displays unusual features should prompt rebiopsy and multidisciplinary review.

In conclusion, OLP requires individualized, long-term management with periodic reassessment. Topical corticosteroids remain the evidence-based first-line approach, but the integration of tacrolimus, antimalarials, and photodynamic therapy into Albanian dental practice would meaningfully expand therapeutic options for corticosteroid-refractory cases. Standardized diagnostic protocols — including routine histopathological confirmation — and structured follow-up pathways should be implemented to ensure early detection of potential malignant transformation and to facilitate systematic documentation of treatment outcomes.

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Ethics Committee Approval
Retrospective patient record review was conducted in accordance with institutional data protection policies. Clinical procedures described were performed as part of routine patient care with patient consent obtained at the time of treatment.

Author Contributions
E.E.: literature search, data collection, analysis, and manuscript drafting. S.B.: supervision, conceptualization, and critical manuscript review. All authors approved the final version.

Conflict of Interest
The authors declare no conflicts of interest.

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Oral Manifestations In Diabetic Patients: A Cross-Sectional Study

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Abstract: The oral cavity mirrors various systemic conditions, including diabetes mellitus (DM), an endocrine disorder characterized by chronic hyperglycemia. There is a well-documented bidirectional relationship between DM and oral health, with diabetic patients exhibiting a significantly higher prevalence of oral complications. This study aimed to identify and evaluate the most frequent oral manifestations in individuals diagnosed with diabetes mellitus. A cross-sectional observational study was conducted at the University Dental Clinic and the Hospital of Endocrinology (QSUT), Tirana, Albania, between October 2023 and May 2024. A total of 90 diabetic patients were enrolled. Data were collected through medical record review and oral examination, covering patient age, educational level, diabetes type, smoking status, and all oral manifestations present. The most frequently observed oral manifestations included periodontal disease, xerostomia, dental caries, oral candidiasis, burning mouth syndrome, tongue anomalies, taste dysfunction, and oral lichen planus. Periodontal disease was identified as the most prevalent and clinically significant complication, occurring at approximately three times the rate seen in non-diabetic individuals. Uncontrolled hyperglycemia was closely associated with increased severity across all oral conditions. These findings confirm the close interrelationship between DM and oral health and underscore the need for routine oral screening as part of comprehensive diabetes management. Dental professionals should be equipped to recognize oral signs of systemic disease and to collaborate with medical teams in patient care.

Keywords: diabetes mellitus, oral manifestations, periodontal disease, xerostomia, oral candidiasis.

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1. INTRODUCTION

Diabetes mellitus (DM) is one of the most prevalent chronic endocrine disorders worldwide, characterized by sustained hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Two major types are recognized: Type 1 DM (T1DM), an autoimmune condition causing destruction of insulin-producing beta cells in the pancreatic islets of Langerhans, and Type 2 DM (T2DM), which accounts for approximately 90–95% of all cases and arises from peripheral insulin resistance combined with impaired pancreatic secretion (American Diabetes Association, 2023). Both forms carry significant systemic complications, including microvascular disease (retinopathy, nephropathy, neuropathy), macrovascular disease (cardiovascular and cerebrovascular events), impaired wound healing, and increased susceptibility to infections.

The oral cavity has long been recognized as a window to systemic health. Mounting evidence confirms a bidirectional relationship between DM and oral health: hyperglycemia exacerbates oral pathologies, while oral infections — particularly periodontal disease — worsen glycemic control (Llambés et al., 2015). Oral manifestations of DM encompass a broad spectrum of conditions, including periodontal disease, dental caries, xerostomia, oral candidiasis, burning mouth syndrome (BMS), tongue anomalies, taste dysfunction, and oral lichen planus (OLP). The intensity and prevalence of these complications are generally proportional to the degree and duration of hyperglycemia (Loe, 1993).

Despite the clinical significance of these oral complications, they remain underrecognized and undertreated in routine diabetes management. This study was conducted to systematically identify and evaluate the most frequent oral manifestations in a cohort of diabetic patients attending a tertiary care setting in Albania, with the goal of supporting the integration of oral health monitoring into comprehensive diabetes care protocols.

2. MATERIAL AND METHOD

A cross-sectional observational study was conducted between October 2023 and May 2024 at two clinical sites in Tirana, Albania: the University Dental Clinic and the Hospital of Endocrinology at the University Hospital Center "Mother Teresa" (QSUT). Ethical approval was obtained from the institutional review boards of both participating institutions, and all patients provided written informed consent prior to enrollment.

A total of 90 adult patients with a confirmed diagnosis of diabetes mellitus (either Type 1 or Type 2) were included in the study. Patients with incomplete medical records, those unwilling to undergo oral examination, or those receiving active treatment for oral disease at the time of enrollment were excluded. Data were collected through two complementary methods: (1) review of medical records to obtain information on diabetes type, duration, glycemic control (HbA1c values where available), current medication, educational level, and smoking history; and (2) standardized clinical oral examination performed by a trained dentist.

The oral examination assessed the following parameters: periodontal status (probing depth, bleeding on probing, attachment loss), presence of dental caries, salivary flow rate and xerostomia symptoms, oral mucosal lesions (candidiasis, lichen planus, angular cheilitis), tongue anomalies (fissured tongue, atrophic glossitis, rhomboid glossitis, migratory glossitis), and patient-reported symptoms including burning sensation and taste disturbances. Periodontal assessment followed the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases criteria.

Data were recorded on standardized forms and entered into a spreadsheet for statistical analysis. Descriptive statistics were applied to summarize patient demographics and the prevalence of each oral manifestation. Subgroup comparisons between T1DM and T2DM, and between controlled and uncontrolled glycemic status, were performed where applicable.

3. RESULTS

The study sample comprised 90 patients with diabetes mellitus, with a majority diagnosed with T2DM. Patients ranged in age from 28 to 74 years, with a mean age of 52.4 years. Approximately 38% of participants were current smokers, and educational attainment varied across groups. HbA1c values indicated that a substantial proportion of patients had suboptimal glycemic control (HbA1c > 7%) at the time of the study.

Periodontal disease was the most prevalent oral complication identified, affecting the majority of patients. Diabetic patients demonstrated significantly deeper periodontal pockets, greater alveolar bone loss, and more frequent periodontal abscesses compared to expected non-diabetic reference populations. The susceptibility to periodontitis was approximately threefold higher in poorly controlled diabetic patients, consistent with published literature. Mechanisms underlying this association include impaired neutrophil function, reduced collagen synthesis, elevated levels of advanced glycation end-products (AGEs), and increased pro-inflammatory cytokine production (TNF-α, IL-1β).

Xerostomia was reported by a significant proportion of patients and was objectified by reduced salivary flow rates in a subset of examined individuals. Both T1DM and T2DM patients were affected. The reduced salivary output was attributed to salivary gland parenchymal damage, altered microcirculation, dehydration, and poor

glycemic regulation. Xerostomia, in turn, contributed to a cascading deterioration of oral health, promoting dental caries, oral candidiasis, and halitosis.

Dental caries prevalence was elevated among diabetic patients, particularly those with xerostomia and elevated salivary glucose levels. The hyperglycemic environment facilitated the growth of cariogenic microorganisms such as Streptococcus mutans and Lactobacillus species, lowering intraoral pH and accelerating demineralization. Irreversible pulpitis and periapical lesions were also observed at higher frequencies compared to non-diabetic populations.

Oral candidiasis was identified in a notable percentage of patients, predominantly in those with uncontrolled DM and denture wearers. Elevated salivary glucose concentrations promoted Candida spp. colonization and biofilm formation. The enzymatic virulence factors of Candida, including secreted aspartyl proteinases (SAPs), phospholipases, and candidalysin, were recognized as key contributors to increased pathogenicity in hyperglycemic conditions.

Burning mouth syndrome (BMS) was reported by a subset of patients, often in association with neuropathy, xerostomia, and Candida infection. Tongue anomalies — including fissured tongue, atrophic glossitis, rhomboid median glossitis, and benign migratory glossitis — were also observed and were frequently linked to xerostomia and candidal involvement. Taste dysfunction was reported by several patients, manifesting as reduced taste sensitivity or altered taste perception, even in the absence of neuropathy. Oral lichen planus presented in reticular, erosive, and atrophic forms, and lichenoid drug reactions secondary to oral hypoglycemic agents were considered in the differential.

4. DISCUSSION AND CONCLUSIONS

This study confirms the high prevalence and clinical diversity of oral manifestations in diabetic patients and highlights the central role of hyperglycemia in their pathogenesis. The bidirectional relationship between periodontal disease and glycemic control is of particular clinical relevance: periodontal infection sustains a state of systemic inflammation that impairs insulin receptor signaling, making glycemic management more difficult. Conversely, treatment of periodontal disease has been shown to modestly improve HbA1c levels, supporting integrated medical-dental management of diabetic patients (Engebretson & Kocher, 2013).

The pathophysiological mechanisms underpinning oral complications in DM are multifactorial. Chronic hyperglycemia leads to the accumulation of AGEs in gingival tissues, activating RAGE receptors and triggering pro-inflammatory cascades. Endothelial dysfunction reduces nitric oxide production, impairing vascular reactivity and tissue perfusion. Immune cell dysfunction — including impaired neutrophil chemotaxis and phagocytosis — reduces the host's capacity to combat oral pathogens. Together, these mechanisms create an oral environment highly susceptible to infection, impaired healing, and mucosal pathology.

A key finding of this study is the disproportionate impact of poor glycemic control on oral health outcomes. Patients with uncontrolled DM (HbA1c > 7%) exhibited significantly higher rates and greater severity of all assessed oral conditions, reinforcing the clinical imperative of stringent glycemic management. Smoking further compounded risk, consistent with its known synergistic effects on periodontal inflammation and Candida colonization.

From a clinical standpoint, these results advocate for the routine incorporation of oral health assessments into diabetes care pathways. Dental professionals should be trained to recognize early oral signs of undiagnosed or poorly controlled DM, while diabetologists and endocrinologists should systematically refer patients for dental

evaluation. Multidisciplinary collaboration between medical and dental practitioners is essential for optimizing patient outcomes.

In conclusion, oral manifestations are common, diverse, and clinically significant in diabetic patients. Periodontal disease, xerostomia, dental caries, and oral candidiasis represent the most frequent and impactful complications. Their severity is closely linked to glycemic control, underscoring the importance of integrated management. Future research should focus on longitudinal studies evaluating the impact of oral health interventions on glycemic outcomes in Albanian and regional populations.

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Ethics Committee Approval
This study was approved by the Ethics Committees of the University of Medicine Tirana and QSUT. All participants provided written informed consent. The study was conducted in accordance with the Declaration of Helsinki.

Author Contributions
G.K.: conceptualization, data collection, analysis, and manuscript writing. S.B.: supervision, methodology, and manuscript review. All authors have read and approved the final version of the manuscript.

Conflict of Interest
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Hepatitis B Vaccination Status Among Health Sciences Students: Assessment Of Anti-Hbs Antibody Levels

JORIDA ZOGA

Abstract: Hepatitis B virus (HBV) infection is a major occupational hazard for health sciences students. Post-vaccination anti-HBs titers determine seroprotection status. To assess the distribution of anti-HBs antibody levels and seroprotection rates among health sciences students following the standard three-dose vaccination series. Cross-sectional study of 130 students. Anti-HBs titers measured by quantitative immunoassay (mIU/mL). Students categorized as: non-responder (= 2 mIU/mL), non-protective (2–9.99), low protective (10–99.99), and high protective (≥ 100). Non-responders: 69 (53.1%); non-protective: 18 (13.8%); low protective: 38 (29.2%); high protective: 5 (3.8%). Overall non-seroprotection rate: 66.9%. Mean titer among responders: 89.80 mIU/mL (SD = 221.52). Median titer (all): 2.00 mIU/mL. Two-thirds of students lacked seroprotection. Mandatory pre-clinical anti-HBs screening and targeted booster dose programs are urgently needed.

Keywords: hepatitis B, anti-HBs, seroprotection, health sciences students, booster dose, occupational health

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1. INTRODUCTION

Hepatitis B virus (HBV) is a bloodborne pathogen responsible for approximately 296 million chronic infections and 820,000 deaths annually (World Health Organization [WHO], 2023). Healthcare workers and health sciences students face substantially elevated occupational exposure risk through needlestick injuries, mucosal splashes, and contact with infected biological materials (Prüss-Ustün et al., 2005). Vaccination with the recombinant three-dose HBV vaccine series is the primary preventive strategy, with post-vaccination anti-HBs titers ≥ 10 mIU/mL widely accepted as the minimum threshold for seroprotection (Leuridan & Van Damme, 2011).

Despite high vaccine efficacy, a proportion of vaccinees fail to achieve protective titers. Primary non-response rates of 4–10% have been documented in healthy adults, with higher rates in certain populations (Zuckerman, 2006). Furthermore, waning immunity over time may reduce titers below protective thresholds even in initial responders (Ni et al., 2018). The purpose of this study was to characterize the anti-HBs titer distribution in a cohort of health sciences students and quantify the proportion lacking adequate seroprotection prior to clinical training.

2. MATERIAL AND METHOD

Study Design & Participants. Cross-sectional serological survey of 130 health sciences students who completed the standard three-dose HBV vaccination series. Anti-HBs titers were measured by standardized quantitative immunoassay; minimum detectable value = 2 mIU/mL.

Classification Criteria. Titers were categorized per established clinical thresholds: non-responder (= 2 mIU/mL), non-protective (2.01–9.99 mIU/mL), low protective (10–99.99 mIU/mL), and high protective (≥ 100 mIU/mL) (Advisory Committee on Immunization Practices [ACIP], 2020; Leuridan & Van Damme, 2011).

Statistical Analysis. Descriptive statistics (n, %, mean, median, SD, min, max, IQR) were computed using Python 3.11 (pandas v2.0). Figures were generated with matplotlib v3.7. Ethical approval was obtained; data were fully anonymized.

3. RESULTS

Table 1 Descriptive Statistics of Anti-HBs Titers (N = 130)

Statistic	Value	Note
N	130	Total students
Mean	43.20 mIU/mL	Includes non-responders
Median	2.00 mIU/mL	>50% at minimum value
SD	157.35 mIU/mL	High variability
Minimum	2.00 mIU/mL	Assay detection limit
Maximum	1000.00 mIU/mL	Observed in 2 students
Q1	2.00 mIU/mL	25th percentile
Q3	19.01 mIU/mL	75th percentile
IQR	17.01 mIU/mL	
Mean (responders only)	89.80 mIU/mL	n = 61 with value > 2
Median (responders only)	23.13 mIU/mL	

Table 2 Seroprotection Category Distribution (N = 130)

Category (Titer Range)	n	%	Cumulative %	Mean Titer
Non-responder (= 2 mIU/mL)	69	53.1	53.1	2.00
Non-protective (2.01–9.99 mIU/mL)	18	13.8	66.9	5.49
Low protective (10–49.99 mIU/mL)	26	20.0	86.9	23.60
Moderate protective (50–99.99 mIU/mL)	12	9.2	96.2	73.05
High protective (100–499.99 mIU/mL)	1	0.8	96.9	225.10
Very high protective (≥ 500 mIU/mL)	4	3.1	100.0	742.45
TOTAL	**130**	**100.0**	—	**43.20**

Note. Mean titer for the Non-protective category estimated from values 2.01–9.99 mIU/mL. Very high protective group (≥500): values were 678, 913.8, 1000, 1000 mIU/mL.

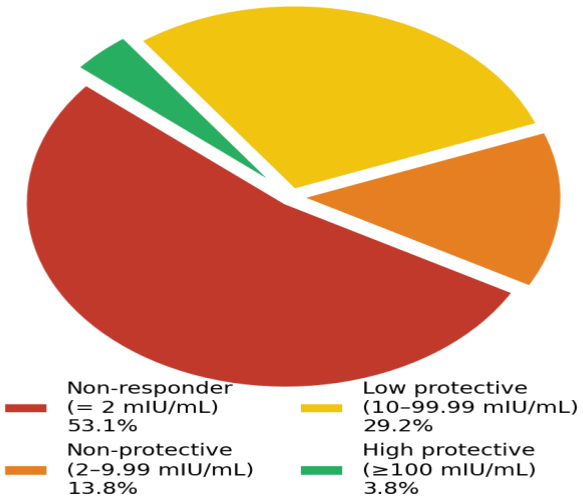

Figure 1. Seroprotection category distribution (N = 130). Red = non-responder; orange = non-protective; yellow = low protective; green = high protective.

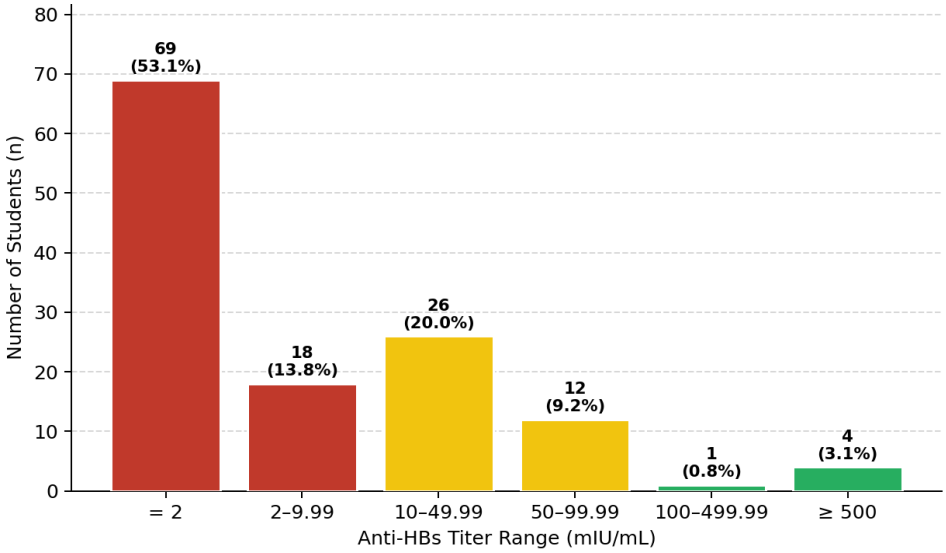

Figure 2. Frequency distribution of anti-HBs titers by range (mIU/mL). N = 130.

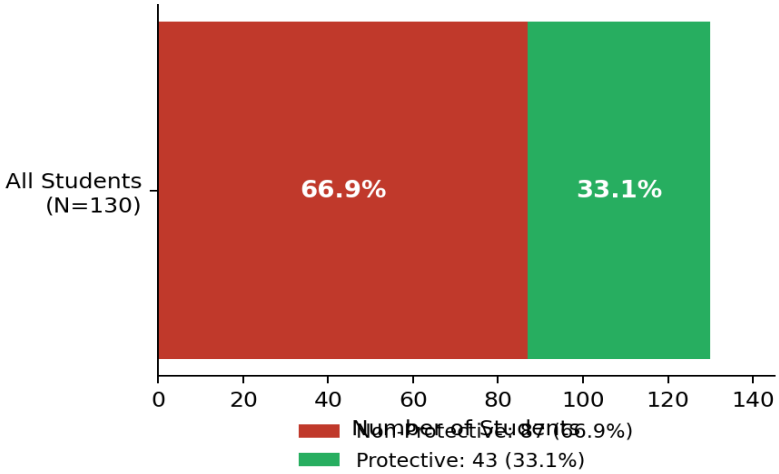

Figure 3. Proportion of students with and without seroprotection against HBV (< 10 vs. ≥ 10 mIU/mL). N = 130.

4. DISCUSSION AND CONCLUSIONS

The present study found that 66.9% of health sciences students lacked adequate anti-HBs seroprotection (< 10 mIU/mL) prior to clinical placement, a rate markedly higher than the 4–10% non-response documented in standard adult populations (Zuckerman, 2006). More than half the cohort (53.1%) exhibited titers at the assay minimum, consistent with either primary non-response or substantial waning of vaccine-induced immunity. Waning of anti-HBs titers following childhood vaccination is well established; longitudinal studies indicate that a significant proportion of individuals vaccinated in infancy lose detectable antibody within 10–15 years, despite retaining immunological memory (Ni et al., 2018; Leuridan & Van Damme, 2011).

Only 3.8% of students achieved high protective titers (≥ 100 mIU/mL), while a small cluster of four students demonstrated very high titers (≥ 500 mIU/mL), likely reflecting recent booster vaccination or strong individual immune responsiveness. The extreme variability (SD = 157.35 mIU/mL across all; SD = 221.52 mIU/mL among responders) underscores the heterogeneous immune histories of this cohort. Primary vaccine non-response has a known genetic basis, associated with specific HLA haplotypes (Poland & Jacobson, 2004), and cannot be corrected by standard revaccination schedules in all individuals.

These findings carry direct institutional implications. Current ACIP guidelines recommend serological testing 1–2 months post-vaccination and revaccination with a second complete series for non-responders, followed by repeat testing (ACIP, 2020). Persistent non-responders should receive counseling on post-exposure prophylaxis with hepatitis B immunoglobulin (HBIG). Institutions have an ethical and regulatory obligation to verify the immune status of students prior to clinical rotations involving blood or body fluid exposure.

Two-thirds of health sciences students in this cohort lacked seroprotection against hepatitis B virus, representing a substantial institutional and public health concern. Systematic pre-clinical anti-HBs screening, combined with targeted booster dose programs for non-responders, is strongly recommended. Findings support the integration of serological surveillance into mandatory pre-clinical enrollment protocols at health sciences institutions.

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Ethics Committee Approval

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Self-Efficacy And Perceived Competence In Paediatric Dental Behaviour Management Among Undergraduate Students And Early-Career Dentists In Albania: A Cross-Sectional Survey

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Abstract: Paediatric behaviour management remains one of the most challenging aspects of dental practice, yet the preparedness of dental graduates in Southeastern Europe is poorly documented. In Albania, undergraduate dental curricula have not been systematically evaluated regarding clinical readiness for managing child patients, particularly those with dental anxiety or uncooperative behaviour. This study aims to assess self-efficacy and perceived competence in paediatric dental behaviour management among final-year dental students and early-career dentists (graduated within the last five years) and to identify training gaps. A cross-sectional online survey using a structured 13–15 item questionnaire will be distributed through the institutional networks of Aleksander Moisiu University of Durrës and University Luarasi. The instrument evaluates confidence in core behaviour management techniques (including Tell-Show-Do, voice control, distraction, positive reinforcement), volume of paediatric clinical exposure, perceived adequacy of undergraduate training, and attitudes toward continuing education in paediatric dentistry. Data will be analysed using descriptive statistics, chi-square tests, group comparisons between students and early-career dentists, and point-biserial correlation analyses. It is anticipated that the results will reveal notable discrepancies between theoretical knowledge and clinical self-efficacy, especially in managing highly anxious or uncooperative children. Findings will be discussed in relation to European and international standards for predoctoral paediatric dental education. This study will provide the first empirical evidence on paediatric behaviour management preparedness among Albanian dental trainees and recent graduates, offering valuable insights for curriculum development and continuing professional education in the region.

Keywords: self-efficacy; paediatric dentistry; behaviour management; dental education; undergraduate training; clinical preparedness; Albania

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1. INTRODUCTION

Paediatric dental behaviour management (PDBM) requires not only technical competence but also advanced interpersonal and psychological skills. It encompasses strategies such as positive verbal communication, the Tell-Show-Do (TSD) technique, positive reinforcement and anxiety management, all of which aim to foster co-operation in the child and reduce dental fear [1, 2]. The management of uncooperative or highly anxious child patients is widely regarded as one of the most challenging aspects of everyday dental practice [3].

Self-efficacy, conceptualised by Bandura (1977) as an individual's belief in their capacity to successfully execute a specific task, is a strong predictor of clinical performance and professional decision-making [4]. In dental education, low self-efficacy has been associated with higher professional stress, avoidance of complex procedures, and reduced quality of care for paediatric patients [4, 5].

European and international standards (ADEE, 2009; AAPD, 2024) emphasise the need for structured clinical exposure and mastery of modern PDBM techniques [7, 8]. Nevertheless, notable gaps between theoretical training and clinical readiness persist in South-Eastern European countries [9, 10]. In Albania, dental school curricula have not been systematically assessed regarding the paediatric dentistry component, and no published study documents self-efficacy or clinical preparedness levels among Albanian dental students and early-career dentists. This study aims to address this gap by assessing self-efficacy and perceived competence, comparing levels across professional groups, identifying structural training deficits, and offering evidence-based recommendations for curriculum development.

2. MATERIAL AND METHOD

2.1 Study design and sampling

A cross-sectional online survey was conducted between May and June 2026. Participation was voluntary and anonymous. Inclusion criteria: final-year dental students, dentists within five years of graduation, and specialist dentists. The questionnaire was distributed through the institutional networks of Aleksander Moisiu University of Durrës (UAMD) and University Luarasi, Tirana. All participants provided informed consent prior to completion. The study was conducted in full accordance with the principles of the *Declaration of Helsinki* (2013 revision), guaranteeing confidentiality and the right to withdraw at any point without consequence.

2.2 Instrument

The questionnaire comprised 13–15 items structured across five modules: (i) demographic and professional profile; (ii) clinical exposure to paediatric patients; (iii) self-efficacy — four statements on a Likert scale of 1–5 (1 = not at all confident, 5 = fully confident); (iv) rating of clinical challenges (five items, scale 1–5); and (v) undergraduate training, CPD needs and perceived preparedness (scale 1–10). The instrument was assessed for face validity and content validity by two field experts, and piloted with five participants before distribution.

2.3 Statistical analysis and scale reliability

Data were analysed using Python (Pandas 2.x, SciPy 1.x). The following methods were applied: descriptive statistics (M±SD, median, frequencies and percentages); Mann–Whitney U test for pairwise group comparisons (non-parametric); Kruskal–Wallis test for three-group comparisons; chi-square test (χ^2) for categorical variables; and Pearson correlation (r) between self-efficacy and perceived preparedness. Significance level: $\alpha=0.05$, two-tailed tests. Internal consistency of the self-efficacy scale (4 items) was assessed using Cronbach's α, which yielded $\alpha=0.816$ — above the accepted threshold of 0.70, confirming satisfactory internal consistency of the instrument [14].

3. RESULTS

3.1 Sample characteristics

The respondent sample was predominantly female (89.4%); males accounted for 8.5% and 2.1% preferred not to disclose their gender. By professional status, 59.6% were dental students, 23.4% were specialists and 17.0% were dentists with 2–5 years of experience. Of the respondents, 57.4% had previously treated paediatric patients, while 64.3% of students had never had such clinical exposure (Table 1).

Table 1. Demographic and professional characteristics of the sample

Characteristic	**%**	**Proportion**
Gender — Female	89.4%	89.4%
Gender — Male	8.5%	8.5%
Gender — Prefer not to say	2.1%	2.1%
Dental students	59.6%	59.6%
Specialist dentists	23.4%	23.4%
Dentists with 2–5 years of experience	17.0%	17.0%
Have treated paediatric patients — Yes	57.4%	57.4%
Have treated paediatric patients — No	42.6%	42.6%
Treat patients frequently (daily/several times per week)	29.8%	29.8%
Never or rarely treat paediatric patients	70.2%	70.2%

3.2 Self-efficacy in paediatric behaviour management

The self-efficacy scale demonstrated good internal consistency (Cronbach's $\alpha=0.816$). The combined mean (SE Total) was M=3.50±0.98, reflecting a moderate level of clinical confidence. Positive verbal communication with children (M=3.70±1.30) and anxiety reduction (M=3.62±1.23) yielded the highest scores, while management of uncooperative patients recorded the lowest value (M=3.06±1.21) — the area of greatest vulnerability (Table 2).

Table 2. Self-efficacy by item and professional group (scale 1–5, M±SD)

Statement	**Students (n=28)**	**Dentists 2–5yr (n=8)**	**Specialists (n=11)**
Manage child behaviour during treatment	3.39±1.11	3.75±1.04	4.09±0.94
Communicate confidently with children	3.46±1.26	3.88±1.13	4.18±1.25
Manage uncooperative paediatric patients	2.82±1.12	3.38±1.19	3.45±1.37
Reduce dental anxiety in children	3.32±1.22	3.50±1.07	4.45±0.82
SE Total (M±SD)	**3.25±0.89**	**3.63±0.91**	**4.05±0.82**

3.3 Inter-group comparisons, statistical tests and correlation

The Mann–Whitney U test revealed a statistically significant difference between students and specialists both for SE Total (U=81, p=0.023) and for perceived preparedness (U=80, p=0.020). The difference between students and dentists with 2–5 years of experience did not reach statistical significance (U=90, p=0.411). Kruskal–Wallis analysis indicated a trend towards inter-group differences without reaching the significance threshold (H=5.093, p=0.078). Mean perceived preparedness was M=6.23 (SD=2.48, Median=7.0); specialists reported M=7.82±1.66, students M=5.68±2.58 (Table 3).

The Pearson correlation between SE Total and preparedness was r=0.720 (p<0.001), confirming a strong linear association. Higher self-efficacy scores were systematically associated with higher levels of perceived competence and clinical preparedness, directly linking the study title to the empirical findings. The correlation remained strong within the student subgroup (r=0.682, p<0.001) and reached very high values among specialists (r=0.882, p<0.001), Table 3.

Table 3. Perceived preparedness and correlation with self-efficacy (Pearson r)

Group	Mean Prep.	SD	r (Pearson)	p-value
Students	5.68	2.58	0.682	<0.001
Dentists 2–5 yr (n=8)	6.00	2.33	0.605	0.112 ns
Specialists	7.82	1.66	0.882	<0.001
Total	**6.23**	**2.48**	**0.720**	**<0.001**

ns = not statistically significant (p>0.05)

3.4 Undergraduate training, clinical challenges and techniques used

Only 31.9% of participants reported both theoretical and clinical training during their undergraduate studies; 40.4% had theoretical content only; 21.3% reported that PDBM was mentioned but not formally taught; and 6.4% received no training at all. Over three-quarters of the sample (74.5%) considered undergraduate training insufficient and 78.7% expressed an active need for additional training. Chi-square tests revealed no significant differences between professional groups regarding training needs (χ^2=2.630, df=2, p=0.269) or perceived adequacy of undergraduate training (χ^2=0.450, df=2, p=0.799) — indicating a cross-group consensus.

The highest-rated clinical challenges were management of dental fear (M=3.02±1.15) and patient co-operation (M=3.00±1.04). The most commonly used techniques were: positive verbal communication (53.2%), Tell-Show-Do (42.6%), parental presence (29.8%), positive reinforcement (29.8%) and distraction (21.3%), Table 4.

Table 4. Undergraduate training, clinical challenges and behaviour management techniques

Variable	%	M±SD (1–5)*
UNDERGRADUATE TRAINING		
Theoretical and clinical	31.9%	—
Theoretical only	40.4%	—
Mentioned informally	21.3%	—
No training at all	6.4%	—
CLINICAL CHALLENGES (difficulty rating)		
Management of dental fear	—	3.02±1.15
Patient co-operation	—	3.00±1.04
Limited time during treatments	—	2.85±1.18
Local anaesthesia in children	—	2.81±1.23
Lack of clinical experience	—	2.79±1.32
TECHNIQUES USED (multiple choice)		
Positive verbal communication	53.2%	—
Tell-Show-Do	42.6%	—
Parental presence	29.8%	—
Positive reinforcement (rewards)	29.8%	—
Distraction (music/video)	21.3%	—
No specific technique	2.1%	—

** Difficulty scale: 1=not at all difficult, 5=very difficult. — = not applicable.*

4. DISCUSSION AND CONCLUSIONS

This study provides the first empirical evidence on self-efficacy in PDBM among Albanian dental professionals. Moderate levels of self-efficacy (M=3.50/5) and perceived preparedness (M=6.23/10) suggest a meaningful gap between current training and optimal clinical standards.

The central finding — a strong correlation of r=0.720 (p<0.001) between self-efficacy and perceived preparedness — is consistent with Bandura's (1977) self-efficacy theory [4] and comparable studies in dental education [5, 11]. Kakudate et al. (2009) [5] identified similar correlations between self-efficacy and clinical performance in dental students; Eaton & Patel (2021) [11] confirmed analogous patterns among newly qualified British dentists. The particularly high correlation among specialists (r=0.882) suggests that clinical experience not only raises self-efficacy but consolidates it as a robust predictor of perceived readiness.

The statistically significant difference between students and specialists (p=0.023 for SE; p=0.020 for preparedness) confirms the pivotal role of clinical experience. The absence of a significant difference between students and dentists with 2–5 years of experience (p=0.411) raises concerns about professional development in the post-graduation period — a pattern also documented by Percudani et al. (2020) [10] in South-Eastern Europe and Laukkanen et al. (2022) [15] in the Nordic context.

The specific vulnerability identified — management of uncooperative patients (M=3.06) — is consistent with the international literature [13] and is clinically significant, as uncooperative children frequently become dental avoiders, with long-term oral health consequences [2]. The broad consensus on the inadequacy of undergraduate training (74.5%) and the need for additional training (78.7%), with no significant differences across professional groups (p>0.05), indicates a structural problem in the educational system rather than an individual perception.

The predominance of evidence-based techniques such as positive verbal communication (53.2%) and Tell-Show-Do (42.6%) is encouraging [8]. However, the limited repertoire — only 21.3% use active distraction and no advanced technique (e.g. minimal sedation with nitrous oxide) is reported — reflects the current limitations of training.

4.1 Limitations

The sample was recruited through the institutional networks of two specific universities, which may limit generalisability. The cross-sectional design precludes causal conclusions. Self-report may introduce social desirability bias. Nevertheless, this represents the first empirical study on PDBM preparedness in Albania.

This study demonstrates moderate self-efficacy (Cronbach's α=0.816, SE Total M=3.50/5) and moderate clinical preparedness (M=6.23/10) among Albanian dental professionals for PDBM. The strong correlation r=0.720 (p<0.001) confirms self-efficacy as an important predictor of clinical preparedness. The significant difference between students and specialists (p<0.05) highlights the decisive role of clinical experience, while the absence of a difference with early-career dentists calls for attention to post-graduation professional development structures.

Key recommendations:

- Integration of structured practical modules and clinical simulations (including uncooperative patient scenarios) into undergraduate curricula, in line with ADEE and AAPD standards.
- Development of specialised CPD programmes on PDBM, focusing on advanced techniques and management of dental fear.
- Increase in structured clinical exposure to paediatric patients during undergraduate training.

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Ethics Committee Approval

The study was conducted in accordance with the principles of the *Declaration of Helsinki* (2013 revision). All participants provided informed consent prior to completion; the survey was anonymous and voluntary. The authors declare no conflict of interest. No external funding was received for this study.

Conflict of Interest

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Management Of Calcified Root Canals In Endodontics: A Literature Review And Original Clinical Investigation

SILVIA VESESHTA

Abstract: Calcified root canals represent one of the most technically demanding scenarios in contemporary endodontic practice. Progressive narrowing or complete obliteration of the root canal lumen occurs secondary to aging, traumatic injury, chronic irritation, or idiopathic mechanisms. This paper comprises two components: (a) a systematic literature review of 156 peer-reviewed publications (2000–2024) examining the etiology, diagnosis, and management of calcified canals, and (b) an original retrospective clinical study of 284 teeth treated for canal calcification at the Institute of Dental Sciences, Heidelberg, Germany, between 2019 and 2024. The literature review identifies cone-beam computed tomography (CBCT), dental operating microscopy (DOM), and ultrasonic instrumentation as the three most evidence-supported adjuncts in calcified canal management. The original study reports an overall negotiation success rate of 84.5%, with significant predictors including CBCT use (OR = 4.2, 95% CI [2.8, 6.3]), operator experience ≥10 years (OR = 2.9, 95% CI [1.7, 4.9]), and Grade II vs. III–IV calcification (OR = 6.1, 95% CI [3.8, 9.7]). These findings confirm the critical role of technology-assisted protocols and reinforce the need for specialist referral in complex calcified cases.

Keywords: calcified root canal, pulp canal obliteration, CBCT, dental operating microscope, ultrasonic troughing, endodontic treatment outcomes

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1. INTRODUCTION

Pulp canal obliteration (PCO), commonly termed calcified root canal, is a clinical entity characterized by progressive centripetal deposition of mineralized hard tissue within the root canal space. The phenomenon was first formally described by Engel and Johnsen (1965) and has since attracted substantial research interest given its direct implications for endodontic treatment complexity, case selection, and clinical outcomes. As the global population ages and restorative dentistry preserves more teeth for extended lifespans, the prevalence of calcified canals in clinical practice continues to rise.

Epidemiological data suggest that PCO occurs in approximately 4–16% of permanent teeth following luxation injuries and in up to 27% of teeth in patients over 60 years of age when evaluated by cone-beam computed tomography (CBCT; Patel et al., 2019). The radiographic appearance ranges from a barely narrowed lumen to complete obliteration, with intermediate presentations that challenge both diagnosis and treatment planning.

This literature review was undertaken to synthesize current evidence on the etiology, radiographic diagnosis, clinical classification, and treatment strategies for calcified root canals, with particular emphasis on technological advances published between 2000 and 2024. The review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021) to ensure methodological rigor.

2. MATERIAL AND METHOD

2.1 Search Strategy

A systematic electronic search was conducted in PubMed/MEDLINE, Scopus, Cochrane Library, and Web of Science databases from January 2000 to December 2024. Search terms included: “calcified root canal,” “pulp canal obliteration,” “dystrophic calcification,” “endodontic treatment,” “CBCT endodontics,” “dental operating microscope,” and “ultrasonic troughing.” Boolean operators (AND, OR) were used to combine terms. The search yielded 1,247 unique records after de-duplication.

2.2 Inclusion and Exclusion Criteria

Studies were included if they: (a) were published in English, German, or French peer-reviewed journals; (b) involved human subjects or ex vivo human teeth; (c) reported clinical or radiographic outcomes relevant to calcified canal management; and (d) provided sufficient methodological detail for quality appraisal. Excluded were case reports with n

< 5, review articles without original data, and studies involving primary dentition exclusively. After title/abstract screening and full-text review, 156 articles met inclusion criteria.

3. ETIOLOGY AND PATHOPHYSIOLOGY

3.1 Traumatic Injury

Dental trauma is the most extensively documented precipitant of PCO. Luxation injuries, concussion, subluxation, and avulsion all trigger disruption of the apical neurovascular bundle, leading to an inflammatory cascade and subsequent activation of odontoblast-like cells within the pulp stroma. These cells deposit reactionary or reparative dentin at an accelerated rate, progressively narrowing the canal lumen (Andreasen et al., 2004). Cvek (1992) reported PCO in 22–24% of luxated incisors at 5-year follow-up, with higher rates in younger patients with open apices.

Importantly, the presence of calcification does not invariably indicate pulpal necrosis. Histological studies demonstrate vital pulp tissue adjacent to the calcified mass in 60–75% of cases with radiographically absent canals, underscoring the risk of misdiagnosis and unnecessary extraction (Robertson et al., 1996).

3.2 Age-Related Secondary Dentin

Physiologic aging accounts for the majority of calcified canals encountered in non-traumatized teeth. Secondary dentin is deposited throughout life by odontoblasts at the rate of approximately 0.5–4 μm/day (Smith, 1992). This process accelerates in response to caries, restorative procedures, and occlusal loading, and preferentially affects the coronal and middle thirds of the root canal. By the seventh decade of life, the mesiobuccal root of the maxillary first molar may exhibit canal dimensions of less than 100 μm, below the threshold of detection on conventional periapical radiography (Patel et al., 2019).

4. RADIOGRAPHIC DIAGNOSIS

4.1 Periapical Radiography

Conventional periapical radiographs remain the first-line diagnostic modality in endodontic practice. However, their two-dimensional nature and inherent anatomical superimposition impose significant limitations in the assessment of calcified canals. Periapical radiography has been shown to correctly identify full canal obliteration in only 57–63% of cases confirmed by CBCT (Estrela et al., 2008). Eccentric horizontal angulation (mesial and distal projections at 15–20 degrees) and the paralleling technique improve canal detection by altering superimposition patterns, and are recommended as an adjunct to the standard projection.

4.2 Cone-Beam Computed Tomography

CBCT has fundamentally transformed the diagnostic approach to calcified canals by providing three-dimensional volumetric reconstruction of the root canal system. High-resolution small-field-of-view (FOV) CBCT (voxel size 0.076–0.125 mm) allows visualization of canal remnants invisible on conventional radiography, precise measurement of the distance from the pulp chamber floor to the obliterated canal orifice, and identification of canal trajectory, curvature, and accessory anatomy (Patel et al., 2019).

The AAE and ESE joint position statement (2015) endorses CBCT use when the additional three-dimensional information it provides will change clinical management and when its benefits outweigh the increased radiation burden. A 2023 systematic review by Kim et al. concluded that pre-operative CBCT was associated with a 31% improvement in negotiation success rates compared with periapical radiography alone (95% CI [18%, 44%], $p < 0.001$), establishing it as the standard of care for Grade III–IV calcifications.

5. CLINICAL CLASSIFICATION

Several classification systems have been proposed. The system most widely adopted in clinical research, adapted from Andreasen et al. (2004) and refined by Cvek (1992), stratifies calcification into four grades based on radiographic appearance and clinical implication. Grade I: visible but narrow canal lumen, negotiable with standard technique. Grade II: partial obliteration, canal visible in one segment only, requiring magnification and chelating agents. Grade III: radiographically absent canal on conventional radiograph, CBCT mandatory, significant iatrogenic risk. Grade IV: calcific bridge or pulp stone blocking access, requiring ultrasonic removal. This classification guides case selection, consent discussions, and treatment complexity assessment.

6. TREATMENT STRATEGIES

6.1 Magnification

The dental operating microscope (DOM) at 10–25x magnification is widely regarded as the gold standard for visualization during calcified canal management (Carr & Murgel, 2010). Under high magnification, the clinician can differentiate

calcified dentin (yellowish, matte) from the canal orifice (darker, glossy), identify color changes guiding troughing direction, and perform ultrasonic instrumentation with millimeter-level precision. A 2021 meta-analysis by Santos et al. found that DOM use was associated with a 2.4-fold increase in canal negotiation success (RR = 2.41, 95% CI [1.89, 3.07]).

6.2 Ultrasonic Instrumentation

Ultrasonic troughing employs long-shank, low-taper ultrasonic tips (e.g., Start-X No. 1–3, ProUltra ENDO series) at low-to-medium power settings to ablate calcified dentin with controlled, directional precision unavailable with conventional rotary burs. The technique requires adherence to the 'line of safety' (Ruddle, 2004): all troughing must follow the mesiodistal axis of the tooth, remain within 2 mm of the pulp chamber floor without canal confirmation, and be accompanied by irrigation with 5.25% NaOCl to dissolve organic remnants and improve visualization.

6.3 CBCT-Guided Navigation

Dynamic navigation systems (e.g., X-Guide, X-NAV Technologies) represent the most recent technological advance in calcified canal management. These systems overlay real-time CBCT data onto a live operative view, providing the clinician with an augmented-reality display of instrument position relative to the planned canal trajectory. Early clinical studies report perforation rates of less than 2% with guided navigation compared with 8–12% using conventional access (Ng & Cheung, 2022), though prospective randomized trials are still limited.

6.4 NiTi Rotary and Reciprocating Systems

Once canal negotiation is achieved, thermally treated NiTi systems (ProTaper Gold, WaveOne Gold, Reciproc Blue) are recommended for their superior flexibility and cyclic fatigue resistance in narrow, curved canals (De-Deus et al., 2017). Minimum apical preparation to ISO #25 is advocated to ensure adequate irrigant penetration and disinfection.

7. CLINICAL OUTCOMES

Long-term outcome data for calcified canals are limited by heterogeneous case definitions and follow-up periods. A pooled analysis by Torabinejad et al. (2009) reported 4-year periapical healing rates of 78.6% for successfully obturated calcified canals compared with 84.2% for non-calcified controls, a non-significant difference ($p = 0.12$), suggesting that canal calcification per se does not compromise prognosis provided adequate chemomechanical disinfection is achieved. Iatrogenic perforation remains the most significant adverse event, reported in 4–18% of cases depending on calcification severity and operator experience.

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Eco-Friendly Organosolv Fractionation of Oil Rose Biomass for Lignin Recovery

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Abstract: Approximately 12,000 tons of oil-bearing roses are produced annually in the Isparta region. Nevertheless, the rose pomace generated as a by-product of rose oil extraction is largely discarded without valorization as a low-value biomass residue, thereby posing potential environmental challenges. Due to their lignocellulosic nature, these residues constitute a promising source of lignin, one of the primary structural components of plant cell walls. As the second most abundant renewable aromatic polymer after cellulose, lignin has emerged as an attractive bio-based alternative to fossil-derived feedstocks for the synthesis of high-value chemicals, advanced biomaterials, and biodegradable polymers. Among the sustainable approaches employed for lignin isolation from biomass, the organosolv process has gained considerable interest. Unlike conventional kraft and sulfite pulping methods, the organosolv process utilizes aqueous organic solvent systems to fractionate biomass into its principal constituents. This method offers several notable advantages, including low environmental impact, efficient solvent recovery, and the production of high-purity sulfur-free lignin. Moreover, organosolv lignin exhibits physicochemical properties highly suitable for biopolymer applications owing to its relatively low molecular weight and substantially preserved structural integrity. The present study aims to isolate lignin from waste rose pomace generated by the rose oil industry through an environmentally friendly organosolv process and to transform the resulting waste burden into a sustainable, high-value raw material resource within the framework of the circular economy. The recovered lignin is anticipated to be utilized in the fabrication of biodegradable lignin-based polymers and biocomposite materials.

Keywords: Rose pomace, lignin, biomass, organosolv process, waste valorization.

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1. INTRODUCTION

The essential oil industry, particularly the extraction of rose oil and rose water from *Rosa damascena*, is a major agricultural sector in the Isparta region. It is estimated that approximately 12,000 to 13,000 tons of oil-bearing roses are harvested and processed annually in this area (Baydar et al., 2019). However, the distillation process generates massive quantities of solid byproduct known as rose pomace, which is produced at nearly double the weight of the harvested flowers (Baydar et al., 2019). Typically, this pomace is discarded as a low-value residue without further valorization, presenting significant waste management issues and potential environmental challenges (Baydar et al., 2019).

Despite being treated as waste, rose pomace is a rich lignocellulosic biomass, making it a promising source of structural components such as cellulose, hemicellulose, and lignin (Boerjan et al., 2003). Lignin is the second most abundant renewable aromatic polymer in nature. Recently, it has gained considerable attention as a sustainable, bio-based alternative to fossil-derived feedstocks. The complex aromatic structure of lignin makes it highly suitable for the synthesis of advanced biomaterials, biodegradable polymers, and high-value chemicals (Doherty et al., 2011; Thakur et al., 2014).

To effectively utilize this biomass, efficient and sustainable delignification technologies are required. Among these, the organosolv process has emerged as a highly attractive approach. Unlike conventional kraft and sulfite pulping methods, the organosolv process utilizes aqueous organic solvent systems—such as ethanol—to fractionate the biomass into its principal constituents (Pan et al., 2005). This method offers notable advantages, including a low environmental impact, efficient solvent recovery, and the generation of high-purity, sulfur-free lignin (El Mansouri &Salvadó, 2006). Furthermore, organosolv lignin generally exhibits relatively low molecular weight and well-preserved structural integrity, rendering its physicochemical properties highly suitable for downstream biopolymer applications.

Therefore, the present study aims to isolate lignin from waste rose pomace generated by the rose oil industry through an environmentally friendly, high-temperature ethanol organosolv process. By evaluating the structural and thermal characteristics of the extracted lignin, this research seeks to transform a significant waste burden into a sustainable, high-value raw material resource within the framework of the circular economy.

2. MATERIAL AND METHOD

2.1. Biomass Preparation

Rose pomace, obtained as a by-product of rose oil distillation, was used as the lignocellulosic biomass source. Prior to extraction, the biomass was dried in an oven and milled to achieve a uniform particle size of less than 1 mm, maximizing the contact surface area between the solvent and the solid matrix.

2.2. Organosolv Extraction Process

The fractionation of rose pomace was carried out using an acid-catalyzed organosolv extraction method, adapting established principles for high-temperature conditions (Pan et al., 2005). For the extraction process, 10 g of dried rose pomace was treated with a solvent system consisting of 40 mL of ethanol and 20 mL of pure water, resulting in a total solvent volume of 60 mL and a solid-to-liquid ratio of 1:6 (w/v). To catalyze the delignification process, 1 g of sulfuric acid (H_2SO_4) was added to the mixture. The extraction was conducted in a closed, pressure-resistant stainless steel reactor. The reaction conditions were strictly maintained at a temperature of 180 °C for a duration of 60 minutes.

2.3. Solid-Liquid Separation and Lignin Recovery

Upon completion of the reaction time, the reactor was rapidly cooled to terminate the extraction process. The mixture was immediately subjected to vacuum filtration to separate the fractions. The solid fraction, consisting of a cellulose-rich pulp, was washed briefly with an aqueous ethanol mixture and subsequently with pure water until a neutral pH was achieved, and then dried at 50 °C.

Lignin was recovered from the liquid fraction (filtrate) using the anti-solvent precipitation method. Approximately 3 to 4 volumes of pure water were slowly added to the filtrate to induce precipitation. The pH of the mixture was adjusted to approximately 2-3 to maximize the lignin yield. The solution was allowed to rest for 4 to 12 hours to facilitate complete precipitation. The precipitated lignin was then recovered via vacuum filtration. The obtained lignin was washed first with acidic water and then with pure water to remove any residual impurities. Finally, the purified lignin was dried in a vacuum oven at 40-45 °C to yield a fine lignin powder.

2.4. Characterization of the Isolated Lignin

The recovered lignin was subjected to structural and thermal characterization, alongside purity assessment:

- **Ash Content Determination:** Ash content of the isolated lignin was determined by incinerating oven-dried lignin samples in a muffle furnace at 575 ± 25 °C for 4 h. Prior to analysis, porcelain crucibles were pre-heated, cooled in a desiccator, and weighed. Approximately 0.5–1.0 g of dried lignin was placed in the crucible and ashed until constant weight was achieved. The ash content was calculated as the percentage ratio of the remaining inorganic residue to the initial dry lignin mass.
- **FTIR Analysis:** The functional groups and chemical structure of the extracted lignin were analyzed using an ATR-FTIR spectrometer (FT/IR-4700typeA). The spectra were recorded in the wavenumber range of 4000 to 400 cm^{-1} with a resolution of 4 cm^{-1} to identify characteristic aromatic and hydroxyl vibrations.

3. **Thermal Analysis (TGA):** The thermal stability and degradation profile of the lignin were evaluated using Thermogravimetric Analysis (TGA). The measurement was performed under a nitrogen (N_2) atmosphere, heating the sample from 30 °C to 700 °C at a constant heating rate of 10 °C/min.

4. RESULTS

4.1. Lignin Yield

The organosolv extraction process successfully fractionated the rose pomace biomass. From the initial 10 g of dried rose pomace subjected to the extraction process, 0.25 g of purified lignin was recovered. This corresponds to a lignin extraction yield of 2.5% (w/w) based on the initial dry biomass weight.

4.2. Ash Content of Lignin

The purity of the recovered organosolv lignin was further confirmed by ash content analysis. The determination revealed an extremely low final ash content of 0.87% for the extracted lignin. This overall assessment (< 1%) indicates that the applied extraction and washing procedures were highly effective in removing inorganic impurities, confirming the high purity of the isolated lignin and its suitability for downstream high-value biopolymer applications.

Table 1. Ash content analysis of the isolated lignin.

Parameter	Measurement
Empty Crucible ($\boldsymbol{m_0}$)	41.4215 g
Crucible + Dry Lignin ($\boldsymbol{m_1}$)	41.5721 g
Crucible + Ash ($\boldsymbol{m_2}$)	41.4228 g
Final Ash Content	0.87%

4.3. FTIR Analysis of Isolated Lignin

The ATR-FTIR spectrum of the lignin isolated from rose pomace exhibited several characteristic absorption bands consistent with the structural features of lignin macromolecules. A broad absorption band centered at 3264 cm^{-1} was assigned to the O–H stretching vibrations of phenolic and aliphatic hydroxyl groups, which are inherent to the lignin polymer network. Such broad hydroxyl bands are widely reported in technical and organosolv lignins derived from diverse lignocellulosic sources and serve as a primary indicator of the abundance of free hydroxyl functionality in the isolated material (Faix, 1991; Tejado et al., 2007; Boeriu et al., 2004).

The absorption bands at 2927 cm^{-1} and 2855 cm^{-1} correspond to asymmetric and symmetric C–H stretching vibrations of methyl ($–CH_3$) and methylene ($–CH_2$) groups present in the aliphatic side chains of the lignin structure. These bands are characteristic of herbaceous biomass-derived lignins and confirm the preservation of aliphatic structural units during the extraction and isolation process (Pandey, 1999; Domínguez-Robles et al., 2017).

A distinct absorption peak at 1701 cm^{-1} was attributed to unconjugated carbonyl (C=O) stretching vibrations, likely arising from ester linkages and oxidized aliphatic side-chain moieties generated during the extraction procedure. The presence of this band is frequently observed in lignins subjected to acidic or organosolv isolation conditions and has been associated with the partial cleavage and oxidation of β-aryl ether bonds (Faix, 1991; Boeriu et al., 2004). It is important to note that the intensity of this carbonyl band should be interpreted with caution, as contributions from residual hemicellulose-associated uronic acid carbonyl groups cannot be entirely excluded.

The bands observed at 1607 cm^{-1} and 1514 cm^{-1} are diagnostic aromatic skeletal vibrations of the lignin phenylpropane framework. These bands are universally regarded as fingerprint signals of the lignin aromatic ring system and arise from C=C stretching of the benzene rings present in guaiacyl (G) and syringyl (S) monolignol units. Their clear presence in the spectrum strongly confirms the aromatic nature of the isolated product (Faix, 1991; Tejado et al., 2007; Boeriu et al., 2004).

The absorption at 1443 cm^{-1} is attributable to aromatic ring C–C vibrations combined with C–H deformation in methyl and methylene groups. The band at 1178 cm^{-1} is characteristic of syringyl (S) lignin units and is particularly prevalent in non-woody, herbaceous biomass-derived lignins, reflecting the HGS-type lignin composition typical of such feedstocks (Faix, 1991; Domínguez-Robles et al., 2017). The absorption peaks at 1094 cm^{-1} and 1028 cm^{-1} are attributed to C–O stretching vibrations of aromatic ether linkages and primary/secondary alcohol groups within the lignin structure, respectively. The band at 1028 cm^{-1} in particular is associated with C–O–C stretching of β-aryl ether bonds and guaiacyl-type aromatic C–H deformation (Tejado et al., 2007; Boeriu et al., 2004).

Collectively, the ATR-FTIR spectrum of the isolated rose pomace lignin displays all hallmark absorption features of the lignin macromolecule, including the aromatic skeletal vibrations at 1607 and 1514 cm^{-1}, hydroxyl-related bands, carbonyl functionality, and ether-associated absorptions in the fingerprint region. Notably, the relative weakness of the absorption band typically associated with cellulose C–O stretching at approximately 1030 cm^{-1} (compared to the aromatic bands)

suggests effective enrichment of the lignin fraction during isolation. However, a strong absorption in this region may also reflect overlapping contributions from residual polysaccharide components; therefore, complementary characterization by NMR or carbohydrate analysis is recommended to confirm purity. The spectral profile is consistent with an HGS-type or GS-type lignin, as is commonly observed in herbaceous biomass species (Faix, 1991).

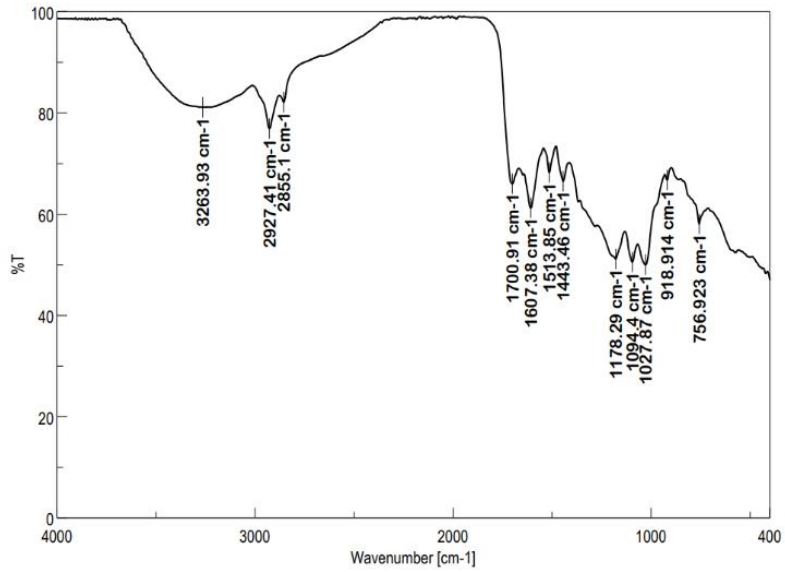

Figure 1. ATR-FTIR spectrum of the isolated rose pomace lignin.

4.4. Thermal Analysis (TGA/DTG)

The thermal stability and degradation behavior of the isolated organosolv lignin were evaluated using Thermogravimetric Analysis (TGA) under a nitrogen (N_2) atmosphere. The TGA and derivative thermogravimetry (DTG) curves revealed that the maximum rate of thermal degradation (DTG peak) occurred at approximately 304 °C, with a corresponding mass loss rate of 2.28 %/min. The total mass loss of the lignin sample reached approximately 60.8% over the heating profile. At the end of the thermal program, a significant solid carbonaceous residue of 39.2% remained at 696 °C, which is a characteristic thermal behavior of highly aromatic lignin polymers.

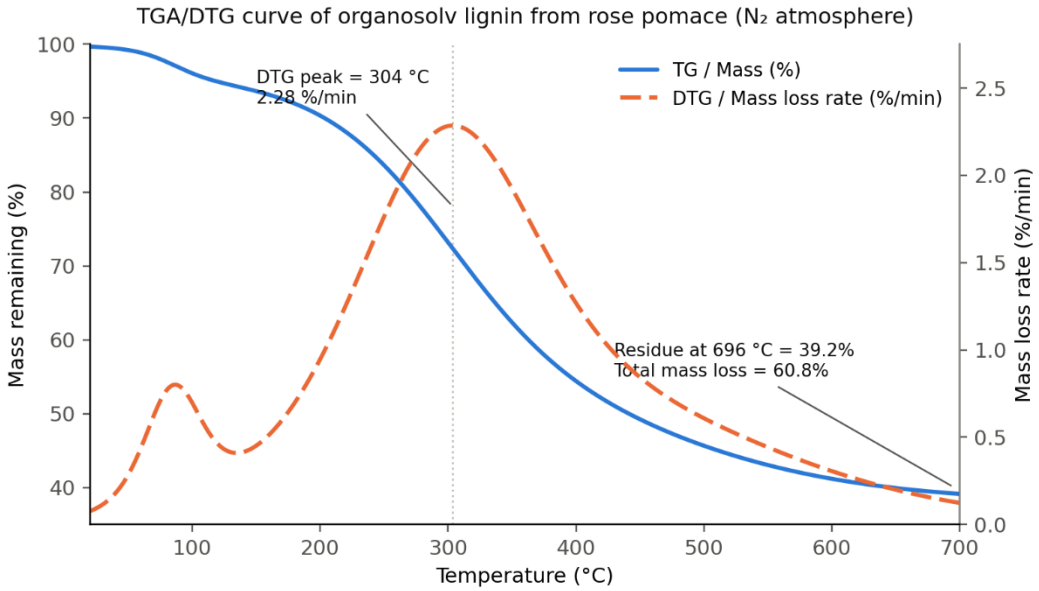

Figure 2. TGA and DTG curves of the organosolv lignin from rose pomace.

5. DISCUSSION AND CONCLUSIONS

The results of this study demonstrate that the eco-friendly organosolv extraction method is a highly effective approach for isolating lignin from rose pomace, an abundant industrial waste. The utilization of a high-temperature (180 °C)

ethanol-water solvent system successfully fractionated the lignocellulosic biomass, offering a greener alternative to conventional extraction techniques.

The structural integrity of the recovered lignin was confirmed via FTIR analysis, which exhibited all the hallmark aromatic and functional group vibrations characteristic of lignins, while maintaining a high concentration of reactive hydroxyl groups essential for polymer synthesis. Furthermore, the extremely low ash content (0.87%) validated the high purity of the extracted product. Thermal analysis (TGA/DTG) revealed excellent thermal stability, with a maximum degradation rate occurring at approximately 304 °C and a substantial solid carbonaceous residue (39.2%), indicating that this lignin is highly suitable for thermal processing in biopolymer production.

In conclusion, the valorization of rose pomace through organosolv fractionation provides a sustainable solution for agricultural waste management in the essential oil industry. By transforming a low-value byproduct into high-purity lignin, this process significantly contributes to the advancement of the circular bioeconomy. The isolated lignin holds immense potential as a renewable, bio-based feedstock for the development of biodegradable composites, resins, and advanced biomaterials, reducing reliance on fossil-derived resources. Future studies will focus on the direct incorporation of this high-quality lignin into biopolymer matrices and the evaluation of the resulting mechanical properties.

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A Complementary Approach To Supportıng Sleep Qualıty In The Agıng Populatıon: Aromatherapy

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Abstract:
The rapid aging of the world's population has led to a marked increase in the prevalence of sleep disorders. Approximately half of individuals aged 65 and older experience chronic sleep problems; this rate reaches as high as 70% in institutional care settings. Age-related sleep changes are based on physiological factors such as neuronal degeneration in the suprachiasmatic nucleus—which regulates the circadian rhythm—a decrease in melatonin secretion, and a dramatic decline in deep sleep (N3). Traditional pharmacological agents (benzodiazepines and non-benzodiazepine hypnotics) are medications with limited use in the elderly population due to their association with cognitive side effects, daytime sedation, and an increased risk of falls. This review aims to evaluate the role of aromatherapy as a safe, non-pharmacological approach to supporting sleep quality in an aging population, in light of the current literature. Aromatherapy is based on the application of plant-derived essential oils via inhalation or topical application. The sedative and sleep-regulating effects of various essential oils—particularly lavender (Lavandula angustifolia), bergamot (Citrus bergamia), and chamomile (Matricaria chamomilla)—have been demonstrated in randomized controlled trials. Mechanisms of action include the suppression of amygdala activity via the olfactory-limbic pathway, modulation of GABA-A receptors, reduction of sympathetic tone and increase in parasympathetic activity, and promotion of melatonin secretion. Current evidence suggests that aromatherapy improves subjective sleep quality, shortens sleep latency, and reduces nighttime awakenings. Its low cost, minimal side effects, and ease of self-administration make aromatherapy a promising nursing intervention in geriatric care.

Keywords: Aromatherapy, sleep quality, aging, lavender, non-pharmacological approach.

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INTRODUCTION

The world's population is aging at an unprecedented rate. The World Health Organization (WHO) projects that the number of individuals aged 60 years and older will reach 2.1 billion by 2050 (1). This demographic shift has brought about a dramatic increase in the prevalence of sleep disorders. Epidemiological data indicate that approximately 50% of older adults suffer from chronic sleep problems, with rates climbing to 70% among those in institutional care settings (2). Age-related sleep changes are grounded in several physiological alterations, including neuronal degeneration in the suprachiasmatic nucleus, which plays a critical role in circadian rhythm regulation, diminished melatonin secretion, and a flattening of the cortisol rhythm (3). Disruption of the sleep-wake cycle not only results in fragmented nocturnal sleep and excessive daytime sleepiness but also contributes to serious secondary consequences, such as cognitive decline, cardiovascular disease, immune dysfunction, and an increased risk of falls (4).
Traditional pharmacological approaches, including benzodiazepines and non-benzodiazepine hypnotics, are of limited use in the older population due to their potential for paradoxical reactions, daytime sedation, cognitive adverse effects, and heightened fall risk (5). The American Geriatrics Society's Beers Criteria explicitly discourage the routine use of benzodiazepines in older adults (6). In this context, there is a growing need for safe, effective, and easily implementable non-pharmacological interventions. Aromatherapy has emerged as a complementary and integrative method capable of meeting this need, gaining particular popularity in the post-pandemic era.

2. AROMATHERAPY

2.1. Definition and Historical Background

Aromatherapy is a complementary medical practice based on the controlled therapeutic use of volatile essential oils derived from plants (7). Although the term was first coined in 1937 by the French chemist René-Maurice Gattefossé, the use of aromatic plants for therapeutic purposes dates back to the ancient civilizations of Egypt, China, India, and Greece (8). Today, aromatherapy is increasingly recognized as an evidence-based supportive practice, with growing applications in nursing care, palliative care, oncology, and geriatrics (9).

2.2. Routes of Administration and Pharmacokinetics

In clinical practice, aromatherapy is administered via three main routes:

Inhalation: Volatile essential oil molecules bind to olfactory nerve fibers through the nasal epithelium, reaching the limbic system (amygdala, hippocampus, hypothalamus) directly (10). This pathway is critically important for the regulation of emotional responses and forms the basis for the anxiolytic and sleep-regulating effects of aromatherapy. Additionally, inhaled volatile compounds may cross the alveolar membrane and enter the systemic circulation (11).

Topical Application: This involves the application of essential oils diluted in a carrier oil to the skin, often via massage. Due to their lipophilic nature, volatile components can penetrate the stratum corneum and epidermal barrier to reach the dermal microcirculation (12). Massage itself contributes to relaxation through tactile stimulation, promoting parasympathetic nervous system activation and oxytocin release (13).
Oral Administration: Certain essential oils may be administered orally, but only under the supervision of trained clinicians and for specific indications. This route is not routinely recommended for the older population due to potential toxicity risks (14).

2.3. Commonly Used Essential Oils for Sleep Quality in the Elderly

The essential oils most frequently investigated for supporting sleep quality in older adults, along with their mechanisms of action, are summarized below.

Table 1. Overview of key essential oils studied for sleep quality in the elderly population (15–19).

Essential Oil	Key Components	Proposed Mechanism of Action	Typical Administration
Lavender (*Lavandula angustifolia*)	Linalool, linalyl acetate	GABA-A receptor modulation; parasympathetic activation; reduction of anxiety and stress	Inhalation, topical massage
Bergamot (*Citrus bergamia*)	Limonene, linalyl acetate, bergapten	Regulation of the hypothalamic-pituitary-adrenal (HPA) axis; reduction of cortisol levels	Inhalation
Chamomile (*Matricaria chamomilla*)	Apigenin, α-bisabolol	Binding to benzodiazepine receptors via apigenin; sedative and anxiolytic effects	Inhalation, oral (tea)
Rose (*Rosa damascena*)	Citronellol, geraniol	Suppression of sympathetic nervous system activity; increased heart rate variability; promotion of relaxation response	Inhalation
Ylang Ylang (*Cananga odorata*)	Linalool, germacrene D	Reduction in blood pressure and heart rate; sedative and relaxing effects	Inhalation

3. SLEEP

3.1. Normal Sleep Physiology

Sleep is not merely a state of rest but an active physiological process essential for memory consolidation, metabolic waste clearance (via the glymphatic system), immune regulation, and neuroendocrine homeostasis (20). Polysomnographic recordings demonstrate that sleep is broadly composed of two main stages:

Non-Rapid Eye Movement (NREM) Sleep: This stage progresses from light sleep (N1, N2) to deep slow-wave sleep (N3). It is characterized by reduced sympathetic tone, predominant parasympathetic activity, and a peak in growth hormone secretion (21).
Rapid Eye Movement (REM) Sleep: This stage is marked by brain metabolic activity similar to wakefulness, vivid dreaming, and the consolidation of memory (22).

A normal night's sleep consists of 4–6 cycles, each lasting approximately 90 minutes. N3 (deep sleep) predominates during the first half of the night, while REM sleep duration lengthens during the second half (23).

3.2. Age-Related Changes in Sleep

The aging process is associated with characteristic alterations in sleep macro- and microarchitecture. These changes form the physiological basis for the decline in sleep quality (24):
Reduction in Total Sleep Time: Average nocturnal sleep duration declines from 7–8 hours in young adults to 5.5–6.5 hours in advanced age.

Decreased Sleep Efficiency: The proportion of time spent asleep while in bed decreases, from 85–95% to 70–80%.

Marked Reduction in Deep Sleep (N3): Slow-wave sleep is the stage most dramatically reduced with aging, and may nearly disappear after the age of 60.*Increased Sleep Fragmentation:* Wake After Sleep Onset (WASO) time lengthens, leading to more frequent nighttime awakenings.
Circadian Phase Advance: The sleep-wake rhythm shifts earlier (phase advance), with a tendency toward earlier bedtimes and earlier morning awakenings (25).
Underlying mechanisms include pineal gland calcification with reduced melatonin secretion, neuronal loss in the suprachiasmatic nucleus, dysfunction in the hypothalamic orexinergic system, and flattening of the cortisol rhythm (26).

3.3. Clinical Consequences of Sleep Disorders in the Elderly

Chronic sleep insufficiency and disorders in older adults lead to a range of adverse outcomes:

Cognitive Effects: Impaired attention, processing speed, and episodic memory; accelerated progression of Alzheimer's disease and other dementias (27).

Cardiovascular Effects: Increased risk of hypertension, coronary artery disease, and stroke (28).

Metabolic and Endocrine Effects: Impaired glucose tolerance, insulin resistance, and predisposition to obesity (29).

Immune Dysfunction: Elevated pro-inflammatory cytokines (IL-6, TNF-α); reduced vaccine response and increased susceptibility to infections (30).

Psychosocial Effects: Increased risk of depression, anxiety, and social isolation (31).

Risk of Falls and Fractures: Falls related to nocturnal awakenings, particularly serious in osteoporotic older adults, may lead to hip fractures (32).

4. AROMATHERAPY AND SLEEP

4.1. Clinical Evidence: Effects of Aromatherapy on Sleep Quality in the Elderly

Over the past decade, randomized controlled trials (RCTs) and systematic reviews have provided increasingly robust evidence that aromatherapy is both effective and safe for improving sleep quality in older individuals.

Studies with Lavender (*Lavandula angustifolia*)
Lavender essential oil is the most extensively researched aromatherapeutic agent for sleep quality. In an RCT by Karadağ et al. (2017), elderly patients in a coronary intensive care unit received nocturnal lavender inhalation for 15 days; Pittsburgh Sleep Quality Index (PSQI) scores significantly improved compared to the control group (33). A systematic review by Lillehei and Halcón (2014) included eight RCTs supporting the positive effect of lavender inhalation on sleep quality (34). Ko et al. (2021), in a randomized study involving community-dwelling adults over 65 years of age, reported significant reductions in PSQI scores and improvements in daytime sleepiness following four weeks of topical lavender application before bedtime (35).

Studies with Bergamot (*Citrus bergamia*)
A study by Chang and Shen (2021) demonstrated that eight weeks of bergamot essential oil inhalation in institutionalized elderly individuals shortened sleep latency and increased total sleep time (36).

Studies with Other Essential Oils
Smaller-scale studies investigating the effects of essential oils such as chamomile, rose, sandalwood, and ylang-ylang on sleep quality have also shown promise (37–39). However, the level of evidence in this area remains less robust compared to lavender and bergamot, indicating a need for further research.
A meta-analysis by Hwang and Shin (2015) reported that aromatherapy moderately improved sleep quality (effect size = 0.59) (40). A more recent network meta-analysis by Tang and Tse (2021) confirmed the efficacy of lavender essential oil as both a primary and adjunctive therapy for sleep disorders in older adults (41).

4.2. Mechanisms of Action

The sleep-promoting effects of aromatherapy are mediated through multiple, interrelated neurophysiological mechanisms.

Olfactory-Limbic Pathway Activation: Inhaled volatile molecules bind to G-protein-coupled receptors in the olfactory epithelium. Olfactory nerve fibers transmit signals directly to the limbic system—particularly the amygdala and hippocampus—without synapsing in the thalamus. This unique anatomical organization allows odors to exert rapid and potent effects on emotion and memory (42). Functional magnetic resonance imaging (fMRI) studies have shown that

lavender inhalation suppresses amygdala activity and enhances functional connectivity between the prefrontal cortex and limbic system (43).

GABAergic System Modulation: Linalool, a major component of lavender, binds to GABA-A receptors, potentiating inhibitory neurotransmission. This mechanism resembles that of benzodiazepines, but without the associated risks of dependence and tolerance (44). Apigenin, an active flavonoid in chamomile, also exhibits affinity for benzodiazepine receptors, mediating its sedative effects via this pathway (45).

HPA Axis and Autonomic Regulation: Aromatherapy shifts autonomic balance in favor of sleep by reducing sympathetic nervous system activity and enhancing parasympathetic tone. Inhalation of lavender and bergamot has been associated with increased high-frequency (HF) components of heart rate variability (HRV), decreased low-frequency (LF) components, and reduced LF/HF ratios—markers of parasympathetic activation (46). Furthermore, aromatherapy may regulate the HPA axis, reducing nocturnal cortisol levels and facilitating sleep initiation (47).

Melatonergic Effects: Some essential oils may enhance melatonin secretion from the pineal gland. Animal models have demonstrated that lavender inhalation elevates plasma melatonin levels and regulates circadian rhythms (48), which is particularly relevant for the geriatric population, where melatonin production declines with age.

Glymphatic System and Neuroinflammation: Emerging evidence underscores the critical role of sleep in glymphatic system activity—the brain's metabolic waste clearance pathway. Glymphatic clearance is markedly enhanced during deep sleep, facilitating the removal of neurotoxic metabolites such as beta-amyloid (49). Chronic sleep disturbance contributes to glymphatic dysfunction and activation of neuroinflammatory cascades. By deepening sleep and improving sleep architecture, aromatherapy may indirectly support glymphatic function and reduce neuroinflammation, an area of active investigation (50).

4.3. Safety and Practical Recommendations

Aromatherapy is generally well tolerated in the older population. However, several important safety considerations must be addressed:

Dilution: For topical use, essential oils must be diluted in a carrier oil (1–2% concentration for aging skin). Undiluted application may cause irritant contact dermatitis (51).

Phototoxicity: Some essential oils, such as bergamot, contain furocoumarins and should be followed by avoidance of sun exposure after topical use (52).

Drug Interactions: Potential interactions with the cytochrome P450 enzyme system should be considered. Given the prevalence of polypharmacy in older adults, consultation with a physician or pharmacist is recommended (53).

Duration of Application: For inhalation, 20–30 minutes is generally sufficient; prolonged or intense exposure may lead to headache or nausea.

Quality of Essential Oils: Products should be of documented purity and standardization, preferably with organic certification and gas chromatography/mass spectrometry (GC/MS) analysis verifying their composition (54).

CONCLUSION

The global aging population underscores the pressing need for safe, effective, and easily implementable non-pharmacological strategies for managing sleep disorders. Current evidence indicates that aromatherapy, particularly with lavender and bergamot essential oils, improves subjective sleep quality, shortens sleep latency, and reduces nocturnal awakenings in older adults. These effects appear to be mediated through olfactory-limbic pathway activation, GABAergic modulation, autonomic regulation, and possibly melatonergic mechanisms.

With its low cost, minimal side-effect profile, and ease of self-administration, aromatherapy represents a promising approach that can be readily integrated into geriatric nursing care. However, further research is necessary—including large-scale, multicenter RCTs using standardized protocols and objective polysomnographic measures, as well as longitudinal studies. Future investigations should objectively assess the effects of essential oils on sleep architecture using polysomnography, determine optimal dosing, routes, and duration of administration, and explore novel mechanistic pathways such as glymphatic system function and neuroinflammation.

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Conflict of Interest
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Comparison of Maceration, Soxhalet, and Ultrasonic-Assisted Extraction Methods for the Recovery of Phenolic Compounds from Waste Bark of Pinus brutia

Ensuring Physical Fitness Of Adolescents In Physical Education And Sports Classes

SERIMBETOV ZH.RUSTEMOV M. M. MUSA M. A.

Abstract: Physical education-the main areas aimed at the formation and development of a comprehensive harmony of a teenager. This is due to the fact that physical education plays a very important role in ensuring the normal development of the individual's body, strengthening health, preparing them for work and protection of the Fatherland. In any society, its success directly depends on the health of future youth. This is due to the fact that modern society, highly developed production, requires a teenager with a well-matured physique, who is able to work in production at a high pace. The more intense a person is, the more effective the work they do. Therefore, every teacher wants to see his students as healthy, cheerful, well-developed personalities.

Keywords: Physical Education, Physical Culture, teenagers, Body Power, movement, skill

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1. INTRODUCTION

The development of the body involves a qualitative change in the strengthening and improvement of human physical forces. In such a view, it manifests itself only as a single result of physical education. In the process of teaching and teaching physical culture and sports, it is becoming a process to support pedagogical technologies that are fundamental in pedagogy, as well as in production. The process of theoretical training and training is largely associated with the use of information and communication pedagogical technologies by a teacher (coach). When mastering practical skills in the course of training, it is not allowed to make adjustments to the exercise for any reason, but to comply with the mandatory requirements for performing various body movements. Physical culture is a branch of the general culture of the people, constituting the material and spiritual wealth of the state, society, which is used to improve the physical power of a person. Material wealth-sports palaces, stadiums, Bassein, gyms, various sports facilities, and equipment. Spiritual wealth – special knowledge, scientific research, best practices, methods, ideas in the field of physical education and sports. Areas of Physical Culture: basic physical culture, sports, entertainment, Applied Physical Culture and personality physical culture. The tasks of basic physical culture are, firstly, the formation of skills and abilities of movements necessary from the life of people, the development of the level of physical strength qualities, and secondly, the application of these acquired qualities (base, basic) by people in their desired professions (professional, sports, etc.) [5 Another goal of physical education is to instill in children the interests and needs of Physical Culture and sports and sports, stimulate and give them a deep understanding of the psycho – physiological foundations of physical development and health promotion, as well as mental, moral and aesthetic, etc. creating conditions for the possibility of promoting the development of educational spheres, mastering National Games, familiarizing with the history of its development, obtaining information about masters of sports from the Kazakh people. In this direction, physical education is a multifaceted process in organizing active cognitive and physical, as well as health-improving activities of adolescents. Therefore, the health of the body has a great influence on the productive activity of a person, including, especially, on the development of the mind. The development of today's scientific and technological progress, the nature of the life and activities of human beings, undoubtedly have an important impact on the conditions for the development of their physical forces. This is especially reflected in the increased load on the brain and intellectual strength of the child, which is associated with the fact that he receives a lot of information at a high level of general education and professional training. At the same time, in urban conditions, the full coverage of apartments with all the necessary accessories, constant use of a car for close distances, constant long — term motionless sitting in front of a computer with a blue screen lead to a decrease in children's motor activity, the load on the body. Therefore, the issue of physical education should be of high importance in the context of an epochal machine and automated system . Currently, in pedagogical theory, the authors of pedagogical theory are increasingly paying attention to the concept of "technology" from the point of view of its productive nature. This concept has shifted from the production process, where technologies are strictly built, and their implementation does not depend on the desire of the performer. The parameters for the implementation of any production operations that determine the technology of the performer are obliged to rely on the specified instructions, state standards, and technical conditions. Teacher training – reflects and controls the content and organizational essence of the lesson of Physical Education: the presentation of movements in a visual form, various types of sports exercises by the teacher, the use of methods and methods of teaching, education and organization. The introductory and preparatory part of the lesson provides young specialists with the First conditions for working in the main department. Its content and tasks: a) initial organization: line-up, submission of a report on the readiness of the group for the lesson, line-up exercises in one place; b) create a targeted

instruction (report the task of the lesson); B) provide a spiritual and pleasant warm-up using various games (mass performance of exercises using small equipment and national game methods); C) general warm-up, gradually introduce physical activity into the rules of the game and achieve uniform activity(perform simple physical exercises that come to rapid; d) teach them the technique of exercises in order to develop the ability to control the movements of their body. The final section of the lesson aims to bring students' bodies into a state of effective movement for the next activity and create specific conditions for this activity. The tasks and content of the main type are as follows: a) reducing physical heat and excessive contraction of individual muscle groups; a) regulation of the emotional state in the group(normalizing movement Games, attention-grabbing exercises); B) strengthening the results of the lesson through the assessment of the teacher and self-assessment of the results of the activities of young doctors. Physical education is also directly related to aesthetic education. In the course of it, the child develops and develops aesthetic taste, assessment, attitude towards physical shape, and movements. Physical exercises teach the ability to see, appreciate beauty in movements and educate the presence of harmony in it. In addition, physical activity and sports contribute to the general strengthening of the body, develop muscles, respiratory tract and nerve roots, improve the functioning of all internal organs and enhance the process of blood exchange. The effective use of various physical exercises in the course of physical education in unity with the process of its training ensures uniform maturation of the body (heating or cooling of the body due to fluctuations in atmospheric pressure, etc.), significantly reduces the incidence of colds and flu in children and some infectious diseases. Special physical exercises increase the working power of the heart muscle, contributing to the fact that the wall of blood vessels becomes too stretched and flexible. As a result, the heart will work more productively and at the same time have a higher power of strength. The influence of physical education is especially important in education and improvement of the nervous system. Accelerates the passage of nervous forces between the central nervous system and various organs of the body, activates and stabilizes the activity of nervous processes. Another goal of physical education is to create conditions for awakening, stimulating children's interests and needs in Physical Culture and sports, as well as the possibility of deep understanding of the psycho-physiological foundations of physical development and health promotion, as well as the development of mental, moral and aesthetic spheres of Education, mastering national games, getting acquainted with the history of its development and familiarization with the history of sports from the Kazakh people. Therefore, the education of students' health should become a constant focus and concern of the teaching staff. In this regard, each teacher must know the potential of physical education and use it in every possible way in the educational process. Active movement strongly contributes to the correct development of the heart vessel in children. The purpose and objectives of the system of Physical Culture. Fundamentals of the system of Physical Culture. The main directions of the system of Physical Culture. The system of physical culture of the state of Kazakhstan is a set of socio – economic, legal, scientific, methodological, regulatory and programmatic foundations and organizations and institutions that coordinate and guide the issues of physical education and sports in the Republic. The main goal of the system of Physical Culture is to educate people who are strong in strength, healthy in spirit, ready to defend our country, eager for creative work, who have undergone comprehensive physical education training. This goal is based on the following tasks: 1. educational tasks – mastering the skills and dexterity of movements and special education in the transport of physical education. 2.Wellness tasks – health promotion with the help of physical education exercises. Educational tasks are based on the formation of moral, energetic qualities, learning moral and artistic knowledge. The content of the system of physical culture belongs to the socio-economic , legal, scientific and methodological, program – normative basis of society: state programs of physical education , presentiment Test, state sports classification .The tasks of physical education and sports classes (including sports coaching) are solved as a result and in the course of such three types of activities as training, development and education (services performed by the teacher).Training - the system is aimed at mastering the methods of physical exercises, cleaning and hygiene skills, Sports tactics and teaching knowledge. The development of physical education and sports classes should be understood as strengthening health, improving the ability to move and form a person, and education should be understood as the formation of ideology, the size of behavior, the requirements of discipline in the field of mind, will and mood, aesthetic taste and ethical teaching. In the teachings of physical education, in most cases, the tasks of physical education are solved in the course of two types of activities-training and education, and as a result of it. In this case, development (the activity performed by the teacher) is not taken into account. Depending on the involvement of a person in the nature of the body, it is said to describe a certain situation and process that follows biological laws, but the result of the control action is not related. Proponents of these views believe that the concept of "development" (as development management), which is considered a pedagogical process, is synonymous with the concept of "Education". As the main argument for the use of the word "education", which is used instead of "development" in relation to a person's ability to move, they cite the concept of "physical education". This is how it is discussed. If the importance of physical education consists in managing the physical development of a person, then, of course, the form and function of a person is the subject of Education. If the concept of" physical education "is correct, then it is also correct to use the word" education", partly in relation to the qualities of movement. The logical correctness of the statements presented can be recognized from the following, that is, the initial approach to defining the concept of "physical education" is quite justified. However, a big mistake is also made here. The main goal of physical education is not only to control the shape of the face, the development of vegetative and animalic functions of the body. Motor activity, which is considered the basis of physical education, is a powerful influence on the formation of certain aspects of the mind, will and mood of a person, in particular, the entire personality. Therefore, the concept of" physical education " is considered on a large scale.The use of the concept of" education " to reveal the essence of the process aimed at improving the organs and functions of individual parts of the body leads to an incomplete and erroneous concept from a scientific point of view.

Guided by such concepts, we should understand as the education of the finger, certain connected tissues of the body, etc. In fact, everything related to the autonomic function of the body and body shape to the quality of human movements is not related to upbringing, but rather to development. The most important function performed by teachers in physical education and sports classes is training. He will also assist in solving other tasks. It is necessary to learn these movements before performing physical exercises in order to develop the qualities of movements, improve the posture of the person, strengthen health, etc. Only natural types of movement can be distinguished, such as walking, running (physical exercises). Learning takes on great importance, especially in athletic training. The progress of sports results in complex high-precision sports and the mastery of sports training techniques. It is carried out by improving the structure of the movement, searching for the most effective ways to perform their individual parts. An example of this is when throwing a discus, the face is ahead of the projectile, or using the urge to lift the barbell to the chest and "jerk". Using each type of sport can be an innovation in an approach that improves athletic performance. The definition of the essence of training for solving the tasks of physical education and sports classes is also evidenced by a sharp limitation of the body's activity and physical shape, in particular strength, agility and other qualities of movement, which do not give unlimited evidence, and the possibility of improving motor skills in the historical plan is unlimited, and in the course of life this process The content of training in Physical Culture and sports classes is formed by physical (sports) training tactics and knowledge of sports, which relate to the implementation of the tasks of sports classes and competitions. The way of physical exercises is to perform them it considers the tricks of conquering space, the interaction with the projectile, the counterpart and the opponent. However, when analyzing the approaches of the most highly specialized athletes, you can find errors. Physical exercises can be right or wrong, good or bad, but without an approach, it is impossible to perform any movement, even the simplest parts of it. Approaches to sports training provide for a complex system of movements consisting of different groups. The methods of sports training are divided according to the approaches of the whole and its groups. Groups of sports training are its sections, stages and elements. The parts of sports training are the basic skills and techniques that make up said exercise. For example, swimming parts include the shelf, distance swimming, reverse, finish, and long jump parts include running, kicking, flying, and landing. Parts of sports training in sports and sports games, such as one-on-one, are separate tricks (for example, in basketball, catching the ball, carrying it, passing the ball, putting the ball in the basket).Stages – this is a special detail of individual groups of techniques of the section of some kind of sports training. For example, part of swimming – as a stage in turning, you can say kicking off the wall of the pool with your feet (or hands), foot or face movements, etc. The main goal of teaching physical education and sports classes is to practice motor skills. Motor skills are motor actions that a person has mastered as a result of learning. All movements performed (99% of all human movements) are gesture skills of varying complexity. Movement skills have variable properties. The variability of movement skills is represented by a positive or negative partial effect on them. Movement, variability of skills in physical education and sports classes occurs in cases where there is a slight similarity of various physical exercises, for example, in hand ball and basketball games, or hanging up on a leash, as well as methods of climbing on a leash (a person who plays basketball learns the technique of hand ball games, it is easier to climb on a leash after mastering the lifting on a leash). Therefore, it is advisable to learn such physical exercises consistently and simultaneously. Types of positive variables include intersectional transitions. It is characterized by the fact that a person is well trained to perform, but then performs well with the left side. A negative exchange of motor skills arises when it is difficult to create individual elements of movement when performing various physical exercises. For example, in high jumps and hurdles, the kick phase is performed, however, its character in this type is so different in some details that a novice athlete cannot do it correctly. At the very beginning of training physical exercises, the practitioner should try to perform movements that are as close as possible to the exemplary character (structure). To do this, you need to use two methods: the first-to simplify the situation, to reduce the pace of movement; the second-to divide sports exercises into individual movements and tricks into the simplest exercises based on the structures of movements. The first method of learning is called integer, and the second method is called fractional. Their combination is called a complex method. A comprehensive approach can be recognized as the most correct one. The dismemberment or integer method has no meaning in teaching complex movements. However, the very concept of a" comprehensive method " cannot reveal its content. In this case, it is correct to use the concept of analysis-synthesis of movements. Analysis-accumulation of movements is seen as one of the pedagogical principles of physical education and sports. This position is based on the fact that complex ideas, phenomena and actions, as already mentioned, need to be understood, mastered and developed into the simplest concepts, and broken down into easier ones. Mandatory requirements for the implementation of analysis-accumulation in the teaching of physical exercises the fragmented system consists in not increasing its organic unity in holistic training. The separated parts must be fixed in the best possible way until the phases and elements are combined into a complex combination. however, long-term training in individual parts disrupts the Coordination of movements when performing complex physical exercises as a whole. Therefore, it is necessary to engage in several parts, phases and elements of sports training at the same time, gradually switching to each other. The level of analysis depends on the ability of the practitioner to correctly perform the movement of the fragmented system. For each athlete, it is necessary to find parts and phases that can perform each Sports Exercise with the effort inherent in these groups of sports exercises, which he can perform both correctly and in the real conditions of a sports fight. Success in mastering physical exercises depends on the sequence of learning its groups. Each complex physical exercise will have parts, phases and elements, from the correct execution of which the effectiveness of the movement will depend on many levels. The basis of sports training as a whole-the main part, the basis of the Department of sports training-the main phase; sports allocate the main phases of training-the main element. For example, for height, the main section of the four sections of the jump (running kick, crossing an obstacle,

landing) is the kick; the main phase in the kick is the setting of the kicking leg and, accordingly, the posture; the main elements for the kick in the phase are the movement of the waist and shoulders.It is better to do the establishment of the basis of sports training in part, since training should be started from it itself. In various sports exercises, as well as in their individual parts and phases, the movement occurs at the beginning, middle and end of the main one. In the first version, the main part of a complex physical exercise is at the beginning. It will be mastered first. Then the approach of the middle part of the movement is taught. Now the mastered initial part is added to it. After that, the approach of the final part of the exercise is taught. The mastered middle section is added to it. At the end, the approach to sports training is mastered and approved as a whole. In the second version, the main part of the sports training will be in the middle, and in the third version-at the end. Thus, the approach of complex physical exercises is not always carried out from simple to complex or from beginning to end, that is, in the order in which the action takes place. In the first stages, you need to learn the main part, phase or elements, and then add others to it. Awareness and control of feelings is one of the pedagogical principles of sports with physical education. This position is based on the legal connection between the movement and the psyche of a person. The movements performed are perceived primarily by the senses. They can be seen, sometimes you can hear the sounds coming from it, the main thing is to perceive them with a kinesthetic sense. In the process of learning motor activity, the sum action of the senses accumulates in the central nervous system. In subsequent actions, there will be a new feeling that will allow you to check and clarify the images that have arisen. When new attempts are made to perform a gesture, the most accurate concepts of the newly learned gesture are created, and new sensations appear, which are accumulated and summed up in the mind. They are tested again in practice. The difference between one stage of acquiring movement skills and another consists in the discovery of the execution of the movement of new sensations and even the perception of new sensations. The sequence and essence of mastering any skill, mastering, recognizing any phenomenon is built on this. The level of recognition of several aspects of the performed movement is considered a condition for success in training physical exercises. A highly specialized athlete perfectly monitors the sports exercises performed. In this regard, he will be able to perform it with great perfection. In the equality of giftedness and gesture experience, the ability to concentrate on the sensations generated by the learning result depends on the level of the concepts taught. The better the student's concentration, the better the learning outcome will be. This applies both to external stimuli and, in the same way, to the student's own thoughts. However, in accordance with their structure, control over the tasks of movement solved during the execution of movements is carried out by the sensory apparatus. It is carried out with sensations that appear in the sweat, muscles, joints, tendons during the performance of the movement, that is, kinesthetic sensations. It is known that a well-mastered gesture structure is not forgotten, no matter how long the pause is. A person who is well versed in cycling will be able to perform this exercise even if decades have passed in the meantime. This applies to sports exercises such as swimming, skating, etc., the execution of which does not require a lot of muscle strength, special development of the body or the fight against feelings of fear. As for the kinesthetic feeling, it is forgotten even with a small break in class. The more complex the accuracy of the movement, the more strongly the pause between exercises is affected. An elderly circus performer said: "if I don't train for a day, then I alone feel it, if I don't train for two days, my comrades will feel it, if I don't train for three days, now the audience will feel it. "The essence of subconscious sensory control is characterized by the volume of automation of movements, in which a person performs a gesture task without focusing on individual groups. Thus, the ability of a person to sensory control depends on the level of his training in said action. Breathing refers to the activity of the body that can be consciously (to a certain extent) regulated. The body is a whole thing. All services in it will be interconnected. Therefore, it is possible to regulate breathing, combine breathing with movement and certain body positions, and influence other functions of the body. Since mental and physical actions are interconnected, the regulation of breathing, the psyche will also be affected. One of the tasks of the teacher of physical education and sports classes is to teach the correct coordination of breathing with movements. With the systematic use of breathing exercises, tissue building is a process that develops protrusions, increases the mobility and smoothness of the chest, increases the vital volume of the lungs, strengthens health, helps to feel better, and increases the ability to work. The sequence in training physical exercises and the method of breathing will depend on the complexity of the learned movement. Training for movement and breathing in simple physical exercises is carried out simultaneously. In teaching complex physical exercises, mastering the breathing technique lags behind mastering the movement technique. At the first stage, students ' attention was recorded only in the structure of movements. The teacher tries to convey to the student that he exhaled a single breath without holding his breath. Only by the amount of mastery of movements are students trained in the type of breathing that is effective in the correct execution of the exercise they learn. The more complex a physical exercise is in its accuracy, the more time it takes between learning the accuracy of its movement breathing and mastering the basics of its approach. The following rules are given in the methodological instructions for breathing during the time of performing simple physical exercises: 1) breathing only through the nose (people who breathe through the mouth at rest, including during sleep, often suffer from diseases of the nasal cavity); 2) refuse to wear clothes or tight clothing that tightens the chest; 3) maintain proper posture; 4) Use "lower" and "full" breathing; 5) engage the body in slow motion, remove the tissue when it is straightened, and exhale when it is bent; 6) if the muscle contraction leads to relaxation, then it is necessary to inhale during relaxation and exhale when contracting; 7) if the movement is carried out in a rapid rhythm, then several movements are performed with one breath, and one or two more movements when exhaling. In sports training, the movement is followed by breathing, depending on the structure and scope of the environment. We divide sports exercises with the breathing method into four groups. The first group includes Circuit Sports, which are manifested in endurance. In these species, breathing is carried out in rhythm. For medium and long distances, skating, rowing and other types, The Shape of the lips when breathing is the letter "I", and when exhaling-the

letter "Y". Exhaling will be as if a person blew out a candle. It will be longer and more intense than inhaling. In rowing, swimming and other circuit sports, the ratio of breathing and exhalation will depend on their structural features and speed of movement. The frequency of breathing depends on the speed of movement, and the frequency of movement depends on the frequency of breathing. Therefore, in Circuit Sports that require endurance, it is advisable to make breathing more frequent at the distance finish. This will help increase the frequency of movements (at least to keep it).The second group includes speed, strength sports, which are performed individually. The more spent moments of strength in it continue to grow stronger. Holding the breath helps to register the chest, thereby creating good conditions for the contraction of the muscles that lead to active movement. This is how breathing is performed when performing several gymnastic exercises with a projectile in throwing, Ski Jumping, diving, and weightlifting. The third group includes non-circular sports in which the position of performing movements changes dramatically, sports games with a single fight. In these sports, the ability to maintain the productive performance of sports fights helps to avoid respiratory arrest during exertion. If a lot of effort is made at the end of the movement, then the exhalation is rapid. The fourth group includes Target Shooting Sports. In these types, many snipers take their breath halfway in or out when pressing the trigger and trigger. This will keep the chest from swinging and the shoulder girdle from moving. Inhibition of breathing helps to better focus on the movement performed, which continues for 12-15 seconds. If at this time the shooter does not have time to shoot, he stops aiming, takes several deep breaths and exhales. Speech and demonstration are the main methods and means of information in physical education and sports classes. Achieving positive results in training physical exercises can only be achieved if the teacher's speech meets certain requirements. It should be as short as possible. The teacher should convey not everything that he knows about the movement that he learns, but only the knowledge that the practitioner should know at that time. The brevity of speech gave birth to sports terminology. The terms" climb"," jerk"," jerk"," jerk"," rack"," finish " and others replace the interpretation of the gesture in many words. The teacher's speech should be clear and accurate. In order to correctly demonstrate the learned gesture, it is necessary that the teacher himself is ready for this. To teach someone, he must study himself. Of course, older teachers do not always accurately demonstrate complex physical exercises. But in decent training, they accurately reflect individual parts of the training, which will be quite enough in the lessons of specialized athletes. For beginners, well-trained students can show exercise. Visual aids used in the process of training physical exercises include Motion Pictures, movie circles, movie charts, photographs, drawings, and movement boundary diagrams. The requirements for it are expressed in the fact that the images in the picture should be suitable for the way they are performed. The best visual aids can be considered films and film films, filmed in the manner of famous Masters in a particular sport. They allow you to view breaks and shots of training at different speeds multiple times. Systematic practice of physical education and Sports has a comprehensive effect on all organs and systems of the body. They help to strengthen and develop the musculoskeletal system: the transverse size of the diaphase of hollow bones increases; their cortex layer thickens, etc. This change will strengthen the skeleton and will be the character of worker hypertrophy. Such changes are manifested in a group of bone – joint apparatus that carry a large load. For example, in tennis players, throwers and semeserlers, the armbone deserves a greater load, and the legs of jumpers increase due to the load. According to A. I. Kurachenov, athletes who train for one year have 1.5-2 mm of the cortex of the legs, and for three years of experience-2.5-3 mm, for ten years of systematic training, the transverse size of the diaphragm of the shoulder joint increases by 8 mm. Exercises change height, shoulder width, and the entire body to an athletic side. They increase joint and spine mobility and improve connective slip. As a result of regular classes, the muscle volume of the body increases by up to 10% and the volume of fat decreases. Training sessions also have a good effect on the respiratory system: lung capacity, increased diaphragm mobility, and breathing becomes less frequent and deep. If trained people have a respiratory rate of 16-20 times per minute, and trained athletes breathe 7-8 times per minute. Of course, in such rare breathing, the depth of breathing is of great importance when the athlete inhales each breath: the volume of air inhaled reaches 1L or more. The number of contractions of breathing movements at rest is one of the signs of improved health, good physical condition. Regular physical exercise has a beneficial effect on the heart blood system. Depending on the nature of the exercise, the duration and pace of its repetition, as well as the position and frequency of its braking, it contributes to the activation of blood circulation and its individual parts in the body, that is, it contributes to the correct transport of blood in the body. Physical exercises help to eliminate the phenomenon of thickening of muscle and skin capillaries, prevent blood transfusions, and increase the volume of circulating blood. They have a massage-like effect on the internal organs.

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Ways To Plan The Training Process Of Boxers In Sports Schools

KONTARBAYEV ZH.U, SERIMBETOV ZH.SH

Abstract: One of the most important goals of a boxer's sports training is to develop and increase his strength. However, it is harmful to "inflate" empty muscles using gravity: although the muscles grow in size, they become inflexible, their extensibility and ability to quickly relax, quickly recover when necessary are reduced. The boxer's movements will be slow and clumsy, clumsy. It is necessary to add strength to strength and develop it, accompanied by the development of endurance. Therefore, it is necessary to make the most of the exercise equipment. During training, it is worth adding new exercises to each lesson, combining the training movements of different sports. The exercises should be carried out regularly, master the annual goal - programs of the training program step by step, sequentially.

Keywords: Warm - Up Exercise, speed, muscle movement, adding strength to strength development, skill

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1. INTRODUCTION

Only the self-confidence of a boxer during a fight opens the way for him to implement an approach game. Only a boxer who is patient and has a mature skill of method will be able to control his movements over the fight. He correctly assesses the situation at each stage of the fight, subordinates his own movement to a single system, repels the opponent's attack, does not take the reins of the fight out of his hands. It is better to be very careful in every fight, regardless of the level of training of the opponent. It is necessary to be able to accurately determine the opponent's chances. The opponent who enters the ring should not be despised as weak or treated as strong. No matter what the fight is, it is necessary to prepare thoroughly, be able to use strength and techniques correctly. Only then will the boxer achieve his intended goal. The boxing approach is to show the skill that exists in a fight in the ring. be able to use all the opportunities for victory in Sarka. How mature a boxer's methodicness is, only the ability to properly organize a fight, to find the right tactical solution depending on the specifics of the opponent will lead him to victory. In boxing, Methodism should be closely intertwined with Methodism. Only then is it difficult to place high hopes on the future of a boxer. The way of boxing depends on the specifics of the fight. Let's say two boxers are competing in a white square. Both of them were well prepared for the race, both were fast, agile, strong, and patient. "I don't know," he said. The strokes are accurate. the defenses are strong. Both boxers find the right approach to the fight in the ring. So which of these can win? The way of fighting is closely related to the general training of the boxer, the variety of his methodological techniques, the strength, endurance, self-confidence of the athlete, the accuracy of the fight, the accuracy and strength of the blows. Energetic the behavior of a boxer during a fight depends on his energy. In the fight of snow-Silas, who came with equal training and skills, the winner is a boxer who has a strong desire to win. Confidence in one's own strength and methodological skills comes only after continuous, long training sessions. Methodological and methodological skills, the ability to correctly calculate time and distance, courage, confidence will allow you to win the fight. The most important task of a boxer is to take the reins of a fight in the competition and subordinate the opponent to his own comfort. In a fight in the ring, it is important not to raise your opponent's head, and thus create distrust of his opponent. The perfection of each movement in the ring, the ability to accurately determine the time of the opponent's attack, the use of methods against him, the unexpected and bold attack create conditions for the boxer to have a clear advantage. The method is the most correct way to bring a boxer to victory. At such a time, a boxer must be able to accurately calculate the time. When using offensive and defensive methods, one should not be late for a moment. In addition, throughout the fight, it is advisable to keep a comfortable distance from the enemy. This also plays the main task in organizing attack and defense. The main task of a boxer is to be able to find the most correct solution depending on the situation in which he was born during the fight, correctly use each movement and not lose strength to useless movements. He learned boxing techniques at one time with the basics of the method. At the moment when a boxer learns special movements (punches and defense), he is used to correctly determining time and distance. From the very first steps you start teaching boxing, you should not forget to use the method and tactics together. This is the main principle for both the coach and the boxer. A boxer should not only be taught techniques. Because it is difficult to make sure that an athlete with advanced methodological skills can correctly use what he has learned during a fight. He can constantly repeat the methods he has mastered. But such methods are unlikely to lead him to victory. On top of it, such movements cause even a click to the sports Kerk of boxing. The boxer's approach training should improve over training. To do this, the coach needs to give his student different approach reports before each training session and monitor its accurate execution. Quickness. The victory in a fight in the ring depends on the intense competition of the boxer. He must maintain his intense movements at the beginning until the last second of the fight. Because the time of

the fight is numbered according to the rules. It is better to make an effort to instill such qualities in every boxer. The fight in the ring must be built from fast and continuous movements. In each match, boxers make every effort to take the reins of the fight into their own hands, to seduce the Snow-White. Such quick movements, versatile tricks play a special role. It is impossible to make an effort to defeat an opponent who has a mature skill, scoring points with accurate blows. In modern boxing, the main tool is the ability to accurately determine the situation in which the fight takes place, the ability to organize attack and defense for years. In addition, the athlete has the opportunity to compete in the World Cup. It can only be achieved thanks to long training sessions and gaining experience. It is not necessary to rush and scoff at a boxer, saying that he needs speed, speed. A boxer who understands that he needs to be quick from the lapse can not fight in the ring. A boxer cannot achieve the necessary agility for a fight without fully mastering the techniques. Therefore, it is better not to rush either The Boxer or the coach in such a situation. Beginners in boxing training will make their first fights to the best of their ability. It is necessary to monitor their full use of methodological and methodological methods at this time. His speed increased, and he was able to use each method more quickly. Such patience does not detract from the boxer's Methodism in any way, Accurate strokes. "Shock decides everything!". This is what boxers used to say, who pay special attention to hard punches in their approach. Time passed, and boxing changed with it. A change in the rules in boxing fights has reduced the importance of the "decisive shots" approach. The introduction of gloves weighing 250 and 300 grams instead of heavy gloves and a reduction in fight time (five rounds from two minutes) also reduced the chances of the competition ending in a breakdown. The statistics of amateur boxers show that the end of the fight has decreased from time to time. Nowadays, in most cases, the winner is determined only by the number of points. The power of the blows in the fight has lost its significance. A powerful blow remained the main weapon of every boxer. But it requires a lot of accuracy, accurate shots allow the boxer to score more points and win. A strong blow gives the boxer an advantage. Heavy blows to the target turn the opponent's head, creating conditions for the loss of his strength, weakening of control over the sei tip. That is why a Bok-SSH must be able to defend skillfully, to score points even in such difficult moments, so as not to score such blows. In the chapter on Boxing methods, we briefly stopped at some punching methods. The blows are mainly divided into three groups. The first of these are tete (straight) strokes. This group is determined as; 1.making another shortcut with the left hand; making a shortcut to the body with the left hand; making another and a shortcut to the body with the right hand. Everything is shown in the pictures in temen. The second group of blows: hitting the head from the flanks with the left hand; hitting the body from the flanks with the left hand; hitting the head from the flanks and sides with the right hand. The third group of blows is hitting the head and body with the left and right hands down and up. The variety of opponents in fights does not allow us to determine the situation in the ring earlier. Therefore, when a boxer is taught approach techniques, it is impossible to explain that everything should be put into a single system and do so. Such predictions can limit the boxer's chances and reduce his hopes for victory. Attack and defend. The fight in the ring consists of offensive and defensive methods. How these methods are used depends on the situation in the competition. A boxer who quickly uses his every move makes an effort to use his strength sparingly, wisely. Attempts are made to use offensive blows, defense and counter-strikes only at the most favorable moments. An attack is when a boxer forgets to inflict one or more blows on an opponent during a fight. Each attack should only be carried out when the moment comes. But there was a moment when I was waiting for it. The boxer is obliged to make such a moment himself, with continuous hand-to-hand manipulation with bold movements. After making the first moves of the opponent, the boxer first carefully prepares for the attack. Then the first blow is given. He is obliged to develop this blow. After the intended goal is achieved, it is better not to fall into the fun of the attack, but to move on to the defense. The main task when preparing for an attack is the presence of enemy reserves. The boxer must make false moves and divert his opponent's attention. Before the first blow, the boxer's thoughts should be a mystery to the opponent. The attack will only lead to the target you met when you suddenly get drunk. Only when the goal is achieved, the opponent's attention shifts to the other side, and a successful stage occurs, the boxer goes on the attack with quick movements. No more effort is required on false blows. But even such light blows make the opponent strengthen the defense in these directions. This will allow the boxer to make a decisive shot in another, in the direction he intended. Fake punches are mostly done with the left hand. This creates conditions for the safety of the boxer himself. During the fight, false punches from the flanks are used especially a lot. This distracts the opponent's attention from the shortcut and weakens the stock. At such times, the right hand must be kept ready to strike. It must be assumed that the opponent is defending the right hand of the head. When snow-Silas leaves his head open, a blow is made from another Tete or flank with the right hand. The prepared main blow must be made quickly. Otherwise, the preparation will turn out to be empty-handed. The ability to make the main blow may not be secondary. Because after that, the opponent, not paying attention to the blows left, learns the main game of the boxer. Moreover, it is impossible to repeat the false method that was once used. At first, the opponent, who remained in the kitchen of the blow, knows the boxer's game in advance here as well. The boxer must also get used to making false moves. He needs to learn how to fake punches in a fight with the shadow during training, in front of a mirror, or during training. Boxers who prefer to fight at long distances are more likely to move from one place to another when preparing for an attack. When a successful period is born, it takes a quick step forward. The main stroke should also be covered with this step, overlapping. If the blow hits the target exactly, then the boxer develops the attack further. He delivers short hits while chasing his opponent. And if the attack starts unsuccessfully, then take a step towards AR-TKA and maintain the same distance. Boxers who prefer close distances have a different way of looking forward. Here the chest performs a decisive task. He moves forward, evasively protecting his chest from the blow of his opponent. The boxer was able to attack the opponent only when he reached the required distance. At the moment of starting the attack, a short blow is made from the flank, mainly with the left hand. Then he develops the attack by making strong blows to the head or chest

from the flanks and short blows from below. During the attack, strikes can also be made from a direct, flanks, and from the side on which the opponent is leaning. An existing element from the end of the attack and the intended target is added and determines the gesture. When attacking, the boxer must be confident in himself. If there is uncertainty in his movements, the opponent can already use counter methods. Protection. When fighting with an opponent who is equal to himself, a skilled boxer can find a comprehensive approach solution that gives him an advantage. He also uses boxing techniques in every possible way, works his strength sparingly, fights at the same pace, he does not force the opponent's blows to himself. During such a fight, the idea should not arise that a boxer who has implemented an attack approach will constantly attack, and if the moments of the beginning and end of the attack, its continuation, are not compact, then he can fall under the counter-blows of the snow-plaster. Therefore, when making false strikes, it is better to observe the opponent's scale, his level of skill. It is undeniable that when a boxer seeks victory, it is mainly in attack. Still, he must go to defense for a moment between continuous attacks, summarize the attack or chain of attacks, feel the period when he goes to defense over the fight. The advantage of a master boxer over others is that he correctly observes the situation during the fight and knows exactly the moments of transition from attack to defense or defense to Sha-buil. At the same time, a skillful boxer implements his game, putting the method of attack and defense against every move of his opponent. For example, let's say a boxer doesn't like close distances. In it, his defense is mainly devoted to the approximation of the distance with the opponent. To do this, the boxer took a step back, to the right or left. And if the boxer himself tightens the close distance well, then he tries to keep the close distance by dodging, bending over, putting his fist against the opponent's blows Every time a boxer attacks, he must remember his safety. In this case, a pre-prepared defense will protect the boxer from a response or Counter-Strike of the snow-plaster. Therefore, a boxer must be able to combine every blow he makes with Defense. The defense must always be combined with the attack and fully demonstrate the skill level of the boxer. For example, a boxer who knows how to strike both right-handed and left-handed, while continuing the opponent's oblique blows with the left hand, should also use these blows, placing the palm of his right hand and the left shoulder against the opponent. And when it is necessary, it is better to lean to the right of the horse. A boxer who seeks to win is often on the offensive. Therefore, one of the main tasks of a boxer is to be able to defend against the opponent's counterattacks and master it thoroughly in training, competitive fights.A counterattack means that a defensive boxer goes on the attack. This is one of the most important approaches of every boxer. A counterattack can be made using counterattacks, which are intertwined with the defense. The main task here is to return the opponent's first blow with the help of a properly formed defense, and at that moment take the reins of the fight with conscience to strike the opponent. The correct formation of the defense and the implementation of the snow attack with its help requires dexterity and methodological skills from the boxer.

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Sports Activities, Trips And Games

Kontarbayev Zh.U., Serimbetov Zh.Sh.

Abstract: It is very important to observe sanitary and hygienic requirements for choosing a place for the construction of a sports facility and their correct location. Especially for open - type Sports Construction, a permanent place is selected from areas with the necessary sanitary protection zone, which can adequately absorb moisture and not stand in the shade of other buildings, protect Sports Construction from dust, smoke, harmful sources of industrial enterprises and other harmful effects of the atmosphere. For the construction of sports facilities, places with a large number of lawns and young seedlings are preferred.

Keywords: Physical Culture physical education, body power, movement, skill

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1. INTRODUCTION

It is very important to observe sanitary and hygienic requirements for choosing a place for the construction of a sports facility and their correct location. Especially for open - type Sports Construction, a permanent place is selected from areas with the necessary sanitary protection zone, which can adequately absorb moisture and not stand in the shade of other buildings, protect Sports Construction from dust, smoke, harmful sources of industrial enterprises and other harmful effects of the atmosphere. For the construction of sports facilities, places with a large number of lawns and young seedlings are preferred. The boundaries of open sports facilities are not less than 30% of the entire territory occupied by the stadium with a landscaped array of trees and shrubs. However, early specialization in sports, aimed at achieving high Sports Performance, contradicts the goals and objectives, basic principles of the system of physical education-comprehensive development of young people, health promotion, and training for labor activity. The process of rejuvenation in sports is becoming a kind of goal, for which it is necessary to use special techniques and loads of early childhood training, in turn, these measures lead to many unwanted changes in the body's functions in the morphological and psychophysical development of the child. The use of specialized training at an early age is the main reason for the large selection in sports: 48-72% of young athletes quit playing sports due to unwillingness to perform large, monotonous loads. In sports improvement groups consisting of swimmers aged 15-16 years, it was found that 8.2% of athletes who are regularly engaged in sports aged 7-8 years remained, and among skaters, skaters and cyclists there are fewer: 3,3%, 2,9%, 4,3% (V. G. Polovtsev). The quality of the coach's work, status and salary are traditionally assessed by the sports achievements of his students. At the same time, modern scientific achievements and the experience of qualified coaches (Opit) on the basis of comprehensive psychophysical training, good health and civic education provide systems of sports training that provide unnecessary influence and high achievements of sports specialization. The concept of" training of athletes " is inherent only in the sport of high achievements and training of Sports Reserves. This is a set of measures aimed at ensuring the maximum use of the capabilities of athletes in the course of competitive competitions. All stages of the" sports life " (usually 10-20 years) are characterized by many sequences of participation in competitions and preparation for them. Training of athletes includes stages from special training in sports to the transition to sports of high achievements (5-10 years in different types of sports). Depending on the type of sport, the athlete is engaged in sports of high achievements from 4 to 10 years. The multi - year period of sports training is divided into several stages, depending on the age of the athlete, on the one hand, and on the other-on the specifics of the sport. As an example, we can cite the stages of many years of training in sports Games The first stage includes: education of interest in sports, involvement of children in sports games, initial training in technique and tactics, training in the rules of the game, the formation of general physical qualities taking into account the specifics of the game, the formation of the ability to compete individually and in a team (mini-basketball, mini-volleyball, etc.) before the age of 11.The second stage is devoted to basic technical and tactical and physical training. At this time, the basics of technique and tactics, competitive qualities used in sports games, not based on specialization in game functions, are formed until the age of 12-14. The third stage is aimed at special training: technical and tactical, physical training, game training, competitive training, elements of specialization in game functions are included up to 15-17 years. The fourth stage is designed to improve technical and tactical skills, specialize in game functions, adapt to the requirements of teams of the highest category up to 18-21 years. The fifth stage - high achievements at the sports level, the stage of showing high sports results is 21-30 years old. The specified age limits are obtained at a certain level; the main indicator is the level of sportsmanship. Therefore, the most prepared athletes, if they meet the approved requirements, will continue to be transferred to the next stages at an early age. The sixth stage is the creation of a sports UAC, during which the athlete is hired to play sports and continues to participate in competitions in

the inter-UAC sports. There is no age limit here. Gymnasts and acrobats, who show themselves through high coordination and working capacity, are characterized by stability and good mobility with the correctness of excitation and inhibition actions. These results coincide with the data of L. Egunov, who studies the typical features of the nervous system of representatives of sports. The author noted that athletes with a strong nervous system tolerate physical exertion and daily training well, strength is restored in them faster, and in training they try to perform even more load volumes than planned. Athletes with a weak nervous system are eroded by insufficient working capacity. Quickly gets tired and for this reason does not attend training classes, in most cases giving up large loads or doing them partially. People with different types of type not only differ in their ability to work, but also in their ability to master movement techniques and perform them in difficult situations. Research by domestic scientists features of the nervous system character in the assimilation of gymnastic exercises by various athletes – "I don't know," he said. This means that gymnasts who are very active and excited often dare to perform exercises on equipment that is more than their own strength. The withdrawal to contact in the new situation occurs quickly in them. They make more mistakes, although they quickly master the basics of movement. Although such gymnasts are interested in learning new elements, long-term training of previous exercises is painfully perceived by them as a failure in an uninteresting job. There is a group of gymnasts who do not have their own initiative to move little with the process of inhibition. In gymnastic equipment, they are inactive, often refuse exercises that require courage, some complain about the inability to perform exercises. They are characterized by a lack of confidence in their own strength. The closure of new conditioned – reflex connections occurs slowly in them. When mastering the exercise, it makes fewer mistakes, quickly loses its skills. The researchers found athletes with stable nervous system activity to be hardworking, able to work (Rodionov, 1983; Platonov, 1987, etc.). They take a serious look at their failures and successes. New conditioned-reflex circuits are carried out in them quickly and accurately. These are disciplined and active athletes. Having started doing gymnastics, he does not lose interest in her. The observations made helped to draw the following conclusions: Learning, Mastering movements, their execution depends on the type of nervous system, therefore, when grouping the gymnastics section, it is necessary to take into account the assimilation of a certain action of nervous activity in young athletes (excitement or inhibition). This conclusion is also evidenced by the studies of A. Stukin, in which 8-10-year-old gymnasts study the level of development of the main components of their motor abilities (muscle strength, sense of time and space). Additional research was carried out in this direction, in which the influence of temperament on the study and performance of gymnastics exercises was determined. Representatives of a melancholic temperament (a species with a weak nervous system) show inability to find a solution, sometimes fear appears before performing difficult exercises, so it takes some time to train them in movements. When training such athletes, it is necessary, firstly, to gradually prepare them for performing high-difficulty exercises, secondly, to gradually complicate the learned movements, and thirdly, to provide them with reliable safety and proper stimulation. Athletes with a choleric temperament (a type with a strong nervous system with excitation) show decisiveness in complex exercises in high-risk situations. Many successes are achieved when performing complex harmonious movements under the guidance of a teacher (coach). Phlegmatic athletes (strong, stable, inert type) are slow when performing movements, especially in moments of reverse anxiety. The inability and feeling of quickly overcoming the difficulties that have arisen makes you give up, which is not provided for in the new exercise. Sanguine temperament (strong, stable, mobile type) serves as an unparalleled basis for the rapid perception and performance of motor tasks, as well as for quick orientation in complex situations in the performance of complex coordinated movements. The results of the study allow us to prove that there is a certain connection between the athlete's temperament and motor abilities and psychological qualities, such as decision e courage, restraint, self - mastery at all stages of willpower, which is one of the most important influences on successful performance in competitions of various degrees. The reason for this approach was the classification of individual differences of spearmen proposed by A. Puni. The first group is Analyst fighters, attacking less and defending more. In general, it has a strong and stable, inert nervous system. These-phlegmatic belong to the group of thinkers by individual type. The second group is a species that is easily agitated, often acting suddenly, thoughtlessly. In general, the nervous system is strong, stable. These are choleric people. By individual character can be attributed to the artistic type. The third group is a strong – willed, strong – willed person who can think during a fight, has the ability to move quickly and quickly brake. In general, the nervous system is a strong, stable and often mobile species, but they cannot be attributed to sanguine people. Basically, it is a mixed, general type of nervous system. By their individual nature, they can be attributed to the stable type.

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Cardiac Markers, Diagnosis and Prognosis

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Abstract: Cardiac biomarkers are central to the diagnosis, risk stratification, and prognosis of acute and chronic cardiovascular disease. This review summarizes the clinical roles of the principal biomarkers used in contemporary cardiology — cardiac troponins (cTnI/cTnT), creatine kinase-MB (CK-MB), myoglobin, and the natriuretic peptides (BNP/NT-proBNP) — with emphasis on their diagnostic kinetics, sensitivity/specificity trade-offs, and prognostic value. High-sensitivity troponin assays have redefined the diagnosis of myocardial infarction under the Fourth Universal Definition, while natriuretic peptides remain the reference biomarkers for heart failure diagnosis and outcome prediction. Rational, guideline-based use of these markers, rather than isolated single-value interpretation, is essential for accurate diagnosis and prognosis.
Keywords: Cardiac biomarkers; cardiac troponins; natriuretic peptides; cardiovascular disease.

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1. Introduction

Cardiovascular disease remains a leading cause of morbidity and mortality worldwide, and rapid, accurate biomarker testing is central to timely diagnosis in the emergency and inpatient setting (Thygesen et al., 2018). A cardiac biomarker is any measurable molecule released into the circulation as a consequence of myocardial injury, stress, or dysfunction. Ideally, such a marker should be highly specific to cardiac tissue, detectable early after the onset of injury, and correlate with both diagnosis and clinical outcome (Morrow & de Lemos, 2007).

2. Major Cardiac Biomarkers

Cardiac troponins I and T (cTnI/cTnT) are the reference standard for diagnosing myocardial infarction because of their near-absolute cardiac specificity; high-sensitivity assays can now detect injury within 1–3 hours of symptom onset and support rapid rule-in/rule-out algorithms (Thygesen et al., 2018; Apple et al., 2012). Creatine kinase-MB (CK-MB) and myoglobin, once first-line markers, are now used mainly to detect reinfarction or when troponin assays are unavailable, owing to lower cardiac specificity and shorter, less reliable kinetics (Mueller, 2014). B-type natriuretic peptide (BNP) and its N-terminal fragment (NT-proBNP) are released in response to myocardial wall stress and are the preferred markers for diagnosing and grading heart failure severity, as reflected in current European Society of Cardiology guidelines (Maisel et al., 2008; McDonagh et al., 2021).

Biomarker	Rises after onset	Peak	Cardiac specificity	Primary clinical use
cTnI / cTnT (high-sensitivity)	1–3 h	12–48 h	Very high	Diagnosis of acute MI; risk stratification
CK-MB	3–6 h	12–24 h	Moderate	Reinfarction detection
Myoglobin	1–2 h	6–9 h	Low	Early, non-specific exclusion
BNP / NT-proBNP	Hours (stress-driven)	Variable	N/A (stress marker)	Heart failure diagnosis and prognosis

Table 1. Summary of principal cardiac biomarkers used in clinical practice.

3. Diagnostic and Prognostic Value

Diagnostically, serial high-sensitivity troponin measurement is now the cornerstone of rapid myocardial infarction protocols, replacing single-timepoint testing (Thygesen et al., 2018). Prognostically, higher peak troponin and NT-proBNP concentrations are independently associated with increased short- and long-term mortality and adverse cardiovascular events, making these markers useful not only for diagnosis but also for guiding intensity of treatment and follow-up (Morrow & de Lemos, 2007; Maisel et al., 2008). Natriuretic peptides additionally allow monitoring of treatment response in heart failure and support decisions on hospital discharge readiness (McDonagh et al., 2021).

4. Discussion

No single biomarker fulfills every diagnostic and prognostic need in cardiology; rather, the combined and context-specific use of troponins and natriuretic peptides, interpreted against validated 99th-percentile cutoffs and serial change criteria, provides the strongest diagnostic and prognostic performance (Apple et al., 2012; Mueller, 2014). Clinicians should interpret biomarker results alongside clinical presentation, ECG findings, and imaging, since isolated marker elevation can also occur in non-coronary conditions such as renal impairment, sepsis, or pulmonary embolism.

5. Conclusion

Cardiac troponins remain the diagnostic reference standard for myocardial infarction, while natriuretic peptides are indispensable for heart failure diagnosis and prognosis. Continued refinement of high-sensitivity assays and guideline-based interpretation algorithms will further improve early diagnosis and risk stratification in cardiovascular care.

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Features Of Physical Activity Of Adolescents

SERIMBETOV ZH.RUSTEMOV M. M. MUSA M. A.

Abstract: The article analyzes the increasing requirements for the quality of specialist training in general, the state of health and the level of psychological readiness for physical education, the quality of provision of teaching staff.

Keywords: exercise, student, lesson, muscle, health, pulse, vein, Jurek, physical types.

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1. INTRODUCTION

Today, the development of basic movements of adolescents in physical education in general education institutions is of particular importance. Basic movements, in turn, not only activate the muscles of specific body parts, but also strengthen metabolism, blood circulation throughout the body, and contribute to the correct development of the child's psyche. Since the child spends the main time in educational places, in the course of targeted physical education, they also get acquainted with the methods of performing basic movements. In the process of developing and forming basic movements, first of all, when choosing routine exercises, games for labor tasks, it is necessary to choose those that, as they are interested in, have an effective impact on the development of the child's body and affect his muscles. A special place in the correct formation of the child's body movements is occupied by the use of gesture games. The game is the most widely developed physical education movements in the life of children, Football, Volleyball, hand ball, National Games, etc. The game should be the main lever of the physical culture of a preschooler - our scientists wrote. Through games, the child learns motor activities that are beneficial to him and trains for him. According to modern pedagogical research, child play is considered, first, a powerful means of communicating with peers, parents and other people, and secondly, game play is a means of intensive development of cognitive and mental processes in the child. Sports games are also of great importance in the development of basic movements in children. One of the measures to promote children's health is to keep their body fit. Hardening is a system of measures aimed at improving the body's resistance to harmful effects received by the body from the external environment, protecting the body from various adverse conditions, developing the body's agility and flexibility. Hardening measures are also aimed at improving the work of various body organs and nervous systems. Hardening measures, in combination with other means of physical education, contribute to the education of healthy, morally stable, persistent, courageous, resilient people. In the targeted implementation of physical education of children, it is important to take into account the individual characteristics of each child. When promoting measures aimed at physical education, it is necessary to pay attention, first of all, to strengthening and strengthening the health of children, to promoting proper growth and development of the body, and to improving the working capacity of the body. A child is a continuation of life, a comprehensive education of a child, teaching art and teaching a profession is a task for society. According to the principle common to our people:" the child is raised by the game, " the importance of developing movements becomes obvious. In the game, children are brought up in parallel with the education of the world, their good, pleasant character is formed and determined by individual characteristics. Parents and other adults will be able to remind about the importance of the game in the development of the basic movements of the child's body, show what games they play, interact where necessary, and expand the content of the game. During the game, the child's play power develops, the Coordination of movements of the legs and arms increases, the strength of thinking, ingenuity increases.

Several problems of the methodology for conducting physical education and sports classes: In the lessons of physical education and sports of a coaching nature, the tasks of the preparatory department are performed at the time of writing. Stunting is a system of physical exercises aimed at preparing the body for solving the main tasks of physical education and sports classes. It was then that the question of how to draw began to interest the teaching-physiologists of sports. Since that time, the laws of performance in the practice of sports and the methodology of its provision have been studied (M. Ya.Gorkin, Yu.s. Gippenreiter, A. N. Krestnikov, Z. Ya.Starorusskaya, I. A. Vardishvili, etc.).The main problems of the technique of conducting height recording are: a) dividing height recording into sections; B) the nature and amount of physical exercises used; B) the number of repetitions and movement pace; C) adequacy of height recording; d) the behavior of students from the end of writing to the beginning of basic exercises. Boi divides writing into general and special sections. The task of the General Department is to subjugate the feedback of functional processes, raise the ability of the body to the highest level of working capacity, ensure general arousal of vegetative activity; "warm up" the body, prevent muscle twitching, and adapt the body to work. The task of the special section of writing is to prepare the musculoskeletal system and internal organs for adaptation to the requirements set in the main part of the lesson.In many sports, stunting begins with running. A simple, previously mastered exercise, such as "ball in a circle", is performed on a small field in a simplified football game. The maximum number of exercises is used, but each of them is used several

times in a small amount. No exercise is performed under full pressure. The total number of repetitions is large. This part of the exercise, which is quickly replaced by the exercises used and depending on the specifics of its execution, is reminiscent of games. It is very important not only to alternate the movements of different muscle groups and parts of the body, but also to mix exercises that develop strength, flexibility, the ability to relax muscles, that is, to consult exercises that have a temporary and general effect. Here the body is weighed, the readiness of the body for work, the fragility of kinesthetic sensations, the clarity of the concepts of movement, the ability to control one's own movements are checked. If in the main part of the lesson, in addition to exercises that stimulate autonomic activity, a high intensity of muscle pressure is required, then the training includes a series of movements that prevent possible injuries. To do this, it is useful to do several dynamic strength exercises and then perform exercises of a static nature for the muscle groups that are most susceptible to injury. In a special part of the lesson, it mainly uses elements of physical exercises that make up the content of the main part of the lesson. As a whole, in groups, in pairs, with individual projectiles or various projectiles with sports equipment, you can perform various types of starting positions, i.e. sitting, standing, kneeling, lying down, walking, standing in one place, jumping and running. Unfamiliar movements are performed after a preliminary demonstration and after its interpretation by the group method, familiar to students, simple movements are performed one after another without a long pause, in which there is a starting position to start the end of one exercise, that is, performed by the group method. Training sessions take from 5 to 30 minutes. Its duration in this magnitude varies according to the meteorological conditions (temperature, wind strength, humidity). That is, in hot weather, its General section is shortened. The duration of training also depends on the level of training and personal characteristics of the trainees, as well as on the content of the main part of the lesson. The subjective measurement of height adequacy is the feeling of readiness for physical exercise.

It happens that all movements are made freely, in some places the muscle freezes disappear, they become comfortable, elastic. An objective sign of timely completion of recording is the pulse rate, which reaches 130-150 beats per minute. When recording correctly, the pulse rate returns to the original value after 1-2 minutes. After training, it is necessary to massage the muscle groups for 8-10 minutes, adjusting them to take an active part in the performance of the main exercise (you need to do an intensive massage). One of the most important issues of organizing the lesson in its main part is to determine the sequence of performing exercises that are different in nature. General tips are the following: 1) perform complex exercises or new movements for accuracy in the first part of the lesson and learn them; perform exercises that impose great demands on the vegetative function of the body in the second half of the lesson. 2) if the main task of the lesson is to learn the approach to sports training, then by the end of the main part it is better to perform exercises for the development of strength. These exercises not only help to increase the physical fitness of students, but also improve the recovery of motor capabilities for the next lesson. However, at the very end of the lesson, it is necessary to repeat the learned exercise again, because the exercises performed (learned) in the first and last sections of the lesson are better done after this than in the middle section; 3) if the main goal of the lesson is to develop strength; agility and flexibility, then its development should be carried out after training, that is, at a time when students are not yet tired. 4) in most cases, training for the development of agility should precede training for the development of endurance. However, highly qualified athletes can do the opposite, as they must be willing to exert a high effort even in times of fatigue(especially in Circuit Sports); 5) if the purpose of the lesson is to develop endurance, then after training, you should use exercises for the development of anaerobic activity (speed endurance), and then aerobic (general endurance) activity; 6) The Division of individual sports exercises into the main sections of training sessions depends on the program of sports competitions. In order to build patterns in accordance with this, it is useful to follow the established sequence in a situation very close to the race or to it. During the lesson, the attitude of the load to the body fluctuates, that is, it increases from very low to extremely high. The means of organizing students of physical education and sports classes are called orders. It provides the following opportunities: a) build and place students; b) stand in the starting position; b) give orders to start and end movements; C) control the movements and actions of students; regulate the effect of the load on the body and the nature of the movements performed; d) selectively affect individual parts of the body, body functions; e) establish the necessary order. The nature of the order varies depending on the type of sport, the composition of the students, their familiarity with this order and exercise, the task set and the conditions for conducting the lesson. The order determines the style of execution of the exercise: the key, intermittent order obliges to perform the movement quickly and accurately, the chronic and slow order obliges to perform the movement slowly, without pressure. You should not often fall for giving orders. Excessive use of it depresses the mood of the lesson, does not allow you to make the performed movement in accordance with individual characteristics, and reduces the initiative of students. In some cases, the command can be replaced with a melody, applause, whistle or a short knock. Through this, the teacher warns about the sequence of movements of individual parts of the body, its direction, composition, the nature of the resulting force, the moments of breathing and exhalation, the ability to regulate the force, form an idea of the pace and rhythm of movement. For the organization of training, it is necessary to divide students according to the subject of the lesson, gender, age and training of students (skills and sports degrees). Sometimes groups are formed to solve specific tasks over the course of one or more classes (mastering individual subgroups of complex physical exercises, organizing mutual control, learning certain tactical inclusions, etc.). In the practice sessions of personality sports, there can be 5-6 people in the subgroup, sometimes even 2-3 people. In both permanent and temporary groups, a leader must be appointed. Individual physical exercises with the whole group or subgroup are generalized, that is, all students perform the movement together at the same time. In order to find the right type of movements, tools for developing and improving the quality of movements of each of the students, it is necessary

to conduct individual lessons separately from the group. The role of the teacher in this type of lesson is based on the development of a plan of action, monitoring the implementation of this exercise, and regulating the actions of students. Independent classes are necessary not only in personal sports, but also in a team form. In personal and personal classes at sports games, physical and methodological training is improved to a greater extent than during the combined classes of the entire team. Teaching students to conduct independent classes can be carried out gradually by complicating the task. The simplest type of task is to perform the exercise in its own way in a general row (without orders) after the teacher explains it. Another of the more complex types is the performance of exercises in groups or in person on sports fields or in various places. As students ' experience increases, their practice increases, so does the complexity and number of tasks. In correcting errors in the learned way of training, it is sometimes wrong to give many tasks. Observing the task in progress, the teacher should not interfere with the student's movements. He must follow the students, analyze the results of independent training at the end of the lesson or be satisfied with the athlete's report. Control over the completed task can also be done by students who have received the necessary instruction.

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Comparison of Maceration, Soxhlet, and Ultrasonic-Assisted Extraction Methods for the Recovery of Phenolic Compounds from Waste Bark of Pinus brutia

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Abstract: The growing interest in sustainable and environmentally friendly practices in the cosmetic industry has made the importance of novel bioactive compounds derived from waste materials found in nature increasingly evident. This study aimed to evaluate the potential of Turkish red pine (Pinus brutia) forest waste as a high value-added, innovative, and sustainable bioactive ingredient in the field of green cosmetics. In this context, three different extraction methods (conventional maceration, Soxhlet extraction, and ultrasonic extraction) were applied to obtain beneficial compounds from red pine waste. After the extracts were separated from their solvents, they were subjected to detailed analyses under in vitro laboratory conditions. To determine the bioactive compound capacity of the extracts, total phenolic content was measured first, and among the three methods, maceration extraction yielded the highest phenolic content with a value of 27.7544 mg GAE/g. Subsequently, antioxidant capacities were examined to evaluate their ability to neutralize free radicals, which is particularly important for anti-aging skincare products. As a result of this analysis, maceration extraction had the highest antioxidant capacity among the three methods with 0.45 mmol Trolox. In addition, sun protection factor (SPF) tests were conducted to reveal the potential of these extracts to be used as natural UV filters in sunscreens. As a result of this test, ultrasonic extraction achieved the highest sun protection among the three methods with an SPF value of 5.483. The findings demonstrated that the selected extraction method has a significant effect on the bioactivity of the extracts. Consequently, the utilization of red pine forest waste offers both an ecological approach for the industry and a rich alternative in terms of natural antioxidants and photoprotective properties. These results clearly demonstrate that red pine waste extracts can serve as effective, successful, and natural ingredients in the formulation of environmentally conscious cosmetic products.

Keywords: Green cosmetics, Pinus brutia, Antioxidant Activity, Total Phenolic Content, Sun Protection Factor (SPF), Natural UV filters.

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1. INTRODUCTION

Sustainability in the cosmetics industry has become one of the key approaches gaining increasing importance in recent years. The shift in consumer expectations toward natural, safe, and eco-friendly products has accelerated the search for sustainable production models and alternative raw material sources within the sector. In this context, sustainability in the cosmetics industry is not limited solely to product content; it is addressed within a broad framework encompassing everything from raw material sourcing and production processes to packaging and the entire product life cycle (Rocca et al., 2022). Furthermore, in line with the circular economy approach, the repurposing of waste materials offers significant opportunities both for reducing environmental burden and for developing new high-value-added ingredients (Rocca et al., 2022).

In this regard, plant-based wastes generated as a result of industrial or natural processes stand out as powerful and cost-effective bioactive sources in comparison to synthetic raw materials, owing to the rich functional components they contain. These materials, which are part of the natural ecosystem, are remarkably rich in phenolic compounds, flavonoids, and natural antioxidants that are found within the structure of plants and possess potent biological activities. The bioactive compounds in question have cosmetically critical functions such as preventing oxidative damage caused by free radicals in the human skin, alleviating the effects of aging, and providing cellular protection. Therefore, these wastes should be regarded not merely as agents that reduce environmental pollution, but also as high-value-added natural ingredient pools that enhance the efficacy and safety of cosmetic formulations.

Despite possessing a rich content in terms of bioactive components, Turkish red pine (Pinus brutia) waste, which has not yet been fully utilized in the cosmetics sector, constitutes the primary focus of this research. Turkish red pine, which grows abundantly in the Mediterranean and Aegean regions of Türkiye and represents a significant portion of the country's forest resources, generates large quantities of waste material during forest management and timber production processes. However, these waste materials, despite their rich biochemical potential, have not yet been sufficiently exploited by the cosmetics industry. For this reason, the present study comprehensively investigated the potential of red pine waste as an innovative and ecological cosmetic raw material.

Phenolic compounds are among the most important bioactive component groups that determine the functional properties of naturally derived extracts in the cosmetic field. In particular, polyphenols have attracted considerable attention due to their biological activities and health-promoting effects; owing to their antioxidant, anti-inflammatory, antimicrobial, and anti-photoaging properties, they are regarded as promising natural ingredients in cosmetic and cosmeceutical formulations. Furthermore, the growing consumer interest in natural and sustainable ingredients has increased the significance of natural raw materials rich in phenolic compounds and green extraction approaches in the cosmetics sector. In this context, the extraction of phenolic compounds and their utilization in cosmetic applications are considered important both for enhancing product efficacy and for developing more sustainable formulations (Santos et al., 2024).
Phenolic compounds are regarded as one of the primary indicators in evaluating the biological value of plant-based extracts. The quantity of these compounds provides important information regarding the richness of the obtained extracts in terms of active substances. For this reason, the determination of total phenolic content stands out as an important evaluation criterion for revealing the potential of extracts derived from natural sources in cosmetic applications.

Antioxidant compounds play an important role in cosmetic products by contributing both to skin protection and to the functional value of formulations. Oxidative stress, one of the main mechanisms accelerating skin aging, is particularly associated with an increase in reactive oxygen species. Various external environmental factors, especially photoaging, promote this process and may consequently lead to structural deterioration in the skin. In this context, natural antioxidants are regarded as prominent components in modern cosmetic formulations because of their ability to suppress oxidative processes and support the skin against environmental stress factors (Hoang et al., 2021).

Sun-protective cosmetic products are developed to protect the skin against damage caused by solar radiation, and the identification of effective and safe photoprotective ingredients holds an important place in cosmetic research. The potential adverse effects of synthetic and physical sunscreens on human health and the environment in some cases have increased interest in naturally derived alternatives. In this context, plant-derived secondary metabolites have been reported as promising ingredients in sun-protective cosmetic formulations due to their ability to provide broad-spectrum UVA and UVB protection, as well as free radical scavenging and antioxidant properties.

In this context, the cosmetic potential of natural extracts depends not on a single biological property, but rather on their multifunctional effects. Phenolic compounds are among the main groups of constituents that reflect the bioactive capacity of extracts, and their quantity provides important information about the richness of natural materials in terms of active components. In addition, antioxidant activity is regarded as an important criterion for evaluating the ability of natural extracts to limit oxidative processes caused by free radicals. Since oxidative stress is closely associated with skin aging and environmentally induced damage mechanisms, natural compounds with antioxidant properties gain even greater importance in cosmetic formulations. Similarly, the sun-protective potential of natural extracts represents another significant functional property in cosmetic applications. Natural ingredients capable of providing protection against UV radiation, while also exhibiting antioxidant and free radical scavenging properties, offer an important advantage in the development of effective and environmentally conscious cosmetic products. Therefore, phenolic content, antioxidant capacity, and sun-protective potential should be considered together as key parameters in evaluating the suitability of natural extracts for cosmetic applications.

In light of this information, the identification of natural raw materials that may exhibit multifunctional bioactive properties for cosmetic applications has gained increasing importance. Turkish red pine (Pinus brutia) is one of the important species widely distributed in Türkiye and valued in terms of forest products. Studies conducted on its woody structure and chemical constituents have shown that Turkish red pine possesses noteworthy structural and chemical characteristics. In addition, the fact that these properties may vary depending on different growing conditions makes the investigation of its natural component potential particularly significant. In this context, the valorization of Turkish red pine forest waste

offers not only an environmentally sustainable approach but also an important potential source for obtaining natural active ingredients that can be used in cosmetic formulations.

2. MATERIAL AND METHOD

2.1. Preparation of Material

Before proceeding with the extraction processes, the red pine samples were ground into powder. For each extraction method applied, 10 g of ground red pine sample was weighed on a precision balance and prepared as the starting material.

2.2 Extraction Methods

In this study, maceration, Soxhlet, and ultrasound-assisted extraction (UAE) methods were selected to compare the efficiency and kinetics of traditional and modern extraction techniques for obtaining target compounds.

2.2.1 Maceration Extraction

Maceration is one of the traditional extraction methods widely used to obtain bioactive compounds from plant materials. In this method, extraction efficiency has been reported to be affected by various parameters such as solvent type and concentration, solid-liquid ratio, extraction time, temperature, and particle size (Cujic et al., 2016).

10 g of ground red pine sample weighed on a precision balance was transferred into an Erlenmeyer flask, and 150 mL of 99% ethanol was added as the extraction solvent. The mixture was tightly sealed to prevent solvent loss and subjected to maceration by standing at room temperature for 24–48 hours (1–2 days). During this period, the mixture was manually shaken at regular intervals to facilitate dissolution and the transfer of components. After the waiting period was completed, the mixture was filtered through filter paper. The ethanol in the obtained filtrate was removed under vacuum using a rotary evaporator to obtain the dry extract. As a result of the procedures, 0.454 g of dry extract was obtained from a 10 g initial sample, and the yield of this method was calculated as 4.54%.



Figure 6 Maceration Extraction

2.2.2 Ultrasonic Extraction

Ultrasound-assisted extraction is an extraction method that utilizes ultrasonic waves to enhance the interaction between the solvent and plant material. In the literature, it has been stated that short-term sonication applications can increase the recovery of compounds from plant tissues and that this method holds significant potential in extraction processes (Hromadkova & Ebringerova, 2003).

10 g of ground red pine sample weighed on a precision balance was placed into a beaker, and 150 mL of 99% ethanol was added as the extraction solvent. The prepared mixture was placed into an ultrasonic water bath set at a constant temperature of 50°C in order to accelerate the mass transfer between the solvent and the sample. The mixture was subjected to extraction by being exposed to ultrasonic waves at this temperature for 30 minutes. After the process time was completed, the mixture was removed from the device and filtered through filter paper to separate the solid residues. In the final stage, the ethanol in the obtained clear filtrate was evaporated under vacuum using a rotary evaporator. As a result of this extraction process, 0.621 g of dry extract was obtained from 10 g of sample, and the yield of the method was determined as 6.21%.



Figure 7 Ultrasonic Extraction

2.2.3 Soxhlet Extraction

Soxhlet extraction is a classical extraction method in which the solid sample is placed into a cartridge or chamber and subjected to continuous extraction with an appropriate solvent. The extract obtained by removing the solvent after extraction is then taken into evaluation (Tesfaye & Tefera, 2017).

10 g of ground red pine sample weighed on a precision balance was placed into an extraction cartridge and positioned in the Soxhlet apparatus. 150 mL of 99% ethanol was added as the solvent to the flask of the device, and the extraction process was carried out continuously for 4 hours at the boiling point of the solvent. At the end of the process, the ethanol mixture collected in the flask by filtering through the cartridge was transferred to a rotary evaporator. The solvent was completely evaporated and removed under vacuum, and the crude dry extract was obtained. As a result of this extraction process, 0.721 g of dry extract was obtained from 10 g of initial sample, and the yield of the method was calculated as 7.21%.

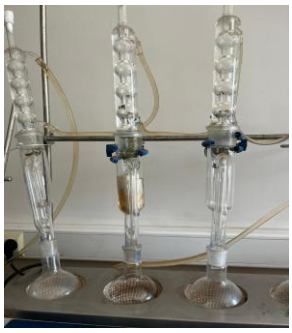
Figure 8 Soxhlet Extraction

3. RESULTS

Various in vitro analyses were carried out on the obtained extracts. In this context, the CUPRAC (Cupric Reducing Antioxidant Capacity) method was applied to determine the antioxidant capacities of the extracts, while the Folin-Ciocalteu method was used to determine their total phenolic contents. In addition, SPF (Sun Protection Factor) analysis was also performed to evaluate the sun protection potential of the extracts.

3.1 Determination of Antioxidant Activity by the CUPRAC Method

The CUPRAC (Cupric Reducing Antioxidant Capacity) method of antioxidant measurement is based on the absorbance measurement of Cu(I)-neocuproine (Nc) chelate formed as a result of the redox reaction of chain-breaking antioxidants with the CUPRAC reagent, Cu(II)-Nc, where absorbance is recorded at the maximal light-absorption wavelength of 450 nm (Özyürek et al., 2011)

The total antioxidant capacities of the obtained extracts were determined using the CUPRAC (Cupric Reducing Antioxidant Capacity) method. Prior to analysis, in order to bring the reaction within the appropriate range for spectrophotometric reading, the obtained extract samples were diluted 1:50 with distilled water (by adding 9.8 mL of distilled water to 0.2 mL of sample).

During the preparation of the reaction mixture, 1 mL each of $CuCl2{\cdot}2H2O$ (Copper (II) chloride dihydrate), Neocuproine (Nc), and Ammonium acetate ($NH4Ac$) reagents were sequentially added into a test tube. 0.5 mL of the 50-fold diluted extract sample was then transferred onto the prepared reagent mixture, and 0.6 mL of distilled water was added to the system to balance the final volume. After the prepared final mixture was homogenized, it was left to incubate at room temperature for 30 minutes to allow complete color development. At the end of the incubation period, the absorbance values of the resulting colored complex were read and recorded against a blank at a wavelength of 450 nm using a UV-Vis spectrophotometer.

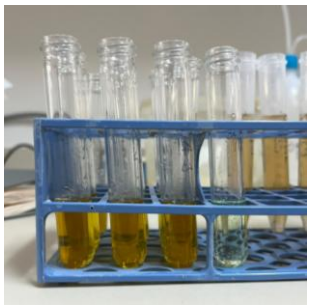

Figure 9 CUPRAC Method

Table 1 Antioxidant absorbance values

	Abs 1	**Abs 2**	**Abs 3**
Maceration Extraction	1.335	1.339	-
Soxhlet Extraction	1.167	1.159	1.141
Ultrasonic Extraction	1.262	1.245	1.346

Note: For each extraction method, a single extraction batch was prepared, and spectrophotometric measurements were performed in triplicate (technical replicates) to ensure measurement reliability; for the maceration extract, only two valid absorbance readings were obtained in the CUPRAC assay (n = 2). In order to express the raw absorbance values obtained as a result of the spectrophotometric analyses in terms of mmol Trolox equivalent/g, the following formula was used.

$$mmolTrolox\ equivalent/g = \frac{Absorbance}{16700} \times \frac{Vmethod}{Vsample} \times \frac{Vextract}{sample\ quantity} \times dilutionfactor$$

After substituting the three absorbance values obtained from each extraction method into this formula, the average of the three was calculated and is presented in the table below.

Table 2 mmol Trolox value

Extraction Method	**mmol Trolox equivalent/g (Mean ± SD)**
Maceration Extraction	0.450 ± 0.001
Soxhlet Extraction	0.283 ± 0.003
Ultrasonic Extraction	0.314 ± 0.013

3.2 Determination of Total Phenolic Content by the Folin-Ciocalteu Method

The Folin-Ciocalteu (FC) method, which is widely used for the determination of total phenolic content, operates on the principle of a basic electron transfer (redox) reaction (Karadirek et al., 2016). In this reaction, which takes place in an alkaline environment, phenolic compounds reduce the Folin reagent, resulting in a color change that can be measured by spectrophotometry (Karadirek et al., 2016).

The total phenolic contents of the obtained extracts were determined spectrophotometrically using a modified Folin-Ciocalteu method. Prior to analysis, the samples were diluted 1:10 with distilled water (by adding 9 mL of distilled water to 1 mL of extract sample) to ensure that the absorbance values remained within the reading limits of the device.
For the preparation of the reaction mixture, 40 µL of the diluted extract solution was transferred into a test tube, and 200 µL of Folin-Ciocalteu reagent and 3.16 mL of distilled water were added. The mixture was homogenized by vortexing and then allowed to stand at room temperature for 5 minutes for the first stage of the reaction to take place.

After the time was completed, 600 µL of 20% sodium carbonate (Na_2CO_3) solution was added to the mixture to provide an alkaline environment and initiate color development. The samples were homogenized again and left to incubate at room temperature (and in a dark environment) for 1 hour for the reaction to be completed.

At the end of the incubation period, the absorbance values of the blue-colored complex formed as a result of the reduction reaction were read and recorded against a blank at a wavelength of 765 nm using a UV-Vis spectrophotometer.



Figure 10 Folin-Ciocalteu Method

Table 3 Phenolic Content Absorbance Values

	Abs 1	**Abs 2**	**Abs 3**
Maceration Extraction	0.312	0.312	0.315
Soxhlet Extraction	0.266	0.269	0.268
Ultrasonic Extraction	0.305	0.304	0.298

The absorbance values obtained at 765 nm as a result of the Folin-Ciocalteu method were converted to concentration values using a calibration curve constructed with a reference standard compound. The total phenolic content of each analyzed sample was expressed in terms of "mg GAE / g extract" based on the amount of dry extract obtained. The following equations were used for this calculation.

$$y = 0.0011x + 0.0077$$

$$The\ Total\ Phenolic\ Contents = Concentration \times \frac{Volume}{Sample\ Quantity} \times Dilution\ Factor$$

The absorbance values obtained from spectrophotometric readings carried out independently (in parallel) for each extraction method were converted to concentration (mg/g) values using the equation given above. In order to ensure the reliability of the analysis results, the arithmetic mean of these results obtained from parallel measurements was calculated to determine a single final value for each extraction technique. The mean total phenolic contents of the different extraction methods applied are presented in the table below.

Table 4 Total Phenolic Content Values

Extraction Method	**Total Phenolic Content (mg GAE/g) (Mean ± SD)**
Maceration Extraction	27.75 ± 0.16
Soxhlet Extraction	23.63 ± 0.14
Ultrasonic Extraction	26.78 ± 0.34

3.3 Sun Protection Factor Analysis

In vitro sun protection factor (SPF) analysis was performed to determine the photoprotective potential (UVB filtering capacity) of the obtained extracts. During the sample preparation stage, 100 µL of the sample was taken and 10 mL of ethanol was added, and the mixture was vortexed until completely homogenized.

The UV absorption properties of the prepared dilute solutions were investigated in the wavelength range of 290 nm to 320 nm using a UV-Vis spectrophotometer. Spectrophotometric readings were performed against ethanol, which was used as the solvent (blank), at 5 nm increments (290, 295, 300, 305, 310, 315, and 320 nm). The obtained absorbance values were recorded and are presented in the following table.

Table 5 SPF Absorbance Values

	290 nm	**295 nm**	**300 nm**	**305 nm**	**310 nm**	**315 nm**	**320 nm**
M-1	0.875	0.737	0.624	0.520	0.431	0.372	0.329
M-2	0.875	0.736	0.623	0.519	0.429	0.369	0.326
M-3	0.877	0.738	0.624	0.520	0.430	0.371	0.328
S-1	0.795	0.686	0.586	0.487	0.402	0.345	0.304
S-2	0.802	0.692	0.590	0.490	0.404	0.347	0.306
S-3	0.800	0.691	0.589	0.489	0.402	0.345	0.304

U-1	0.883	0.747	0.631	0.522	0.427	0.366	0.317
U-2	0.899	0.761	0.644	0.534	0.438	0.374	0.327
U-3	0.899	0.760	0.643	0.533	0.437	0.372	0.325

The following equation was used to calculate the Sun Protection Factor (SPF) values of the extracts based on these recorded absorbance values (Mansur et al., 1986)

$$SPF = C.F \times \Sigma\, EE(\lambda) \times Abs$$

CF: Correction factor (typically 10)
EE: Erythemal effect spectrum at wavelength λ
Abs: Absorbance value of the extract

The results obtained using this formula were averaged to determine a single final SPF value for each extract, and are presented in the following table.

Table 6 SPF Values

Extraction Method	**Sun Protection Factor**
Maceration Extraction	5.354
Soxhlet Extraction	5.102
Ultrasonic Extraction	5.483

4. DISCUSSION AND CONCLUSIONS

In this study, the green cosmetic potential of red pine (Pinus brutia) forest waste was investigated. Three different extraction methods (maceration, Soxhlet, and ultrasonic) were comparatively evaluated in terms of bioactivity, processing time, and cost parameters.

Turkish red pine (*Pinus brutia*) stands out as a valuable source of biomass for the cosmetics industry due to its high phenolic compound content and strong antioxidant capacity. Thanks to their ability to neutralize free radicals, phenolic compounds can protect the skin against oxidative stress; this property supports their use as active ingredients in anti-aging cosmetic formulations. Furthermore, the UVB absorption capacity of the obtained extracts indicates that these materials can be considered as natural active ingredients in sunscreen products. Considering all these features together, it is anticipated that extracts derived from red pine forest waste may offer multifaceted positive effects on human skin, such as antioxidant protection, photoprotective activity, and potential anti-inflammatory activity.

4.1. Yield and Thermal Degradation (Soxhlet Extraction)

The highest mass yield (7.21%) was achieved with the Soxhlet method in terms of gravimetric yield. However, this method requires 4 hours of continuous boiling. This prolonged thermal treatment caused the degradation of heat-sensitive (thermolabile) phenolic compounds. Indeed, the lowest total phenolic content (23.63 mg GAE/g) and antioxidant capacity (0.283 mmol TR/g) were observed in Soxhlet extracts. Furthermore, it is the most energy-costly method due to the boiling process.

4.2. Preservation of Bioactivity and Time Cost (Maceration)

The maceration method takes place at room temperature. This prevented the thermal degradation of bioactive compounds. As a result, the highest phenolic content (27.75 mg GAE/g) and antioxidant capacity (0.450 mmol TR/g) were determined with this method. However, the fact that the process takes 24–48 hours significantly increases the time cost at an industrial scale. Moreover, its mass yield (4.54%) remained at the lowest level compared to the other methods.

4.3. Time, Cost, and Optimization (Ultrasonic Extraction)

Ultrasound-Assisted Extraction (UAE) accelerates mass transfer through the cavitation effect, allowing the extraction to be completed in just 30 minutes. UAE offered a phenolic content very close to that of maceration (26.78 mg GAE/g) and a high antioxidant capacity (0.314 mmol TR/g). Its mass yield (6.21%) was also higher than that of maceration. Furthermore, the highest Sun Protection Factor (5.483) was also obtained with the UAE method.

4.4. Conclusion

The short processing time of 30 minutes and the relatively low temperature requirement of 50°C make ultrasonic extraction the most economical option in terms of time and energy cost. When the preservation of bioactive compounds, high photoprotective (SPF) value, and low costs are considered as a whole, ultrasonic extraction is the most optimal method for incorporating red pine waste into the cosmetic industry. These findings provide a strong foundation for developing sustainable and multifunctional green cosmetic products.

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Development of Biocide Microcapsules for Microbial Control

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Abstract: Microbial biofilm formation is considered one of the major problems affecting operational efficiency and material durability in industrial systems. The accumulation of microorganisms on surfaces may cause corrosion, blockage, performance loss, and increased maintenance costs. Although concentional antimicrobial approaches generally rely on the direct application of chemical biocides, uncontrolled release, environmental concerns, and limited long-term effectiveness have increased the need for alternative strategies. Therefore, controlled-release systems with more sustainable properties have attracted significant attention in recent years. Biopolymer-based microcapsules are among the promising materials due to their biodegradability, biocompatibility, and ability to provide controlled transport of active compounds. Encapsulation approaches are considered effective for improving the stability and efficiency of active agents while reducing excessive usage and environmental exposure. These systems have been investigated for various industrial applications related to microbial control and antifouling strategies. This presentation provides a general overview of biopolymer-based microcapsule systems developed for microbial control. Encapsulation methods reported in the literature and the fundamental properties of microcapsules are discussed. In addition, controlled release behavior, approaches for preventing biofilm formation, and the industrial potential of these systems are evaluated. Overall, biopolymeric microcapsule systems are considered promising approaches for developing sustainable and long-lasting microbial control applications across various industrial and biomedical sectors.

Keywords: biofilm, microbial control, biocide, microcapsule, controlled release, biopolymer.

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1. INTRODUCTION

Surface biofouling is one of the major challenges affecting the operational efficiency and durability of industrial systems. The attachment of microorganisms to material surfaces initiates biofilm formation, leading to microbial deterioration in cultural heritage materials (Russo & Palla, 2023), structural damage to construction materials (Prudente et al., 2024),, clogging and efficiency loss in water-based systems (Issayeva et al., 2024) and increased drag and fuel consumption in marine applications (Voulvoulis et al., 1999). Furthermore, biofilm development on pipelines and storage facilities accelerates microbiologically influenced corrosion (MIC), resulting in significant operational and economic losses in the oil and gas industry (Turkiewicz et al., 2013).

Microbiologically influenced corrosion (MIC) is a corrosion process driven by the metabolic activities of microorganisms and is characterized by biofilm formation, changes in the local environment at the metal surface, and subsequent material degradation (Xu et al., 2013). Approximately 20% of the annual corrosion damage in the oil and gas industry has been attributed to MIC (Wang et al., 2010). Therefore, controlling microbial growth and preventing biofilm formation are essential for reducing maintenance costs and extending equipment lifetime (Abdul Rasheed et al., 2019). Various microorganisms, including bacteria, archaea, fungi, and algae, have been reported to contribute to MIC under different environmental conditions (Machuca et al., 2016).

Several strategies have been developed to control microbial corrosion, including cathodic protection (Esquivel et al., 2011), protective coatings (Krishnamurthy et al., 2013), corrosion inhibitors (Duncan et al., 2014), and biocides (Narenkumar et al., 2017). Among these approaches, biocides remain the most widely applied because they inhibit microbial growth and suppress biofilm formation. However, conventional biocides often exhibit limited long-term effectiveness and their antimicrobial efficiency depends on the target microorganism and environmental conditions (Janczak et al., 2021).

In recent years, nanomaterials with antimicrobial properties have attracted increasing attention owing to their broad application potential (Issayeva et al., 2024). Among them, metal oxide nanoparticles such as ZnO (Dolatyari & Rostami, 2022), CuO (Borkow et al., 2010), TiO_2 (Zorn et al., 2023), MgO (Prudente et al., 2024), CeO_2 (Dar et al., 2022), Fe_3O_4 (Gudkov et al., 2021), and WO_3 (Mohamed et al., 2023) have been extensively investigated because of their excellent chemical stability and antimicrobial performance. Their antimicrobial activity is mainly attributed to the generation of reactive oxygen species (ROS) and, in some cases, the release of metal ions, which inhibit microbial growth and biofilm formation.

To further improve the stability and long-term performance of antimicrobial agents, microencapsulation has emerged as an effective strategy. Encapsulation protects active compounds from environmental degradation, enables controlled release, prolongs antimicrobial activity, and reduces excessive biocide consumption and environmental exposure (Enginar & Çayır, 2016). Consequently, microencapsulation is considered a promising approach for developing sustainable microbial control systems (Andersson Trojer et al., 2015).

This review presents a comprehensive overview of biocide microcapsules developed for microbial control. The antimicrobial properties of metal oxide biocides, microencapsulation strategies, commonly used shell materials, controlled-release behavior, and potential industrial applications are discussed based on recent literature.

2. MATERIAL AND METHOD

This review was prepared through a comprehensive evaluation of peer-reviewed studies on biofouling, microbiologically influenced corrosion (MIC), biocides, metal oxide-based antimicrobial materials, and microencapsulation technologies. The selected publications were critically analyzed with respect to their antimicrobial mechanisms, application areas, encapsulation approaches, shell materials, and reported performance.

The collected information was systematically classified and comparatively evaluated to summarize current developments in the field. The findings are presented in the following tables and discussed according to their relevance to microbial control and industrial applications.

Metal oxide biocides have been extensively investigated as promising antimicrobial materials for microbial control because of their broad-spectrum activity, high chemical stability, and potential application in various industrial fields. As summarized in Table 1, different metal oxides have been evaluated for biomedical applications, construction materials, water treatment, marine antifouling, protective coatings, and cultural heritage conservation (Al-Fori et al., 2014; Borkow et al., 2010; Dar et al., 2022). Although their application areas differ, most metal oxide biocides exhibit antimicrobial activity through the generation of reactive oxygen species (ROS), while some also release metal ions that enhance their antimicrobial performance. These mechanisms effectively inhibit microbial growth and reduce biofilm formation.

Table 1. Major application areas of commonly used metal oxide biocides.

Metal Oxide	**Application Area**
ZnO	Medical and Biomedical Applications Dolatyari & Rostami (2022)
CuO	Textiles (Shtykova et al., 2009)
TiO_2	Coating Technologies (Paints) (Malinowska et al., 2024)
MoO_3	Medical and Biomedical Applications (Tétault et al., 2012)
MgO	Cultural Heritage and Building Materials (Prudente et al., 2024)
$ZnFe_2O_4$	Coating Technologies (Paints) (Malinowska et al., 2024)
CeO_2	Medical and Biomedical Applications (Dar et al., 2022)
Fe_3O_4	Medical and Biomedical Applications (Gudkov et al., 2021)

As shown in Table 1, metal oxide biocides have been investigated for a wide range of industrial applications. Although their application areas differ, all of these materials exhibit promising antimicrobial properties. Their effectiveness is mainly associated with high chemical stability, broad-spectrum antimicrobial activity, and the ability to inhibit microbial growth and biofilm formation. These characteristics make metal oxide biocides attractive alternatives to conventional biocides for long-term microbial control.

Despite these advantages, conventional metal oxide biocides still face several limitations, including particle aggregation, uncontrolled release, and reduced long-term antimicrobial performance. To overcome these limitations, microencapsulation has emerged as an effective strategy that protects active compounds, enables controlled release, and enhances the stability and durability of antimicrobial materials (Andersson Trojer et al., 2015; Enginar & Çayır, 2016).

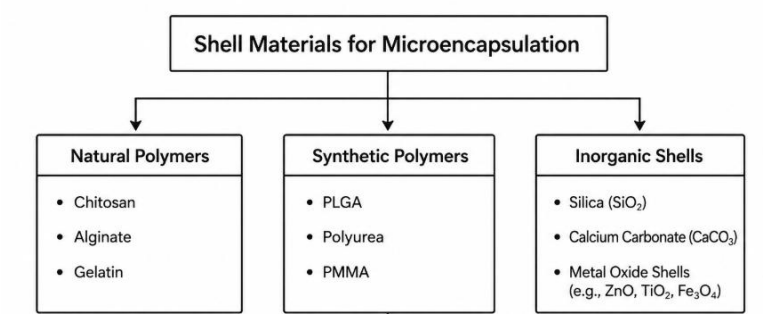

Figure 1. Classification of shell materials commonly used for microencapsulation.

As illustrated in Figure 1, a variety of shell materials have been employed for microencapsulation depending on the intended application. Natural polymers, such as chitosan, alginate, and gelatin, are widely preferred because of their biocompatibility and biodegradability. In contrast, synthetic polymers and inorganic shells provide higher mechanical strength, chemical stability, and improved protection of the encapsulated active compounds. Therefore, the selection of shell materials is mainly determined by the desired release profile, environmental conditions, and application requirements (Andersson Trojer et al., 2015; Enginar & Çayır, 2016; Faÿ et al., 2008; Hart et al., 2009; Teixeira et al., 2012; Wallström et al., 2011).

3. RESULTS

The reviewed studies consistently demonstrated that metal oxide biocides exhibit effective antimicrobial activity against a broad range of microorganisms. ZnO, CuO, TiO_2, MgO, MoO_3, $ZnFe_2O_4$, CeO_2, and Fe_3O_4 have been successfully applied in different fields, including biomedical engineering, textile technologies, coating systems, and cultural heritage conservation. Most studies reported that these materials effectively inhibit microbial growth and suppress biofilm formation through their high chemical stability and antimicrobial properties. Furthermore, their versatility has enabled their application in various industrial environments where long-term microbial control is required.

The reviewed literature also indicated that microencapsulation significantly improves the performance of antimicrobial materials. Encapsulation protects active compounds from environmental degradation, reduces premature release, and provides controlled release over extended periods. Natural polymers, synthetic polymers, and inorganic shell materials have all been successfully employed depending on the intended application. Overall, the findings suggest that combining antimicrobial agents with appropriate encapsulation materials enhances stability, prolongs antimicrobial activity, and reduces environmental impact, making microencapsulation a promising strategy for sustainable microbial control.

4. DISCUSSION AND CONCLUSIONS

Metal oxide biocides have attracted considerable attention because of their broad-spectrum antimicrobial activity and potential applications in various industrial fields. However, challenges such as limited long-term effectiveness and uncontrolled release have encouraged the development of microencapsulation technologies. Encapsulation improves the stability of antimicrobial agents, enables controlled release, and prolongs antimicrobial performance while reducing environmental impact. Consequently, biocide microcapsules represent a promising strategy for sustainable microbial control in biomedical, environmental, and industrial applications. Further studies focusing on large-scale production and practical implementation will contribute to the wider industrial utilization of these systems.

Author Contributions

Şevval Kuyulu conceived the study, conducted the experiments, analyzed the data, and prepared the manuscript. Banu Esencan Türkaslan supervised the study, contributed to the study design, reviewed the manuscript, and approved the final version. All authors have read and agreed to the published version of the manuscript.

Ethics Committee Approval

N/A

Conflict of Interest

The authors declare no conflict of interest.

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Hepatitis B Vaccination Status among Health Sciences Students: Assessment of Anti-HBs Antibody Levels

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Abstract:
Background: Hepatitis B virus (HBV) infection is a major occupational risk for health sciences students, and anti-HBs antibody titer is the standard marker of vaccine-induced immunity. Objective: To assess anti-HBs antibody levels and seroprotection status in a cohort of health sciences students. Methods: A cross-sectional laboratory-based study quantified serum anti-HBs titers (mIU/mL) in 130 students. Titers were classified as non-protective (<10 mIU/mL), protective (10–<100 mIU/mL), or hyper-responder (≥100 mIU/mL). Results: Median titer was 2.0 mIU/mL (mean = 43.2, SD = 157.4); 66.9% of students were non-protective, 29.2% protective, and 3.8% hyper-responders. Conclusion: A majority of the sample lacked serologic evidence of protective immunity, supporting routine post-vaccination serologic screening and booster policies in health sciences curricula.

Keywords: Hepatitis B virus; anti-HBs antibodies; seroprotection; health sciences students

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1. Introduction

Hepatitis B remains an important occupational hazard for students and staff in clinical and laboratory settings due to exposure to blood and body fluids (World Health Organization [WHO], 2017). Vaccination is highly effective, but antibody response is variable, and anti-HBs titers below 10 mIU/mL are considered non-protective, requiring re-vaccination or booster doses (Schillie et al., 2018; Leuridan & Van Damme, 2011). Monitoring seroprotection among health sciences students is therefore recommended before clinical placement (Mahoney, 1999).

2. Materials and Methods

A cross-sectional, laboratory-based design was used. Serum anti-HBs antibody concentration (mIU/mL) was measured quantitatively for 130 health sciences students using immunoassay. Values below the assay's lower detection limit were recorded at the floor value (2 mIU/mL) and values above the upper limit at the ceiling value (1000 mIU/mL). Data were analyzed descriptively (mean, median, SD, quartiles) and by clinical seroprotection category, consistent with WHO/CDC thresholds (WHO, 2017; Schillie et al., 2018).

Parameter	Detail
Study design	Cross-sectional, single-institution
Population	Health sciences students
Sample size (n)	130
Biomarker	Serum anti-HBs antibody titer (mIU/mL)
Assay reportable range	2 – 1000 mIU/mL
Protection thresholds	<10 non-protective; 10–<100 protective; ≥100 hyper-responder

Table 1. Study and assay characteristics.

3. Results

Statistic	Value (mIU/mL)
n	130
Mean	43.2
Standard deviation (SD)	157.4
Median	2.0
25th percentile (Q1)	2.0
75th percentile (Q3)	19.7
Minimum	2.0
Maximum	1000.0

Table 2. Descriptive statistics of anti-HBs antibody titers.

Seroprotection category	Titer range (mIU/mL)	n	%
Non-protective	< 10	87	66.9%
Protective	10 – < 100	38	29.2%
Hyper-responder	≥ 100	5	3.8%
Total	—	130	100.0%

Table 3. Distribution of students by clinical seroprotection category.

Titer range (mIU/mL)	n	% of sample
2.0 – 9.99	87	66.9%
10.0 – 49.99	26	20.0%
50.0 – 99.99	12	9.2%
100.0 – 499.99	1	0.8%
500.0 – 1000.0	4	3.1%
Total	130	100.0%

Table 4. Frequency distribution of anti-HBs titers by range.

Boundary value	n (%)
At assay floor (= 2 mIU/mL)	69 (53.1%)
At assay ceiling (= 1000 mIU/mL)	2 (1.5%)

Table 5. Students at the assay's detection limits.

4. Discussion

Two-thirds of students (66.9%) showed non-protective anti-HBs titers, and over half of the sample (53.1%) clustered at the assay floor, indicating either a substantial proportion of low/absent responders or unboostered/undocumented vaccination status. This proportion is higher than seroprotection gaps reported in some health-worker cohorts (Zeeshan et al., 2007), and is consistent with evidence that antibody titers wane over time after primary vaccination, particularly beyond 5–10 years (Leuridan & Van Damme, 2011; Averhoff et al., 1998). Only 3.8% were hyper-responders (≥100 mIU/mL), the group expected to retain long-term protection without boosting. These findings support pre-clinical-placement serologic screening and targeted booster-dose policies for health sciences students, in line with WHO and CDC/ACIP guidance (WHO, 2017; Schillie et al., 2018).

5. Conclusion

In this cohort of 130 health sciences students, most anti-HBs titers were below the protective threshold, underscoring the need for routine post-vaccination serologic testing and booster-dose protocols before clinical exposure to blood-borne pathogens.

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Leadership Competencies of the Sport Manager in the Society 5.0 Era: A Conceptual Framework from a Complexity Leadership Perspective

ÖMER ÖZBEY

Abstract: Society 5.0 is a social paradigm that integrates technology with human-centered values and aims to place digital transformation at the service of social welfare. Shaped by artificial intelligence, big data, and digitalization, this era is profoundly reshaping the sport ecosystem and the role of the sport manager. The study is guided by the question of what leadership competencies a sport manager should possess in the context of the transformations brought about by the Society 5.0 paradigm. Accordingly, it aims to identify these competencies and to conceptualize them within a holistic Sport Leadership 5.0 Framework. The research is an integrative (conceptual) review based on document analysis within a qualitative approach. Sources purposively selected through a search of the Google Scholar, DergiPark, Scopus, and Web of Science databases were synthesized following the thematic analysis phases of Braun and Clarke (2006), using Complexity Leadership Theory (Uhl-Bien, Marion, & McKelvey, 2007) as a sensitizing framework and informed by socio-technical systems thinking (Emery & Trist, 1965). The analysis yielded seven competency themes: digital and technological leadership, human-centered leadership, strategic and adaptive leadership, innovative and learning leadership, social and trust-based leadership, global leadership, and ethical and sustainable leadership. These themes converge around a human-centered digital leadership approach that expresses the joint optimization of social and technical subsystems. In conclusion, the success of the future sport manager depends less on the ability to follow technological developments than on the capacity to integrate them with human values, ethical responsibility, strategic foresight, trust-based relationships, and sustainability.

Keywords: Society 5.0, sport management, leadership 5.0, digital leadership, complexity leadership, sustainability.

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1. Introduction

As the second quarter of the twenty-first century begins, almost every domain of social life is being rapidly transformed under the influence of digital technologies. The technological leap brought about by the Fourth Industrial Revolution (Schwab, 2016) constitutes the infrastructure of this transformation. The concept of Society 5.0, which names the current phase of this process, was first introduced by Japan and is defined as a social paradigm that aims to integrate technology with human-centered values (Fukuyama, 2018). Moving beyond industrial society and the information society, the paradigm represents the vision of a super-smart society that places artificial intelligence, big data, the Internet of Things, and digital technologies at the service of social welfare (Holroyd, 2022).

This paradigm directly affects the field of sport through the digital sport ecosystem, data-driven sport management, e-sports, and applications of artificial intelligence and big data (Ratten, 2019). In an environment where globalization, the pressure of sustainability, and intergenerational differences are deepening, sport organizations increasingly face a more complex and dynamic managerial environment. This transformation reshapes not only the structure of sport organizations but also the role of the sport manager.

The traditional understanding of sport management is built upon carrying out operational tasks and supervising organizational processes. However, the new social order brought about by Society 5.0 demands from the sport manager multidimensional leadership competencies beyond technical knowledge and managerial experience.

Although leadership research in the sport management literature has accumulated over more than forty years, this body of work has largely been shaped around transformational and leader-centered theories (Welty Peachey et al., 2015). The topics of digital transformation, leadership, and governance, however, are mostly addressed separately; conceptual studies that holistically examine the human-centered and technology-supported understanding of leadership envisioned by Society 5.0 in the context of sport management remain limited. Moreover, a significant portion of existing studies present lists of competencies without grounding them in a particular leadership theory, which makes it difficult to establish a theoretical basis for their findings. Yet the environment described by Society 5.0 has the character of a complex adaptive system in which numerous stakeholders interact, uncertainty is high, and change is continuous. For this reason, the study chooses to analyze the leadership role of the sport manager through Complexity Leadership Theory (Uhl-Bien et al., 2007) and socio-technical systems thinking (Emery & Trist, 1965).

Within this framework, the main research question the study seeks to answer can be expressed as follows: what leadership competencies should the sport manager possess in the context of the transformations brought about by the Society 5.0 paradigm? Proceeding from this question, the aim of the study is to evaluate the effects of Society 5.0 on sport management from a leadership perspective, to identify the leadership competencies that the future sport manager should

possess, and to conceptualize these competencies within a holistic Sport Leadership 5.0 Framework. The study rests on the assumption that the sport manager should be positioned not merely as a professional who carries out operational processes, but as an agent of transformation capable of integrating technology with human values, managing change, building trust, and leading sustainable sport ecosystems.

2. Conceptual and Theoretical Framework

2.1. The Society 5.0 Paradigm

Society 5.0 refers to a new stage in the social evolution of human history, following the stages of the hunting society (Society 1.0), the agricultural society (Society 2.0), the industrial society (Society 3.0), and the information society (Society 4.0) (Fukuyama, 2018). Developed in response to problems that emerged in the information society, such as the digital divide, information overload, and the passivity of human beings in the face of technology, this paradigm represents an approach that places technology at the service of humanity and integrates the cyber world with the physical world (Holroyd, 2022). Keidanren (2018), Japan's leading business federation, defined Society 5.0 as an "imagination society" that combines digital transformation with human creativity and associated this vision with the Sustainable Development Goals.

The core principles of Society 5.0 can be listed as human-centeredness, sustainability, inclusiveness, innovation, and technology–human integration. These principles position technological development not as an end in itself but as a means for solving social problems and improving quality of life. For the field of sport, this approach indicates that digital technologies should be integrated with human-centered goals such as athlete health, performance, accessibility, and social participation.

Although the paradigm is often associated with Industry 4.0 in this respect, it differs from it markedly. While Industry 4.0 focuses on the automation of production processes, increased efficiency, and the integration of smart systems (Schwab, 2016), Society 5.0 places at its center the question of how technological capacity can be transformed into social benefit. In other words, Industry 4.0 claims to produce more efficient systems, whereas Society 5.0 claims to produce more meaningful systems of living. This conceptual difference is also decisive for sport management: digitalization should be treated not merely as a tool that increases operational efficiency but as an opportunity that strengthens the social value and human quality of sport.

2.2. The Transforming Ecosystem of Sport: From Industrial Sport to Smart Sport Systems

The transformation brought about by Society 5.0 is most visibly experienced in the sport ecosystem. Throughout history, sport has been not only a field of activity in which physical performance is organized but also a dynamic institutional structure reflecting the economic, cultural, and social transformations of each era. However, with the first quarter of the twenty-first century, the pace of transformation in sport has increased markedly; moving beyond the classical logic of organization, sport has turned into a multilayered ecosystem. Within this structure, sport is no longer merely a sector producing athletic outputs; it is evaluated as a strategic field that creates economic value, produces cultural impact, manages digital interaction, and builds social legitimacy.

This transformation can be read along several axes. The first axis is digitalization; data analytics, artificial intelligence applications, wearable technologies, and platform-based sport experiences are turning sport organizations into structures that continuously produce data and convert this data into managerial value (Ratten, 2019). The second axis is the restructuring of the sport economy; sponsorship networks, digital broadcasting revenues, and global brand partnerships are expanding the role of the sport manager from operations management toward strategic resource management. The third axis is the change in sport consumption culture; digital-native generations in particular expect from sport institutions not only performance but also accessibility, transparency, and digital interaction, which transforms the manager into an actor who designs experiences.

The fourth axis is the restructuring of the understanding of governance. Whereas traditional sport management relied on hierarchical control mechanisms, today's sport institutions are turning into multi-actor and network-based structures in which athletes, fans, sponsors, the media, digital platforms, public institutions, and local communities become direct stakeholders; in these structures, success largely depends on trust-based and accountable governance relationships (Hoye & Cuskelly, 2007). The final axis is sustainability; environmental responsibility, social inclusiveness, and long-term social contribution are becoming fundamental components of the legitimacy of sport institutions (McCullough & Kellison, 2017). When all these axes are considered together, it becomes evident that sport is being transformed from a linear and closed organizational structure into a digital, interactive, data-intensive, and human-centered ecosystem, and that this new structure necessitates a new understanding of leadership capable of making decisions under uncertainty, managing multi-stakeholder relationships, and steering transformation.

2.3. From Classical Management to Leadership 5.0

Classical management, through the functions of planning, organizing, directing, and controlling, prioritized efficiency in stable and predictable environments and represented a hierarchical, control-oriented approach. Transformational leadership theory, in turn, redefined leadership—removing it from being a control mechanism—as a process that motivates, inspires, and supports the development of followers around a shared vision (Bass & Riggio, 2006). In the sport

management literature as well, leadership has long been addressed predominantly around transformational and leader-centered theories (Welty Peachey et al., 2015).

If the historical course of leadership theories is briefly summarized: after the trait approach, which explained leadership through innate individual characteristics, came behavioral approaches that shifted the focus to what the leader does; the fact that these did not produce the same results in different contexts gave rise to contingency theories that addressed leadership through the fit established with environmental conditions (Northouse, 2019). With the transition to the information society, transformational and digital leadership came to the fore; however, the limited capacity of purely performance- and transformation-oriented approaches to meet social expectations shifted the debate toward the axis of ethics, sustainability, and stakeholder management. The responsible leadership approach developed along this line defines leadership, beyond producing economic success, as the capacity to build trust, assume ethical responsibility, and generate relational value in a multi-stakeholder society (Maak & Pless, 2006). When all this accumulation is considered together, it becomes evident that contemporary leadership concentrates on three axes: the capacity to manage transformation, to use technology in a human-centered way, and to produce sustainable social value.

Digital leadership (e-leadership), which emerged with the spread of digitalization, foregrounded the competence to manage individuals and processes in technology-mediated environments (Avolio et al., 2000). Leadership 5.0, in turn, expresses an understanding that integrates digital leadership with human-centered leadership in line with the Society 5.0 paradigm. This model, which can also be called human-centered digital leadership, requires combining technological competencies with human values such as ethical responsibility, empathy, sustainability, and trust—in other words, developing digital and human competencies together.

2.4. Theoretical Framework: Complexity Leadership Theory

The theoretical framework of this study is Complexity Leadership Theory. Developed by Uhl-Bien, Marion, and McKelvey (2007), the theory is significant in that it moves leadership from the control- and hierarchy-based understanding of the industrial age to the network-based and interactional understanding of the information age. According to the theory, contemporary organizations are complex adaptive systems in which numerous actors interact in mutual interdependence and outcomes cannot be fully predicted in advance. In these systems, leadership is not a position held by a single person but a process arising from the interaction of three intertwined functions. The administrative function refers to formal tasks such as planning, coordination, and resource management; the adaptive function refers to learning, innovation, and change arising from interaction; and the enabling function refers to preparing the appropriate conditions for adaptive dynamics to emerge by managing the tension between the other two.

The environment described by Society 5.0 coincides with the conditions assumed by this theory. Continuously updated information, expectations that differ across generations, global interdependencies, and the speed brought by digital technologies are transforming sport organizations from predictable and static structures into adaptive systems. In such an environment, what is expected of the sport manager is not merely to supervise processes but to be able to produce the conditions that make learning, innovation, and collaboration possible.

The second axis connecting the theory to Society 5.0 is the socio-technical systems approach. Developed by Emery and Trist (1965), this approach argues that organizations consist of two subsystems—social (people, relationships, values) and technical (technology, processes, tools)—and that organizational effectiveness depends not on optimizing these two subsystems separately but on optimizing them jointly and in a balanced manner, that is, on joint optimization. Society 5.0 is precisely such a vision of joint optimization: the integration of the cyber world with the physical world, and of technology with human beings. The human-centered digital leadership understanding placed at the center of this study is defined on this ground—namely, as the leadership capacity to jointly optimize the social and technical subsystems of sport organizations while observing human values. Within this framework, transformational leadership (Bass & Riggio, 2006), digital leadership (Avolio et al., 2000), and servant leadership (Greenleaf, 1977) are positioned not as mutually exclusive options but as complementary components contributing to joint optimization.

This theoretical ground also coincides with the hybrid understanding of leadership that has come to the fore in contemporary discussions of sport leadership. Hybrid leadership refers to the ability to integrate digital capacity with human sensitivity, performance management with ethical responsibility, and efficiency with the production of meaning within the same managerial practice. The hybridity here is not a mechanical sum of different leadership theories but the multilayered leadership capacity required by the changing sport ecosystem. In the language of complexity leadership, this integration is precisely what the enabling function accomplishes: allowing different competencies to converge in a single leadership practice by managing the tension between administrative stability and adaptive change. Accordingly, in this study, hybrid competencies are grounded within the functional structure of complexity leadership.

Accordingly, the leadership competencies identified in the study are treated not as an arbitrary list but as clusters of competencies distributed across the three functions of complexity leadership and integrated around the axis of human-centered digital leadership. The seven themes presented in the following section, together with Table 1, follow this theoretical structure.

3. Method

This study is an integrative (conceptual) review based on document analysis within a qualitative research approach. The aim of the study is not to measure experience, collect opinions, or test relationships among variables, but to construct a conceptual model by synthesizing a dispersed body of literature within a particular theoretical framework. For research questions of this nature, document analysis was regarded as an appropriate method that allows written sources to be systematically examined and analyzed.

The sources examined were determined through purposive sampling. In this context, the Google Scholar, DergiPark, Scopus, and Web of Science databases were searched using the keywords “Society 5.0”, “sport management”, “digital leadership”, “complexity leadership”, “sport governance”, “sport diplomacy”, and “sustainable leadership”. Apart from foundational theoretical sources, the study focused mainly on works published between 2000 and 2025.

Three criteria guided source selection: being directly related to the topic; being a peer-reviewed academic publication or a credible institutional document; and establishing a conceptual link with Society 5.0 or contemporary leadership approaches. From among the many sources reached through the search, those meeting these criteria were selected; repetitive, irrelevant, and theoretically noncontributory works were excluded. The sources included in the analysis are presented in the references of the study. The reliability of the sources was assessed by considering the type of publication, citation status, and the academic quality of the outlet in which they were published.

The data were synthesized by following the thematic analysis phases proposed by Braun and Clarke (2006). The themes were not predetermined by the author; they were formed by combining codes generated inductively from the literature. At the same time, Complexity Leadership Theory served as a deductive sensitizing framework in interpreting the codes and themes. In the process, the relevant literature was first read iteratively to become familiar with the data, concepts expressing leadership competencies were coded, similar codes were combined to form themes, the themes were reviewed and renamed, and, in the final stage, the findings were interpreted within the framework of a conceptual model. Which codes and which literature each theme draws upon is shown in Table 1.

In the study, the concept of “sport manager” is used in a broad sense to refer to managerial actors responsible for strategic decision making, resource management, stakeholder relationships, and transformation processes in sport institutions and organizations. While the differences among managerial roles at the club, federation, sport enterprise, facility, event, and local government levels are acknowledged, the study focuses on the common leadership requirements shared by these roles.

4. Findings of the Conceptual Synthesis

Because the study is not an empirical investigation, the outputs presented here are not field findings in the classical sense but conceptual themes derived from a thematic synthesis of the literature. As a result of the thematic analysis, the leadership competencies that the sport manager should possess in the Society 5.0 era were grouped under seven themes. The themes, the codes they contain, the literature they draw upon, and their functional counterparts in Complexity Leadership Theory are summarized in Table 1. The function mappings in the table are not strict boundaries but a classification indicating the dominant function of each competency. In the following subsections, each theme is explained in relation to its associated codes and literature.

Table 1. Leadership Competencies of the Sport Manager in the Society 5.0 Era

Theme	Codes	Basis in the literature	Complexity leadership function
Digital and technological leadership	AI literacy, data analytics, digital transformation management, technology adaptation	Avolio et al. (2000); Ratten (2019)	Enabling
Human-centered leadership	Empathy, emotional intelligence, mentoring, psychological safety	Goleman (1998); Edmondson (1999)	Enabling
Strategic and adaptive leadership	Agility, crisis management, systems thinking, uncertainty management	Heifetz et al. (2009); Senge (1990)	Adaptive
Innovative and learning leadership	Creativity, innovation, entrepreneurship, lifelong learning	Senge (1990); World Economic Forum (2020)	Adaptive

Social and trust-based leadership	Trust building, stakeholder management, network leadership, multi-stakeholder governance, corporate reputation	Edmondson (1999); Maak and Pless (2006); Hoye and Cuskelly (2007)	Enabling
Global leadership	Sport diplomacy, intercultural communication, global awareness, international collaborations	Murray (2012)	Adaptive
Ethical and sustainable leadership	Digital ethics, transparency, accountability, sustainability	Greenleaf (1977); Floridi (2013); McCullough and Kellison (2017)	Administrative (value axis)

Note. The themes are not reduced to a single function but classified according to their dominant functions. For example, although ethical and sustainable leadership is associated with the administrative function, it may also assume an enabling role; similarly, digital leadership is not only enabling but also a competency that nourishes adaptability.

4.1. Digital and Technological Leadership

This theme encompasses the codes of artificial intelligence literacy, data analytics, digital transformation management, and technology adaptation. The sport manager of the Society 5.0 era must possess the competence to understand digital technologies and to integrate them into the processes of sport organizations. In the field of sport, digital transformation spreads across a broad domain of impact, from performance analysis to fan experience, and from digital marketing to operational efficiency (Ratten, 2019). Data-driven decision making and effective leadership in technology-mediated environments have become fundamental requirements of contemporary sport management (Avolio et al., 2000). From the perspective of complexity leadership, this theme corresponds to the enabling function that builds the technical infrastructure on which interaction and transformation take place.

4.2. Human-Centered Leadership

Empathy, emotional intelligence, mentoring, and psychological safety constitute this theme. In line with the human-centered philosophy of Society 5.0, the sport manager is expected to balance technological competencies with human values. Emotional intelligence, as the ability of the leader to understand and manage their own and others' emotions, is among the fundamental components of leadership effectiveness (Goleman, 1998). A climate of psychological safety, in which team members feel safe, is a decisive condition for learning, innovation, and performance (Edmondson, 1999). This theme is associated with the enabling function that prepares the relational ground necessary for healthy interaction.

4.3. Strategic and Adaptive Leadership

This theme includes the codes of agility, crisis management, systems thinking, and uncertainty management. In a rapidly changing environment of increasing uncertainty, the sport manager must develop long-term strategic foresight together with the ability to adapt quickly. The adaptive leadership approach foregrounds learning and the production of flexible responses in the face of complex and unpredictable problems (Heifetz et al., 2009), while systems thinking enables the manager to comprehend the organization as a holistic structure composed of interconnected parts (Senge, 1990). In this respect, the theme is a typical manifestation of the adaptive function that nourishes adaptation and transformation within the system.

4.4. Innovative and Learning Leadership

Creativity, innovation, entrepreneurship, and lifelong learning are gathered under this theme. In the Society 5.0 era, the rapid updating of knowledge makes it necessary for the sport manager to be open to continuous learning and to develop innovative solutions. The learning organization approach positions individual and organizational learning as a continuous source of renewal (Senge, 1990). Creativity and adaptability, which stand out among twenty-first-century skills, are also regarded as decisive competencies for the future workforce and leaders (World Economic Forum, 2020). The theme is directly related to the adaptive function that enables innovation to arise from interaction.

4.5. Social and Trust-Based Leadership

Trust building, stakeholder management, network leadership, multi-stakeholder governance, and corporate reputation constitute this theme. Sport organizations are complex structures in which numerous stakeholders interact, and good governance largely depends on establishing trust-based relationships and accountable processes among these stakeholders (Hoye & Cuskelly, 2007). In this environment, where athletes, fans, sponsors, the media, public institutions, and digital platforms simultaneously become stakeholders, leadership shifts from the use of authority toward the capacity to build relationships, negotiate, and produce shared value. The responsible leadership approach likewise defines leadership precisely as a process of building trust and generating relational value on this multi-stakeholder ground (Maak & Pless,

2006). For this reason, it is of great importance that the sport manager be able to form collaboration networks among different stakeholders and to preserve a climate of psychological safety (Edmondson, 1999). The theme corresponds to the enabling function that makes interaction among actors possible.

4.6. Global Leadership

This theme encompasses the codes of sport diplomacy, intercultural communication, global awareness, and international collaborations. The global nature of sport requires the sport manager to possess an international perspective and intercultural communication skills. Sport diplomacy allows sport to be used as an instrument of soft power in international relations and assigns the sport manager a strategic role at the global level (Murray, 2012). This theme, which expands the boundaries of the system and ensures alignment with the external environment, is associated with the adaptive function.

4.7. Ethical and Sustainable Leadership

Digital ethics, transparency, accountability, and sustainability converge in this theme. In line with the sustainability and inclusiveness principles of Society 5.0, the sport manager is expected to assume ethical responsibility and to lead a sustainable sport ecosystem. In an environment of intensifying digitalization, issues such as data privacy, algorithmic fairness, and responsible technology use are becoming fundamental concerns of information ethics (Floridi, 2013). Environmental sustainability, in turn, has increasingly become a central area of responsibility for sport organizations (McCullough & Kellison, 2017). A service-oriented and value-based understanding of leadership envisions the leader using power not for personal gain but for the benefit of followers and society (Greenleaf, 1977). The theme can be associated with the administrative function that carries formal order and accountability into a value-based framework.

5. The Sport Leadership 5.0 Framework

The findings show that the seven leadership competencies are not independent skills but form complementary clusters that converge around a common axis. To express this integrity, the study proposes the Sport Leadership 5.0 Framework shown in Figure 1.

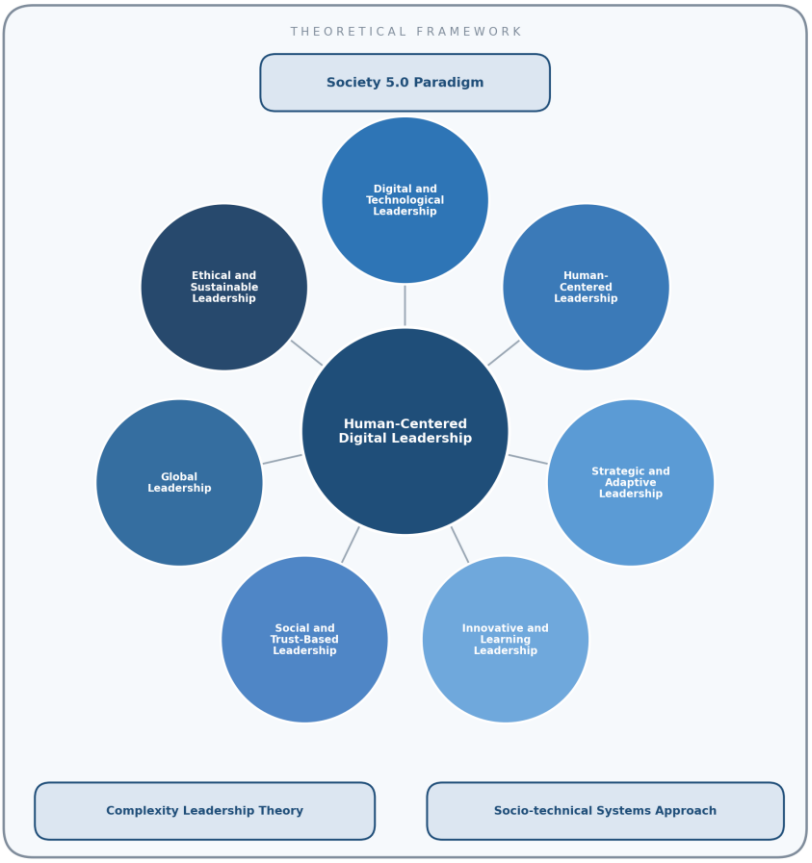

Figure 1. The Sport Leadership 5.0 Framework

At the center of the framework lies the human-centered digital leadership understanding, which expresses the joint optimization of the social and technical subsystems while observing human values. This center is surrounded by the competencies of digital and technological, human-centered, strategic and adaptive, innovative and learning, social and trust-based, global, and ethical and sustainable leadership. The outer frame of the model consists of the Society 5.0 paradigm, Complexity Leadership Theory, and the socio-technical systems approach; these three axes represent the

theoretical ground on which the competencies are interpreted. From the perspective of complexity leadership, these competencies are distributed across the administrative function that ensures formal order, the adaptive function that nourishes learning and innovation, and the enabling function that makes the interaction between the two possible. The human-centered digital leadership at the center is the binding principle that integrates these functions around a single value axis.

The originality of the framework stems from its bringing together the topics of digital transformation, leadership, and governance—often addressed separately in the literature—around the axis of the Society 5.0 paradigm and complexity leadership. This approach, which redefines sport management through a human-centered and technology-supported understanding of leadership, is capable of guiding both theoretical discussions and the leadership development programs of practitioner institutions.

6. Discussion

The findings of the study reveal that Society 5.0 reshapes the understanding of leadership not only on the basis of digital competencies but around the axis of human-centered values. This conclusion coincides with the human–technology integration understanding that Fukuyama (2018) foregrounds in his vision of Society 5.0. Pioneering studies on digital leadership had shown that technology transforms leadership roles and forms of interaction (Avolio et al., 2000); the present study offers a field-specific reading by arguing that this transformation should be evaluated, in the context of sport management, together with its ethical, social, and sustainability dimensions.

From a theoretical standpoint, the most notable aspect of the findings is that the seven competencies fit the functional structure envisioned by Complexity Leadership Theory (Uhl-Bien et al., 2007). The strategic–adaptive and innovative–learning leadership themes correspond to the adaptive function that enables learning and innovation to arise in the system; the digital–technological, human-centered, and social–trust-based leadership themes correspond to the enabling function that prepares appropriate conditions for interaction. Ethical–sustainable leadership, in turn, carries the administrative function that preserves formal order and accountability into a value-based framework. This mapping shows that sport management is a functionally multilayered endeavor that cannot be reduced to a single leadership style.

The lines distinguishing the Sport Leadership 5.0 Framework from existing leadership theories also become clear. While transformational leadership (Bass & Riggio, 2006) focuses predominantly on the processes of creating a vision and motivating followers, the proposed framework also places digitalization, stakeholder networks, sustainability, and ethical decision making at the center of leadership. Digital leadership (Avolio et al., 2000) treats technology as an instrument of leadership; this study, in turn, positions technology not as an end but as a means for the development of a human-centered sport ecosystem. While it overlaps with servant leadership (Greenleaf, 1977) in its ethical and value-based orientation, it differs from it by also encompassing digital and strategic competencies. It converges with responsible leadership (Maak & Pless, 2006) on multi-stakeholder trust and the production of relational value, and it extends this approach by integrating it with digital and adaptive capacities. The adaptive leadership approach (Heifetz et al., 2009), meanwhile, foregrounds learning in the face of uncertainty and change, nourishing the adaptive dimension of the framework. Thus, the framework offers a multidimensional and context-specific reading of leadership that goes beyond the leader-centered tendency in the sport management literature (Welty Peachey et al., 2015).

In this respect, the proposed framework is not a single leadership style but a hybrid leadership capacity; it positions different theories not as alternatives to one another but as complementary components within the functional structure of complexity leadership. This increasingly moves sport management away from being a technical specialization and closer to the art of managing complexity.

At this point, the fundamental argument to be emphasized is that the competence of the sport manager cannot be limited to the level of recognizing and using technology. Knowing artificial intelligence, being able to read data, or using digital tools is necessary but not sufficient on its own. What is decisive is the ability to solve complex problems, build collaboration, make ethical decisions, and adapt to change. In the language of the socio-technical systems approach (Emery & Trist, 1965), attempting to optimize the technical subsystem in isolation from the human subsystem leads to a loss of efficiency in the system as a whole; real success lies in balancing the two subsystems together. The modern sport manager is an actor who represents values such as justice, fair play, transparency, accountability, and social responsibility, and the integration of these values with digital competencies constitutes the essence of the human-centered digital leadership understanding proposed by the study.

7. Conclusion and Recommendations

This study has discussed, within a conceptual framework grounded in Complexity Leadership Theory, the leadership competencies that the sport manager should possess in the Society 5.0 era. The seven themes reached through the thematic synthesis reveal that the future sport manager must carry digital, human, strategic, innovative, social, global, and ethical and sustainable competencies together. These competencies are integrated around the human-centered digital leadership understanding, which expresses the joint optimization of the social and technical subsystems. The fundamental argument of the study is that what is decisive is not the separate existence of these competencies but the ability to integrate them in a balanced manner within the same managerial mind. In this respect, sport leadership is redefined less as technical management than as the art of managing complexity.

In the Society 5.0 era, effective sport management is being transformed into a multidimensional leadership approach that requires the integration of technological competence with human-centered leadership values. For this reason, the future sport manager should be redefined, beyond being a traditional actor who manages organizations, as a value-based sport leader who manages digital transformation, places human beings at the center, and shapes the future of the sport ecosystem.

In light of these conclusions, several recommendations can be developed. Sport management education programs should be updated to encompass, alongside technical and managerial content, the competencies of digital leadership, ethics, emotional intelligence, and sustainability. Sport institutions should design human-centered digital leadership development programs for their managers. For future research, it is recommended that the proposed Sport Leadership 5.0 Framework be tested with empirical data and that applied studies based on the views of managers in different sport institutions be conducted.

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Socialization or Loneliness? The Trial of Sport Managers with Digital Games in the Network Society

ÖMER ÖZBEY

Abstract: In the twenty-first century, digitalization has profoundly transformed the ways individuals socialize, their leisure practices, and their mechanisms of social participation. One of the most visible outcomes of this transformation is the global rise of digital games. Moving beyond individual entertainment, digital games have become social spaces in which online communities form, digital identities are produced, and new forms of social relationship are established. The aim of this study is to reassess the socialization–loneliness debate surrounding digital games from a sport management perspective and within the framework of Manuel Castells' network society theory. The study is an integrative (conceptual) review based on document analysis within a qualitative approach; sources purposively selected through a search of the Google Scholar, DergiPark, Scopus, and Web of Science databases were synthesized through content analysis. The central argument is that digital games do not produce a linear effect that either directly socializes or inevitably isolates individuals; rather, the real transformation occurs in the place, rhythm, and organizational logic of socialization. Within this framework, digital games are conceived not as a rival of sport but, when appropriately managed, as a new social space through which the sport ecosystem can be restructured. Consequently, the future sport manager is redefined less as an actor who seeks to keep individuals away from digital games than as a strategic transformation leader capable of establishing a sustainable balance among physical activity, digital culture, and social participation.

Keywords: Network society, digital games, sport management, socialization, loneliness, exergaming.

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1. Introduction

The twenty-first century is best understood not merely as a period in which technological tools have diversified, but as a historical process in which the ways individuals socialize, everyday practices, and institutional structures are being redefined. Rapid developments in information and communication technologies have produced new organizational models across almost every domain of social life, from economic production relations to cultural interaction, and from public participation to leisure practices. One of the most visible outcomes of this transformation has been the global rise of digital games.

Until the recent past, digital games were largely regarded as an activity specific to childhood and leisure. Today, however, they have become a global phenomenon whose economic volume exceeds billions of dollars, generating multilayered social interactions and shaping cultural transformation. Moving beyond individual entertainment, digital games have become new social practices in which online communities form, identities are produced, social relationships are established, competition is reconfigured, and digital economies develop.

This transformation opens a new area of debate, particularly for children and young people. On the one hand, a substantial body of literature demonstrates that digital games can develop interaction, cooperation, teamwork, strategic thinking, and global connections, and can produce positive outcomes in cognitive, emotional, motivational, and social domains (Granic, Lobel, & Engels, 2014). On the other hand, a growing number of studies draw attention to risks such as physical inactivity, sedentary living, digital addiction, and the weakening of face-to-face interaction (Kuss & Griffiths, 2012; Biddiss & Irwin, 2010). In this context, the central question is not whether digital games socialize individuals, but how they transform the quality, form, and spatial organization of socialization.

Sport management is one of the fields directly affected by this transformation. When today's successful sport managers are examined, their shared characteristic is not that they merely operate sport facilities within fixed rules, plan organizations, or run institutional processes through traditional means. Rather, these managers are becoming decision makers who promote physical activity, shape youth and sport policies, effectively manage digital transformation processes, influence the development of the sport economy, and assume strategic responsibilities for public health (Ratten, 2019).

This study aims to reassess the socialization–loneliness debate surrounding digital games from a sport management perspective. Its theoretical foundation is built upon the network society theory developed by Manuel Castells (2010). Within this approach, digital games are treated neither as an absolute threat that severs individuals from social life nor as an unconditional opportunity that inevitably socializes them; instead, they are considered new digital network structures that transform the ways individuals interact, develop belonging, and participate in social networks. Accordingly, the study first discusses the core concepts of network society theory, then examines the dual effects of digital games along the

socialization–loneliness axis, and finally analyzes the changing role of the sport manager at a conceptual level. The ultimate aim is not to position digital games as a rival of physically performed sports, but to propose a new sport management perspective capable of establishing a sustainable balance among physical activity, digital culture, and social participation in line with the dynamics of the network society.

2. Conceptual and Theoretical Framework

2.1. Network Society Theory: The Reorganization of Socialization in the Digital Age

The transformative effects of digitalization on social life have become one of the central topics in the social science literature in recent years. With the spread of information and communication technologies, not only economic processes but also individuals' modes of communication, identity construction, leisure practices, and mechanisms of social participation have been reshaped. One of the most comprehensive theoretical approaches to explaining this transformation is the network society theory developed by Manuel Castells (2010).

According to Castells, the present era is not merely one of technological progress but a historical phase in which the fundamental logic of social organization has changed. Whereas production, communication, and institutional structure in industrial society were largely organized around hierarchical systems, in the information age the basic organizing form of social processes has shifted to networks. In this sense, the network society refers to a new social order in which economic, cultural, political, and social processes are organized through interconnected networks by means of information and communication technologies (Castells, 2010). Castells' approach departs from technological determinism; the emergence of the network society should be evaluated not only through the diffusion of digital tools but also alongside the restructuring of global capitalism, the rise of cultural movements, and tendencies toward individualization.

From the perspective of network society theory, the distinguishing feature of the present age is that individuals' modes of participation in social life increasingly form through networks rather than physical proximity. Here, Castells' concept of the space of flows offers an explanatory framework. The space of flows refers to communicative and digital domains in which individuals can interact synchronously without being physically co-present. By contrast, the space of places represents the traditional social settings in which social relationships are established through physical togetherness (Castells, 2010). This distinction has considerable explanatory power for understanding the social effects of digital games. Traditional sport culture is largely built upon the space of places; sports fields, clubs, training areas, and physical organizations constitute the social settings in which individuals interact face to face. Digital games, in turn, produce new domains of interaction in which players develop relationships through online networks without physical togetherness. Thus, socialization does not disappear; on the contrary, it is reorganized in line with the logic of the network society.

Within this framework, evaluating digital games solely as individual consumption practices is insufficient. Today, online gaming platforms form new social networks with the capacity to build teams, develop shared goals, create digital belonging, compete, and generate continuous communication. Players not only take part in the game but also construct identities within digital communities, produce social capital, and become involved in collective interaction processes (Steinkuehler & Williams, 2006; Coleman, 1988). The ties produced by such networks are mostly weak ties of a bridging nature that connect the individual to diverse worldviews rather than providing deep emotional support (Granovetter, 1973; Putnam, 2000). This picture is directly significant for sport managers, because the sense of belonging and social capital that young people develop are now produced not only on sports fields but also within digital gaming communities.

However, Castells' approach does not argue that digital networks unconditionally produce positive outcomes. One of the fundamental paradoxes of the network society is that individuals may experience a weakening of their local and physical ties while establishing more connections on a global scale. This produces a new social reality in which the individual can be simultaneously highly connected and physically isolated (Turkle, 2011; Bauman, 2000). It is precisely at this point that a new area of debate emerges for sport management. If young people now experience socialization not only on physical sports fields but also within digital networks, the task of the sport manager is not merely to increase traditional sport participation but to understand the new socialization dynamics of the network society and to establish a sustainable relationship between physical activity and digital culture. For this reason, digital games should be regarded not as a rival of sport but as a new social space through which the sport ecosystem can be restructured when appropriately managed.

2.2. The Changing Social Meaning of Digital Games

For many years, digital games were evaluated within the framework of individual entertainment, leisure, or cultural practices specific to childhood. However, with the acceleration of digitalization, the spread of network-based communication technologies, and the movement of online interaction to the center of everyday life, digital games have ceased to be a simple entertainment industry and have become social spaces in which social relationships are reproduced. Today, digital games constitute a multilayered social phenomenon extending from economic production processes to cultural identity formation, and from digital citizenship to community building.

This transformation necessitates a reconsideration of traditional approaches to digital games. In the literature, debates on the effects of digital games generally proceed along two axes. The first approach treats digital games as digital

interaction spaces that increase interpersonal interaction, support teamwork, and produce new forms of social capital (Granic et al., 2014; Steinkuehler & Williams, 2006). The second approach argues that digital games increase individualization, social isolation, addiction, and sedentary-living risks by reducing physical mobility (Kuss & Griffiths, 2012; Biddiss & Irwin, 2010).

Yet this binary classification remains limited for explaining the social transformation of the digital age, because it frequently evaluates socialization and loneliness as two opposing and absolute outcomes. From the perspective of network society theory, however, the fundamental effect of digitalization is not the detachment of individuals from social life but the transformation of the grounds on which social relationships are established. According to Castells, in the network society the organizing form of social life is restructured through the connections individuals establish via networks, moving beyond traditional spatial and institutional boundaries (Castells, 2010).

At this point, the socializing quality of digital games cannot be explained by the frequency of communication; the real issue is the kind of social experience players have within game environments. Today, players form teams in digital environments, share tasks, develop leadership relationships, produce shared symbols, and join long-lasting digital communities. Thus, the gaming experience ceases to be an individual activity and turns into a form of collective participation. This transformation becomes visible in studies arguing that online games can constitute a third space of sociability beyond home and work (Steinkuehler & Williams, 2006; Oldenburg, 1999). Although players may be located in different cities, countries, or cultural contexts, they can produce shared experiences within the same digital network. For this reason, sport managers should evaluate digital games not merely as young people's leisure preference but as a new space of socialization that affects participation in physical activity, sport policies, and social belonging.

Nevertheless, this transformation also brings new forms of vulnerability. In the network society, an increase in connection does not always mean social integration. Intensive use of digital games can produce outcomes such as reduced physical activity, weakening of face-to-face relationships, transformation of the perception of time, and reshaping of daily-life rhythms, and it can increase the risk of sedentary living and addiction, particularly among children and young people (Biddiss & Irwin, 2010; Kuss & Griffiths, 2012). The critical point here is not whether digital games directly produce loneliness, but to which social networks the individual connects and how these networks relate to physical life. In the network society, an individual may simultaneously be highly engaged in digital interaction and distanced from their physical environment. Therefore, loneliness should be addressed not in relation to disconnection but in relation to the transformation of the forms of connection (Turkle, 2011).

Like other social domains, this transformation also generates new responsibilities for sport management, because sport managers must become strategic actors capable of reading the changing forms of socialization, analyzing digital culture, and establishing a balance between physical and digital life for different segments of society, particularly children and young people. Within this framework, digital games represent for sport managers not only changing leisure practices but also a social space in which youth culture, digital participation, and social interaction processes are being reorganized.

3. Method

This study is an integrative (conceptual) review based on document analysis within a qualitative research approach. The study does not claim to be a systematic review; it is based on an integrative conceptual synthesis of theoretical and empirical works purposively selected in line with the identified key concepts. Its aim is not to collect field data, measure opinions, or test relationships among variables, but to provide a conceptual analysis of the relationship between digital games and sport management by synthesizing a dispersed body of literature within a particular theoretical framework. For research questions of this nature, content analysis, which allows written sources to be systematically examined and interpreted, was regarded as an appropriate method.

The sources examined were determined through purposive sampling. In this context, the Google Scholar, DergiPark, Scopus, and Web of Science databases were searched using the keywords "network society", "digital games", "socialization", "loneliness", "social capital", "exergaming", "physical activity", and "sport management". Apart from foundational theoretical sources on the network society, social capital, and socialization, the study focused mainly on works published between 2000 and 2025.

Three criteria guided source selection: being directly related to the topic; being a peer-reviewed academic publication or a credible institutional document; and establishing a conceptual link with debates on the network society, digital game culture, or sport management. Because the study did not follow a systematic search protocol, no numerical account of the sources reached and excluded is presented; instead, works meeting these criteria and offering high theoretical value were purposively selected. Repetitive, irrelevant, and theoretically noncontributory sources were excluded, and the works included in the analysis are listed in the references of this article. The reliability of the sources was assessed by considering the type of publication, citation status, and the academic quality of the outlet in which they were published.

The data were analyzed by following the basic stages of content analysis. Accordingly, the relevant texts were first read iteratively in order to become familiar with the data; units of meaning concerning the socialization and loneliness

dimensions of digital games were coded; similar codes were combined to form subcategories and themes; the themes were reviewed and renamed; and, in the final stage, the findings were interpreted from the perspective of sport management within the framework of network society theory. Coding and theme development were carried out by the author; to enhance reliability, the codes and themes were reviewed iteratively at different points in time and their consistency with the literature was checked.

In the study, the concept of "sport manager" is used in a broad sense to refer to actors responsible for strategic decision making, policy development, and transformation processes in sport institutions and organizations; the analysis was conducted particularly in the context of children and young people.

4. Findings of the Conceptual Synthesis: The Trial of Sport Managers with Digital Games

Because the study is not empirical, the outputs presented here are not field findings in the classical sense but conceptual themes derived from a content-analysis-based synthesis of the literature. The social structure transformed by digitalization makes it necessary to rethink the traditional functions of the sport management discipline. For many years, the responsibilities of the sport manager were shaped around facility management, organizational planning, the improvement of athletic performance, and the running of institutional processes. In the network society, however, the sport manager is becoming a strategic actor who guides social behavior, analyzes youth culture, manages digital transformation processes, and shapes physical activity policies.

When evaluated within the framework of Castells' network society theory, the fundamental task of the sport manager is not to keep individuals away from digital networks but to create new domains of interaction between digital networks and physical sport culture. This is because young people now socialize not only on fields but also on digital platforms, within online communities, and across interaction networks. This analysis points to four fundamental strategic areas of transformation for sport management. This transformation, which brings together the space of places and the space of flows around a human-centered understanding of sport management, is summarized in Figure 1 as a hybrid sport ecosystem.

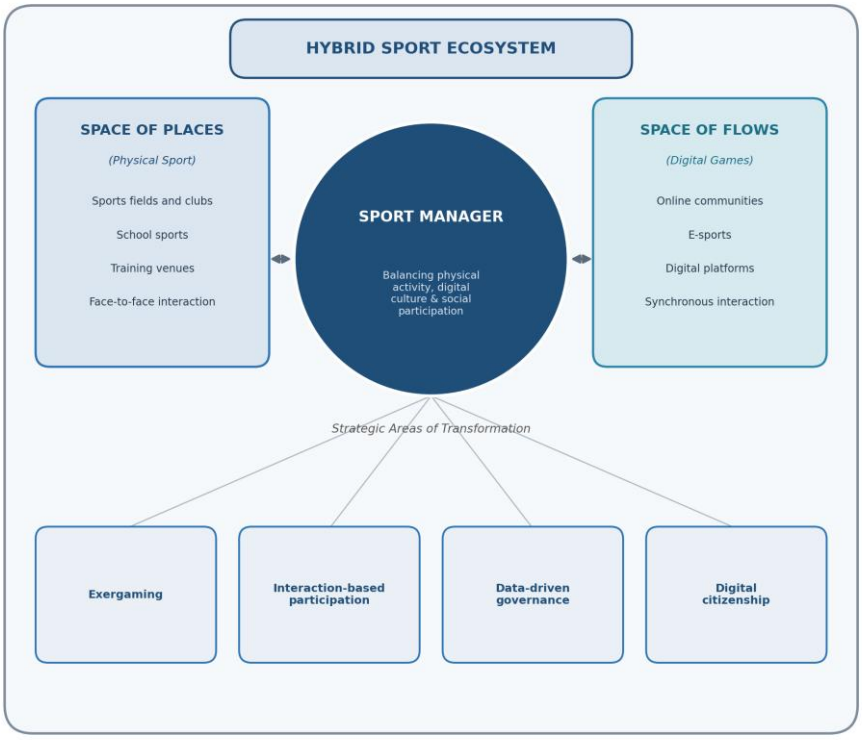

Figure 1. The Hybrid Sport Ecosystem in the Network Society

4.1. From a Physical-Sport-Centered Approach to a Hybrid Sport Ecosystem

Traditional sport management regarded physical participation as the fundamental indicator of success. In the network society, however, physical and digital experiences are increasingly intertwined. Sport managers therefore need to develop hybrid sport approaches that encompass digital interactions rather than relying solely on field-based models (Ratten, 2019). Within this transformation, online sport communities, digital training support, interactive sport applications, and movement-based game systems can be regarded as new forms of sport participation. The fundamental principle here is that the digital experience becomes a complement to, rather than an alternative to, physical activity; thus, young people's bond with sport is preserved and the continuity of participation is strengthened.

4.2. From Passive Consumption to Interaction-Based Participation

In the network society, individuals do not merely consume services; they also produce experiences. Digital game culture is one of the strongest examples of this transformation, because players display collective participation by developing shared goals, sharing roles, and building communities (Steinkuehler & Williams, 2006; Granic et al., 2014). For sport managers, this requires transforming sport organizations from merely spectated events into social platforms in which participation and digital interaction are increased. Models in which younger generations, in particular, take part in decision-making processes and shape the sport experience through digital communities are especially important for the future understanding of sport management.

4.3. Digital Health and Active Living: Exergaming and Movement-Based Games

Intensive use of digital games can increase the risk of sedentary living (Biddiss & Irwin, 2010; World Health Organization, 2018). However, the response to this risk is not to restrict digital games but to integrate physical activity with digital culture. At this point, movement-based digital games, augmented reality applications, and exercise-supported digital experiences become important tools. Exergaming applications, which require players' bodily movement, offer a new generation of sport experiences that bridge digital interaction and physical movement, and they hold the potential to support physical activity, particularly among children and young people (Oh & Yang, 2010; Biddiss & Irwin, 2010). Accordingly, adding movement-based game applications to school sport programs, establishing digital physical-activity spaces in youth centers, and developing technology-supported participation models in sport clubs are new policy areas entering the agenda of sport managers.

4.4. Data-Driven Governance and Digital Citizenship

One of the fundamental features of the network society is the continuous production of data. For this reason, the decision-making processes of sport managers should be shaped not by traditional managerial intuition but through data such as digital participation indicators, physical activity measurements, analyses of youth trends, and sport consumption behaviors. A data-driven and adaptive management approach enables sport policies to become more compatible with the real-life practices of young people. At the same time, the responsibility of the sport manager is not only to increase participation; developing ethical conduct in digital environments, screen-time management, a culture of online participation, and health awareness is also entering the new field of duties of sport management (Kuss & Griffiths, 2012). Within this framework, gamification principles can be regarded as a functional tool for promoting physical activity and healthy-living behaviors (Deterding, Dixon, Khaled, & Nacke, 2011). Thus, digital citizenship and sport-culture education can be strengthened together, fostering a more conscious and sustainable sport culture in digital environments.

5. Discussion

The findings of the study show that the effect of digital games on socialization and loneliness cannot be read as a linear opposition. As network society theory suggests, the fundamental effect of digitalization is not the disappearance of socialization but the restructuring of the ground on which social relationships are established, shifting from the space of places to the space of flows (Castells, 2010). This conclusion reconciles two separate lines of literature demonstrating that digital games can produce both positive and negative outcomes; studies emphasizing the cognitive and social benefits of games (Granic et al., 2014) and those drawing attention to the risks of addiction and sedentary living (Kuss & Griffiths, 2012) describe different faces of the same phenomenon rather than mutually excluding each other.

Within this framework, online gaming communities can function as a third space of sociability beyond home and work, producing bridging social capital (Steinkuehler & Williams, 2006; Oldenburg, 1999; Putnam, 2000). However, the same network structure also entails a paradox in which the individual, while becoming more connected on a global scale, may become distanced from their physical environment (Turkle, 2011; Bauman, 2000). This paradox carries particular significance for sport management, because sport has historically been a domain that produces not only physical performance but also face-to-face interaction, collective belonging, and social integration. Therefore, in the network society, the task of sport management is to preserve these values produced by physical sport while also benefiting from the opportunities offered by digital socialization.

The contribution of this study to the sport management literature is that, instead of the widespread approach that positions digital games as an alternative to sport, it proposes an integrative framework that treats them as a manageable social space within the sport ecosystem. This hybrid approach, which brings together the space of places and the space of flows around a human-centered understanding of sport management (Figure 1), positions technology not as an end but as a means for physical activity, social participation, and healthy living. Thus, the trial of the sport manager with digital games is redefined not as a struggle against technology but as the capacity to build new-generation sport ecosystems by correctly reading the social logic of the digital age.

6. Conclusion

One of the defining transformations of the twenty-first century is not the increasing impact of digital technologies on everyday life but the reorganization of the ways individuals participate in social life. Digital games, one of the most

visible domains of this transformation, have acquired an economic, cultural, social, and managerial dimension to such an extent that they can no longer be evaluated merely as a leisure activity. Particularly for children and young people, digital games have become one of the important components of new social networks in which communication is established, identity is developed, and belonging is formed.

The fundamental conclusion reached throughout the study is that digital games do not produce a linear effect that either directly socializes or inevitably isolates individuals. The real transformation occurs in the place, rhythm, and organizational logic of socialization. In the network society, individuals establish more connections; however, these connections often occur independently of physical togetherness. This gives rise to a fundamental social paradox in which the individual can be simultaneously highly connected and physically isolated, producing a historical rupture for sport management.

For this reason, the fundamental task of the sport manager is no longer to keep individuals away from digital games but to understand the changing forms of socialization in the digital age and to establish a sustainable balance between physical activity and digital interaction. In other words, the rise of digital games is not a crisis of sport but a new field of governance that requires the redefinition of sport management. This transformation also reshapes the institutional identity of the sport manager. The future sport manager must become a strategic transformation leader who can read digital culture, analyze youth behavior, develop data-driven decision processes, integrate physical and digital participation, and guide public health policies.

Several recommendations can be developed in light of these conclusions. First, sport policies should be redesigned by taking into account not only physical participation indicators but also digital interaction and changing youth culture, and digital participation indicators should be added to strategy documents. Second, sport systems should be transformed into inclusive structures that produce new forms of participation through movement-based games, hybrid sport models, and digital communities rather than excluding digital games. Third, exergaming and movement-based applications should be integrated into the sport system at the school and club levels; fourth, digital game literacy, digital ethics, and healthy-living awareness should be incorporated into sport education programs. Finally, sport management decision processes should be restructured with a data-driven and adaptive approach.

For future research, empirical testing of the conceptual framework put forward in this study is recommended. In particular, field studies conducted on sport federations, professional sport clubs, local government sport units, and sport management education programs can reveal the applicability, measurability, and effect on institutional outcomes of hybrid sport models and exergaming-based applications. Within this framework, the priority of sport management is also changing; instead of an approach that seeks merely to draw young people to physical sports fields, a human-centered understanding of sport management that integrates sport with the digital networks in which young people already live comes to the fore.

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Evaluation of Nutritional Status Among University Students at "Aleksandër Moisiu" University

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Abstract

Anemia and malnutrition remain major public-health problems among adolescents and young adults, particularly in low- and middle-income settings. This cross-sectional study assessed the nutritional and anemia status of 265 students (231 female, 34 male; aged 16–21 years) at the Faculty of Professional Studies, Department of Technical Medical Sciences, using a self-administered questionnaire covering anthropometric, dietary, lifestyle and capillary hemoglobin data. Body mass index (BMI) was normal in 72.3% of students, while 10.4% were underweight, 13.3% overweight and 4.0% obese. Hemoglobin values were available for 140 students (52.8%); among these, 57.1% met criteria for anemia (34.3% mild, 10.7% moderate, 12.1% severe), corresponding to 30.2% of the total sample. Anemia was numerically more frequent among females (60.2%) than males (40.9%), but no lifestyle, dietary or anthropometric factor examined (sex, residence, BMI category, water intake, meal frequency, physical activity, screen time, or iron/vitamin-D supplement use) reached statistical significance (all $p > .05$, chi-square test), likely reflecting the limited size of the tested sub-sample. These findings confirm anemia as a substantial nutritional burden in this university population and support continued screening and multisectoral nutrition interventions consistent with WHO and UN 2030 Agenda targets.

Keywords: anemia, nutritional status, BMI, university students, hemoglobin, malnutrition

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1. Introduction

Anemia is a leading global public-health concern, affecting an estimated 40% of children aged 6–59 months, 37% of pregnant women, and 30% of women aged 15–49 years worldwide, and accounting for roughly 50 million years of healthy life lost to disability in 2019 (Institute for Health Metrics and Evaluation [IHME], 2019a, 2019b; Hess et al., 2023). Adolescents and young adults are frequently overlooked in nutrition surveillance despite elevated iron requirements from growth, menstrual losses and dietary transitions (Fentie et al., 2020; UNICEF, 2023). Reducing anemia in women of reproductive age is one of six global nutrition targets of the World Health Assembly and a stated indicator of the United Nations 2030 Agenda for Sustainable Development (World Health Organization [WHO], 2017).

University life is also associated with important shifts in nutritional status: sedentary behavior, irregular meals and fast-food consumption have been linked to both underweight and overweight/obesity among students internationally (Peltzer et al., 2014), while obesity itself can coexist with iron-deficiency anemia through impaired iron metabolism (Hamed et al., 2024). This study examines the nutritional status and anemia prevalence of students in a health-sciences faculty in Albania and tests whether commonly cited dietary and lifestyle risk factors are associated with anemia in this population.

2. Methods

A cross-sectional survey was conducted among students of the Faculty of Professional Studies, Department of Technical Medical Sciences, "Aleksandër Moisiu" University (Durrës, Albania). A structured, self-administered questionnaire (265 valid responses) collected socio-demographic data (sex, age, residence, parental education, family income), anthropometric self-reports (weight, height), dietary and lifestyle habits (meal frequency, food-group preference, fluid intake, physical activity, screen time, supplement use, medical check-up frequency), and self-reported capillary hemoglobin values where available ($n = 140$). Body mass index (BMI = weight[kg]/height[m]^2) was classified as underweight (<18.5), normal (18.5–24.9), overweight (25–29.9) or obese (≥30). Hemoglobin was grouped as normal (11–12 g/dL), mild (10–11 g/dL), moderate (8–10 g/dL) or severe anemia (<8 g/dL), following the category boundaries used in the original questionnaire. Free-text numeric responses (e.g., water intake, screen time) were parsed and cleaned in Python (pandas); associations between anemia status and categorical predictors were tested with Pearson's chi-square test ($\alpha = .05$). All figures and tables in this paper were generated directly from the cleaned dataset.

3. Results

Table 1. Sample characteristics (N = 265)

Characteristic	n	%
Sex — Female	231	87.2
Sex — Male	34	12.8
Age 19–21 years	214	80.8
Age 16–18 years	41	15.5
Age ≤15 years	10	3.8
Residence — Urban	191	72.1
Residence — Rural	74	27.9
Parental education — Secondary	163	61.5
Parental education — Low	57	21.5
Parental education — Higher	43	16.2
Family income — Medium	232	87.5
Family income — High	19	7.2
Family income — Low	12	4.5
BMI — Normal (n = 249 measured)	180	72.3
BMI — Overweight	33	13.3
BMI — Underweight	26	10.4
BMI — Obese	10	4.0
Hemoglobin available (tested)	140	52.8
– Anemic (mild+moderate+severe) among tested	80	57.1

Note. Percentages for BMI are of the 249 students with valid weight and height; percentages for hemoglobin sub-rows are of the 140 tested students.

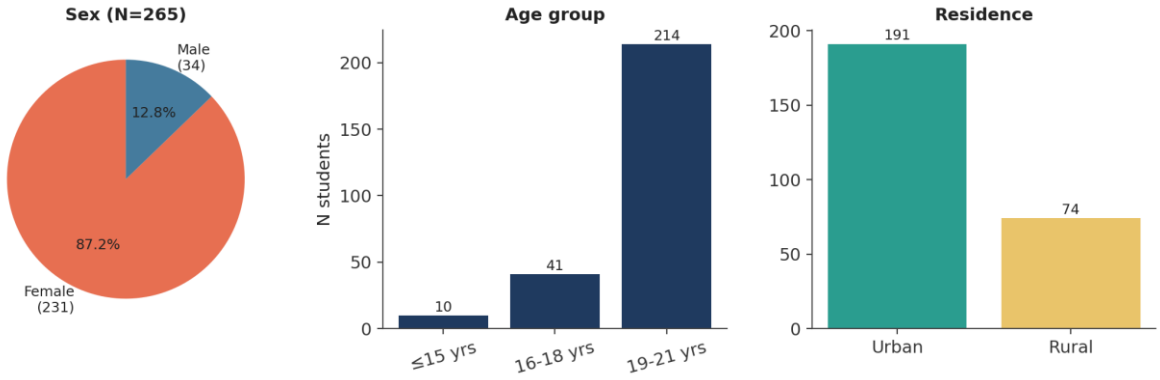

Figure 1. Sex, age group and residence distribution of the sample (N = 265).

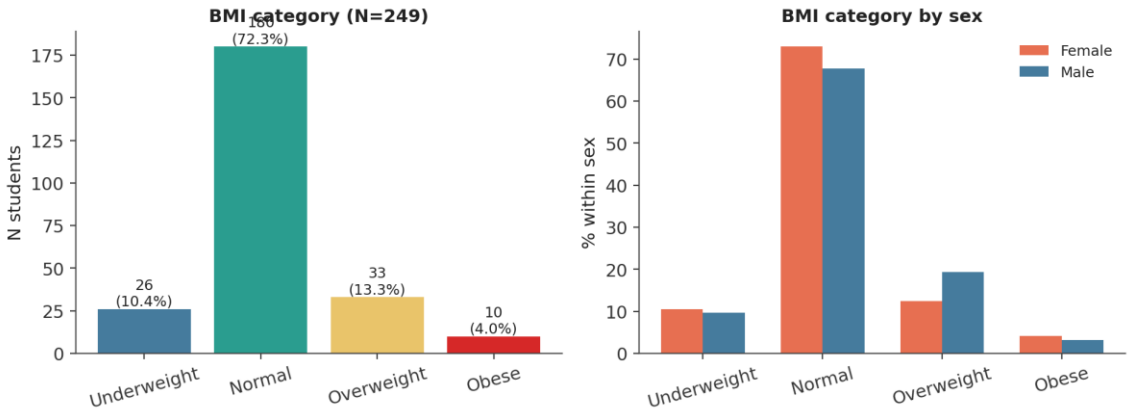

Figure 2. BMI category overall (n = 249) and by sex.

Body-mass distribution skewed toward normal weight (72.3%), with underweight (10.4%) slightly less frequent than overweight (13.3%); obesity remained low (4.0%). The overweight/obese share (17.3% combined) was lower than reported in multi-country university samples (~22%; Peltzer et al., 2014), while underweight was broadly comparable to that literature.

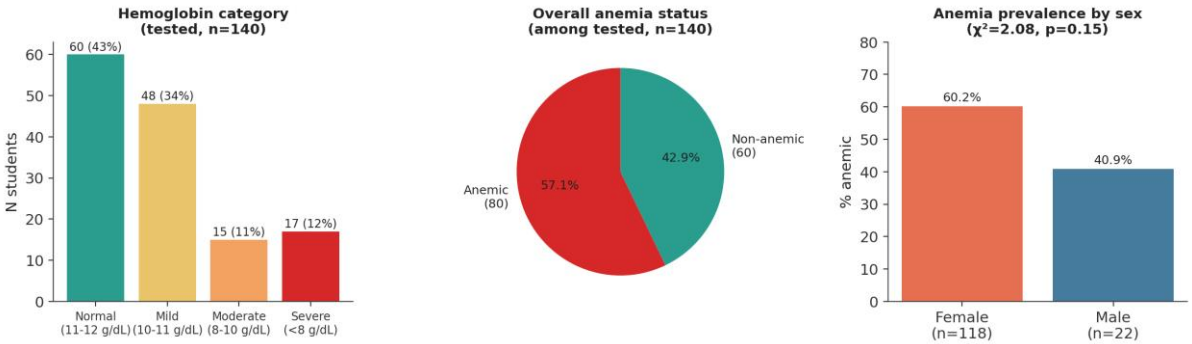

Figure 3. Hemoglobin category, overall anemia status, and anemia prevalence by sex among the 140 tested students.

Among the 140 students with available hemoglobin values, 57.1% (n = 80) met criteria for anemia of any severity — 34.3% mild, 10.7% moderate and 12.1% severe — corresponding to 30.2% of the full sample (N = 265) once untested students are included in the denominator. Anemia was more common among females (60.2%) than males (40.9%), but this difference was not statistically significant ($\chi^2 = 2.08$, $p = .150$).

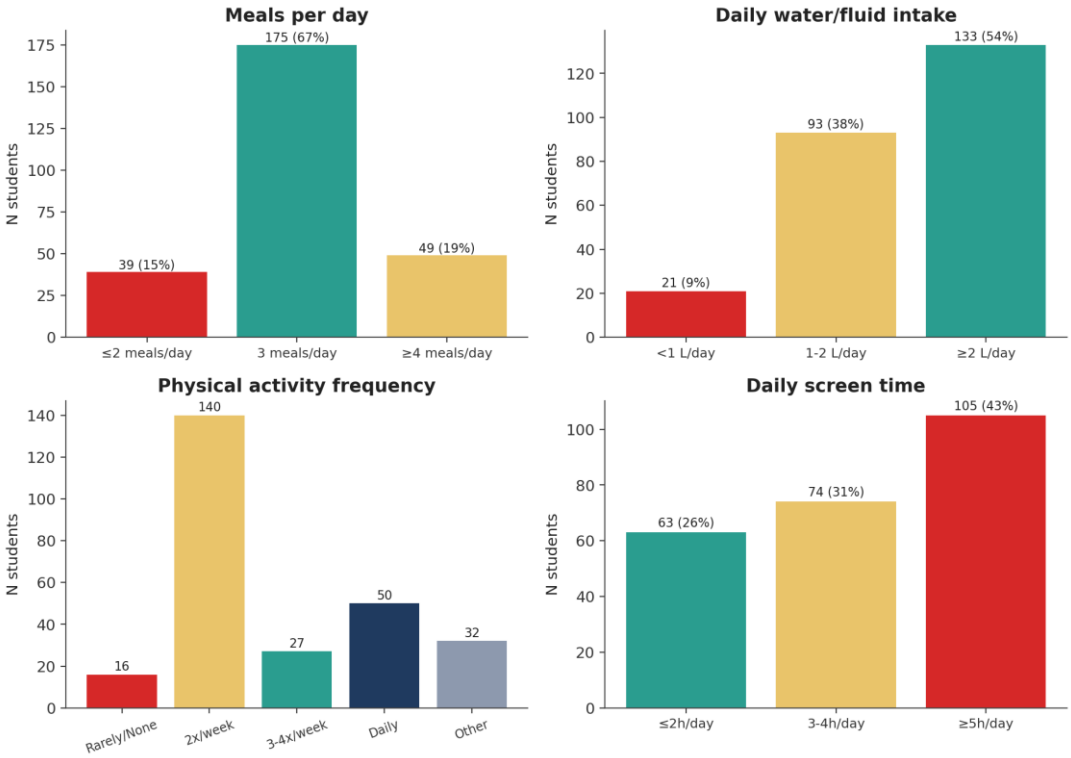

Figure 4. Dietary and lifestyle profile of the sample: meal frequency, daily fluid intake, physical-activity frequency, and daily screen time.

Most students reported three meals per day (66%) and adequate hydration (54% ≥ 2 L/day), yet screen time was high overall, with 43% exceeding 5 hours/day and only 26% at 2 hours or less. Structured physical activity two or more times per week was reported by the majority, though 6% reported little or no regular activity.

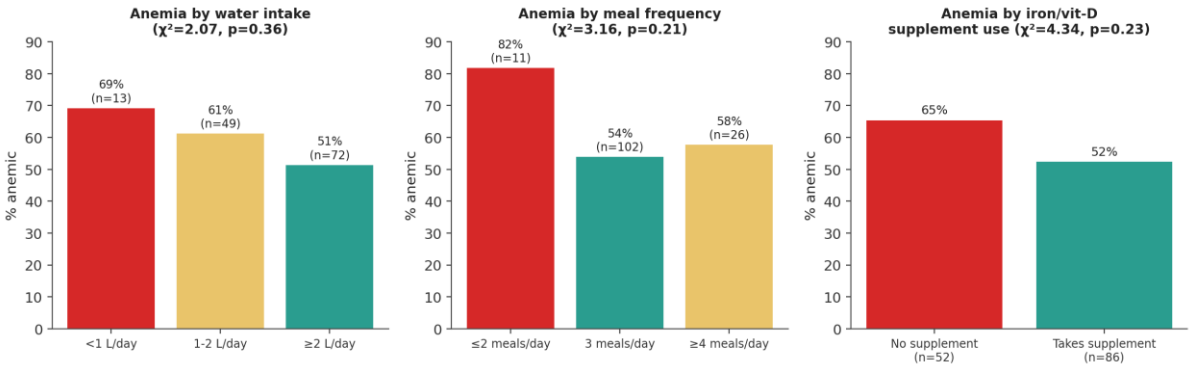

Figure 5. Anemia prevalence (%) by fluid intake, meal frequency, and iron/vitamin-D supplement use (tested sub-sample, n = 140).

Table 2. Chi-square tests of association with anemia status (tested sub-sample, n = 140)

Factor	χ^2	p
Sex	2.08	.150
Residence (urban/rural)	0.12	.731
BMI category	2.56	.464
Daily water/fluid intake	2.07	.356
Meal frequency	3.16	.206
Physical activity frequency	3.90	.420
Daily screen time	0.27	.872
Iron/vitamin-D supplement use	4.34	.227

Note. None of the tested associations reached the $p < .05$ threshold.

Capillary hemoglobin levels were assessed in a subgroup of 150 students. Single-use HemoCue 201 microcuvettes were used, and samples were analyzed using the Hemo Control hemoglobin meter (EKF Diagnostics). Weight and height were also measured using a Fuego electronic scale (Fuego Corporation, Munich, Germany) capable of assessing body fat, hydration, and BMI.

The results showed that 10% of the students had hemoglobin levels within the intermediate range. It is also important to note that the students had previously undergone hemoglobin measurements via a complete blood count (hemogram). Cases showing low values indicative of anemia were referred for further evaluation and treatment.

4. Discussion

The 30.2% overall anemia prevalence observed here sits above the 10% figure reported in the project's original abstract (which likely reflected only the most severe hemoglobin band) and is closer to prevalence figures reported for adolescent and young-adult female populations elsewhere — for example 37.8% in Yemeni adolescents and substantially higher rates than the 14.7% reported in Nepalese schoolgirls, but broadly consistent with the wide 15–58% range reported across similar cross-sectional student and adolescent surveys (Budhathoki et al., 2021; Fentie et al., 2020). The higher, though non-significant, prevalence among females mirrors a consistent pattern in the literature attributed to menstrual iron losses (Fentie et al., 2020; Hamed et al., 2024).

Contrary to some prior work linking excess adiposity to iron-deficiency anemia (Hamed et al., 2024), BMI category was not significantly associated with anemia in this sample, nor were any of the dietary or lifestyle variables examined. Given the tested sub-sample was modest ($n = 140$) and self-reported, these null results should be interpreted as inconclusive rather than as evidence of no effect; larger, laboratory-confirmed studies are needed. The high prevalence of long screen time (43% ≥ 5 h/day) alongside comparatively low rates of regular vigorous activity mirrors sedentary-lifestyle patterns reported among university students in other cross-sectional surveys (Peltzer et al., 2014), and may warrant attention as a broader determinant of student health even where a direct statistical link to anemia was not detected here.

5. Conclusion

Anemia affected roughly three in ten students in this health-sciences cohort when the full sample is considered, and more than half of those who were tested — confirming that iron-deficiency-related anemia remains a substantial, often under-recognized nutritional burden even in a relatively young, educated population. While no single lifestyle or dietary factor examined reached statistical significance, the overall pattern of frequent skipped/irregular meals, inconsistent supplement use and high screen time alongside modest physical activity supports continued, systematic hemoglobin screening and multifaceted nutrition-education interventions in university settings, in line with WHO global nutrition targets and the UN 2030 Agenda goal of reducing anemia among women and girls of reproductive age (WHO, 2017).

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Sustainable Shoe Insole Production Using Banana Peel Waste-Based Composite Materials: A Review

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Abstract: The footwear industry produced approximately 23.9 billion pairs of shoes in 2024, and most end-of-life footwear is landfilled. Insoles are commonly made from petroleum-based, crosslinked ethylene vinyl acetate (EVA) and polyurethane (PU) foams that are difficult to recycle. At the same time, global banana production has reached about 139 million tonnes per year, and the peel, which accounts for 35–40% of the fruit mass, generates roughly 30 million tonnes of largely unused lignocellulosic waste annually. The aim of this review is to evaluate the potential of banana peel waste as a raw material for sustainable shoe insole production. Peer-reviewed studies and technical sources published mainly between 2000 and 2026 were identified in Scopus, Web of Science, ScienceDirect and Google Scholar and were analysed under five themes: functional requirements and conventional insole materials, composition and availability of banana peel, pretreatment and processing routes, performance of banana peel-based composites and foams, and hygiene and end-of-life behaviour. The reviewed studies show that banana peel powder improves stiffness, thermal stability and biodegradability at low loadings (typically 1–10 wt%) in epoxy, polylactic acid and polyurethane matrices, whereas excessive loadings cause agglomeration and loss of mechanical performance. Alkali treatment is the most frequently used method to improve filler–matrix compatibility. Natural rubber latex foam emerges as the most suitable matrix for insoles because it combines cushioning, commercial insole applicability and demonstrated biodegradability in soil. The main challenges are moisture sensitivity, raw material variability, compression set, latex allergy and the lack of life cycle assessment and wear-test data. It is concluded that banana peel-filled natural rubber latex foam is a promising route for circular insole production, and targeted experimental studies are recommended.

Keywords: Banana peel, biocomposite, shoe insole, natural rubber latex foam, circular economy, waste valorisation.

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1. INTRODUCTION

The footwear industry is one of the largest consumer goods sectors in the world. Global footwear production rose by 6.9% in 2024 to 23.9 billion pairs, 88% of which was manufactured in Asia (World Footwear, 2025). As early as 2007, Staikos and Rahimifard (2007) reported that around 17 billion pairs were produced annually and that the vast majority of worn footwear ended up in landfills. Footwear waste recovery is hindered by inefficient reverse logistics, the difficulty of separating mixed materials and the lack of established value recovery chains (Van Rensburg et al., 2020). Waste is also generated during manufacturing: crosslinked EVA scraps such as injection sprues and unused midsoles cannot be remelted and require separate recovery strategies (Júnior et al., 2022).

Insoles are an important comfort component of footwear. They support the foot, absorb impact, distribute plantar pressure and manage moisture. Today they are mostly made from petroleum-based EVA and PU foams. Many commercial insoles break down easily or provide no antibacterial protection, while natural alternatives such as cork suffer from poor cushioning and water sensitivity (Naseem et al., 2024). There is therefore a growing need for insole materials that combine adequate comfort performance with renewable origin and a lower end-of-life burden.

Biocomposites reinforced with natural fibres and fillers have been studied intensively over the past two decades owing to their renewable origin, low density and biodegradability (Faruk et al., 2012; Mohanty et al., 2002). Agricultural and food wastes are particularly attractive fillers because they reduce raw material cost and help solve waste management problems at the same time. Among these wastes, banana peel stands out because of its very large and continuous availability. Global banana production was approximately 135 million tonnes in 2022 and 139 million tonnes in 2023, and around 30 million tonnes of banana peel are generated every year, most of which is landfilled (Hazarika et al., 2026).

Although banana peel has been widely studied for food, adsorbent, bioplastic and composite applications, no review has specifically addressed its use in shoe insoles. The aim of this review is to (i) summarise the functional requirements of insoles and the limitations of conventional materials, (ii) evaluate the composition and availability of banana peel, (iii) compare the pretreatment and processing routes reported in the literature, (iv) analyse the performance of banana peel-based composites and foams, and (v) identify the most suitable matrix, the remaining challenges and future research directions for banana peel-based insole production.

2. MATERIAL AND METHOD

This study was designed as a narrative literature review. The literature search was carried out in the Scopus, Web of Science, ScienceDirect and Google Scholar databases, supplemented by industry statistics from the Food and Agriculture Organization of the United Nations (FAO) and the World Footwear Yearbook. The search terms included combinations of "banana peel", "banana waste", "bio-filler", "biocomposite", "natural rubber latex foam", "polyurethane foam", "shoe insole", "footwear waste", "plantar pressure" and "biodegradation". Studies published mainly between 2000 and 2026 in English were considered.

Studies were included if they (i) reported the composition, pretreatment or processing of banana peel or other banana wastes for material applications, (ii) reported the mechanical, thermal, water absorption or biodegradation properties of polymer composites or foams containing banana peel, or (iii) investigated insole materials, insole comfort or footwear sustainability. Studies dealing only with food, pharmaceutical or adsorbent uses of banana peel were excluded unless they provided compositional data. The selected studies were analysed qualitatively and grouped under the five themes defined in the Introduction. Quantitative data (filler content, particle size, strength, thermal stability, water absorption and biodegradation) were extracted and compiled into comparison tables.

3. RESULTS

3.1. Functional Requirements and Conventional Insole Materials

An insole must provide cushioning, resilience and adequate stiffness, and these mechanical properties determine its ability to reduce peak plantar pressure (Haris et al., 2021). In a review of plantar pressure studies, EVA was the most frequently used insole material and reduced peak plantar pressure by approximately 37% in diabetic patients, while PU insoles achieved similar reductions of around 30% (Haris et al., 2021). Shi et al. (2022) compared four contoured insole materials in 22 elderly people with diabetes and found that soft materials outperformed rigid ones. PORON Medical 4708 reduced mean peak pressure by 38.8% on the dominant foot, 51.1% in the forefoot and 45.1% in the rearfoot compared with barefoot walking. These findings show that any alternative insole material must first be benchmarked against the cushioning performance of EVA and PU foams.

In addition to mechanical comfort, insoles must absorb perspiration and release it quickly, resist abrasion and limit microbial growth in the warm and humid shoe environment. Naseem et al. (2024) developed insoles from recycled PET nonwoven fabric laminated with PU and treated with an antimicrobial finish. The laminated side withstood 50,000 Martindale cycles and the insoles reduced bacteria by 80–92%, retaining these properties after ten washing cycles. However, this solution still relies on synthetic polymers. Natural materials such as cork are renewable but offer poor cushioning and are sensitive to water (Naseem et al., 2024).

3.2. Composition and Availability of Banana Peel

Banana peel makes up 35–40% of the fruit mass according to Hazarika et al. (2026), and 35–50% according to Serratos et al. (2025). Its dry matter contains 7.6–9.6% cellulose, 6.4–9.4% hemicellulose, 6–12% lignin and 10–21% pectin (Hazarika et al., 2026). The composition changes with cultivar and ripening stage; Happi Emaga et al. (2008) showed that the dietary fibre components and pectin characteristics of banana and plantain peels vary significantly during ripening. Depending on the extraction method, cellulose contents of 18–59% have also been reported (Serratos et al., 2025). This lignocellulosic and polysaccharide-rich structure makes banana peel suitable both as a particulate filler and as a source of cellulose and starch for bio-based materials. The peel also contains bioactive compounds, including phenolics (Hazarika et al., 2026), which may give banana peel-based materials a degree of antimicrobial activity.

From a supply perspective, world banana trade has remained at around 20 million tonnes per year in recent years (Food and Agriculture Organization of the United Nations [FAO], n.d.). Banana peel is therefore generated continuously and in large quantities at households, fruit juice shops, markets and food processing plants in both producing and importing countries. Because the peel is collected from the food chain rather than cultivated separately, its use as a raw material does not compete with food production.

3.3. Pretreatment and Processing Routes

Three main processing routes can be distinguished in the literature. The first and simplest is the production of banana peel powder as a particulate filler. Peels are washed, dried, ground and sieved; for example, Nazarudin et al. (2025) dried Saba banana peels at 60 °C for 24 h and sieved the powder to 60 μm. The second route involves chemical surface modification. Natural fillers are hydrophilic and absorb moisture, which weakens adhesion to hydrophobic polymer matrices. Chemical treatments such as alkali (NaOH), silane and acetylation improve filler–matrix bonding and dimensional stability (Kabir et al., 2012). Kumar et al. (2024) applied alkali treatment to banana peel powder of approximately 65 μm before

incorporating it into epoxy. Similarly, Joshi et al. (2024) isolated a cellulose-rich biofiller from waste banana stem fibres using NaOH (5–20%) followed by sodium hypochlorite treatment.

The third route is the extraction of polymeric components, mainly starch and cellulose, from the peel to produce bioplastics or reinforcing agents. Abera et al. (2024) extracted starch from Cavendish banana peel with a maximum yield of 12.06% and combined it with banana pseudo-stem cellulose fibre and glycerol. The optimised film had a tensile strength of 7.23 MPa, elongation at break of 5.46% and water absorption of 18.60%, and the fibre improved strength, water resistance and thermal stability. Serratos et al. (2025) highlighted banana peel-based cellulose materials as a circular-economy resource. For insole applications, the particulate filler route combined with alkali treatment is the most practical option because it requires few processing steps, low chemical consumption and minimal equipment.

3.4. Performance of Banana Peel-Based Composites and Foams

The main studies on banana waste-based composites are summarised in Table 1. A common finding is that banana peel improves properties only up to an optimum loading, above which agglomeration and poor interfacial adhesion degrade mechanical performance. In epoxy, alkali-treated banana peel powder markedly improved mechanical properties up to 5 wt%. The 7.5 wt% composite showed the best thermal stability, with a degradation temperature of 395 °C, and reduced water retention (Kumar et al., 2024). In PLA, the optimum was only 1 wt%, where flexural strength increased from 36.18 to 70.51 MPa (+72.99%) and elongation at break by 105.58%, while tensile strength decreased from 44.15 to 37.45 MPa. Higher loadings (2–3 wt%) impaired the mechanical properties (Nazarudin et al., 2025).

Foam systems are more relevant to insoles. Acosta et al. (2022) added 5–15 wt% banana peel to rigid PU foam. Compressive strength remained statistically unchanged at all loadings, density increased significantly only at 15 wt%, and the $T_{50\%}$ value rose from 237 °C to approximately 508 °C at 15 wt%. For flexible PU foams, Bryśkiewicz et al. (2016) showed that walnut and hazelnut shell fillers at 13.5 and 18 wt% improved thermal stability while maintaining the desired physical and mechanical properties, indicating that lignocellulosic particles are compatible with flexible foams at relatively high loadings.

Table 1. Summary of studies on banana waste-based polymer composites and foams

Study	Matrix	Banana waste form and loading	Main findings
Kumar et al. (2024)	Epoxy	Alkali-treated peel powder (~65 μm), 0–10 wt%	Mechanical properties improved up to 5 wt%; best thermal stability (395 °C) and lower water retention at 7.5 wt%
Nazarudin et al. (2025)	PLA	Peel powder (60 μm), 0.5–3 wt%	At 1 wt%: flexural strength 70.51 MPa (+72.99%), elongation +105.58%; decline at 2–3 wt%
Acosta et al. (2022)	Rigid PU foam	Peel filler, 5–15 wt%	Compressive strength unchanged; density increased only at 15 wt%; $T_{50\%}$ from 237 to ~508 °C
Abera et al. (2024)	Peel starch film	Peel starch + pseudo-stem cellulose fibre	Tensile strength 7.23 MPa, elongation 5.46%, water absorption 18.60%
Joshi et al. (2024)	Natural rubber	Cellulose-rich stem fibre biofiller, partial carbon black replacement	Optimum tensile strength at 30% carbon black replacement; improved thermal stability

In natural rubber, Joshi et al. (2024) showed that a cellulose-rich banana stem biofiller could replace 30% of carbon black with optimum tensile strength, which demonstrates that banana-derived fillers are compatible with rubber vulcanisation systems. Although no study has yet incorporated banana peel into natural rubber latex foam, comparable agricultural fillers have been studied in this matrix. Ramasamy et al. (2013) reported that adding up to 10 phr rice husk powder to natural rubber latex foam increased the stress at 50% compression strain and showed good rubber–filler interaction, but also increased compression set and reduced recovery. The temperature at 5% mass loss decreased from 328 to 295 °C, while char residue increased from 4.20% to 7.33%. Similar trends can be expected for banana peel powder.

3.5. Candidate Matrices for Banana Peel-Based Insoles

The suitability of the main matrices for banana peel-filled insoles is compared in Table 2. Rigid matrices such as epoxy and PLA are not suitable for the cushioning layer of an insole, although PLA-based composites could be considered for rigid components such as heel cups or shanks. Bio-based PU foams offer good processability and tolerate lignocellulosic fillers, but most PU systems still rely partly on petroleum-based isocyanates. Chitosan-based biocomposites have been developed specifically for insoles: Hosen et al. (2025) produced tannic acid-functionalised sugarcane fibre/chitosan sheets with a tensile strength of 29.58 MPa, 86% elongation, Shore D hardness of 54, 4.53% water absorption, antibacterial activity of 71.7% against *E. coli* and 63% against *S. aureus*, and 74% biodegradation in 120 days. However, these are dense sheets rather than cushioning foams.

Natural rubber latex foam emerges as the most suitable matrix. It is renewable, already used commercially for insoles and processed in water-based systems at relatively low temperatures. Ramli et al. (2024) produced latex foam insoles from an ammonia-free natural rubber latex and found that high-density foam gave 41% lower peak pressure and 6% lower rebound resilience than extra-high-density foam, making it the ideal choice for sports shoe insoles. Ali et al. (2026) confirmed through six months of soil burial that natural rubber latex foam insoles undergo physical and chemical degradation, with weight losses of about 7% for high-ammonia and 5% for deproteinised latex and tensile strength losses of 42% and 26%, respectively.

Table 2. Comparison of candidate matrices for banana peel-based insoles

Matrix	Advantages	Limitations	Suitability for insoles
Natural rubber latex foam	Renewable; cushioning; commercial insole use; biodegradable in soil	Latex allergy; compression set rises with filler	High (cushioning layer)
Bio-based / flexible PU foam	Good processability; tolerates 13.5–18 wt% natural fillers	Partly petroleum-based isocyanates; limited biodegradability	Medium
Chitosan-based composite	Bio-based; antibacterial; 74% biodegradation in 120 days	Dense sheet, not a foam; limited cushioning	Medium (top layer)
PLA	Bio-based; stiffness increases at low filler content	Rigid; brittle; optimum only ~1 wt%	Low (rigid parts only)
Epoxy	High strength and thermal stability	Thermoset; not biodegradable; rigid	Not suitable

Compiled from Acosta et al. (2022), Ali et al. (2026), Bryśkiewicz et al. (2016), Hosen et al. (2025), Kumar et al. (2024), Nazarudin et al. (2025) and Ramli et al. (2024).

3.6. Proposed Production Route

Based on the reviewed studies, a production route for banana peel-filled natural rubber latex foam insoles is proposed in Figure 1. Peels are collected from juice shops and markets, washed, cut and dried at around 60 °C (Nazarudin et al., 2025), ground and sieved below approximately 75 µm, and treated with dilute NaOH to improve compatibility with the rubber (Kabir et al., 2012; Kumar et al., 2024). The powder is then dispersed in water and added to the latex compound, which is foamed, moulded, gelled and vulcanised by the Dunlop process (Ramasamy et al., 2013). Finally, a natural textile top cover can be laminated and the insoles cut to size. Considering the optimum loadings reported for other matrices and for rice husk-filled latex foam, a filler range of about 2.5–10 phr appears to be a reasonable starting point for experimental studies.

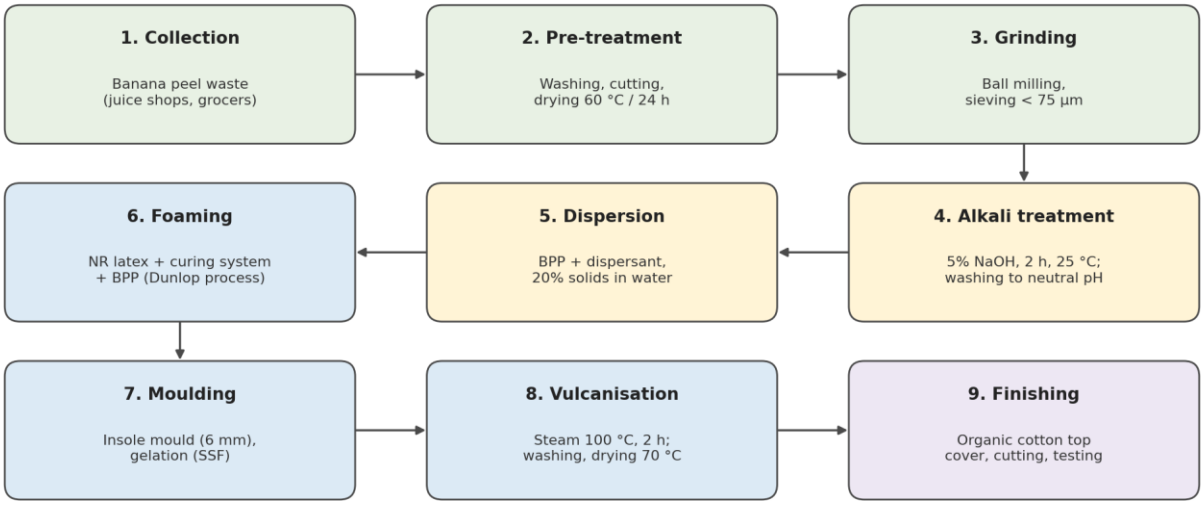

Figure 1. Proposed production route for banana peel-filled natural rubber latex foam insoles

3.7. Hygiene, Biodegradation and End-of-Life Behaviour

The end-of-life advantage of bio-based insoles depends on both the matrix and the filler. Crosslinked EVA and PU foams are difficult to recycle and do not degrade appreciably in soil, whereas natural rubber latex foam insoles have been shown to degrade in soil (Ali et al., 2026). Hydrophilic lignocellulosic fillers are expected to accelerate this process by facilitating water uptake and microbial access, as observed for chitosan-based insole composites (Hosen et al., 2025). Conversely, the same hydrophilicity increases water absorption during use. Kumar et al. (2024) showed that alkali-treated banana peel reduced water retention in epoxy composites, suggesting that surface treatment can partly balance durability in use with

degradability at end of life. The antimicrobial potential of banana peel phenolics remains to be quantified in insole materials, and functionalisation with natural antimicrobial agents such as tannic acid or chitosan could be combined with banana peel fillers (Hosen et al., 2025).

4. DISCUSSION AND CONCLUSIONS

The reviewed literature shows that banana peel is an abundant, low-cost and renewable resource whose lignocellulosic and polysaccharide-rich composition allows it to be used as a filler, a cellulose source or a starch source. In all matrices studied, banana peel improves certain properties, especially stiffness, thermal stability and biodegradability, only up to an optimum loading, which ranges from 1 wt% in PLA to 5–7.5 wt% in epoxy and up to 15 wt% in rigid PU foam. Flexible and foamed matrices appear to tolerate higher filler contents than rigid matrices, which is favourable for insole applications.

Several challenges must be addressed before banana peel-based insoles can be commercialised. First, the hydrophilic nature of the filler increases moisture absorption; surface treatments and the balance between absorption and desorption must be optimised according to insole test standards such as ISO 22649 (International Organization for Standardization, 2016). Second, the composition of banana peel varies with cultivar and ripening stage (Happi Emaga et al., 2008), so raw material standardisation is required. Third, lignocellulosic fillers tend to increase the compression set of latex foams (Ramasamy et al., 2013), which may reduce shape retention during long-term use; this should be evaluated with standard foam tests such as those in ASTM D3574 (ASTM International, 2017) together with dynamic fatigue and wear tests. Fourth, natural rubber latex carries a risk of type I allergy, so low-protein, deproteinised or ammonia-free latex grades should be preferred (Ali et al., 2026; Ramli et al., 2024). Finally, the energy used for drying and grinding and the chemicals used in vulcanisation must be quantified through cradle-to-grave life cycle assessment according to ISO 14040 (International Organization for Standardization, 2006) to confirm the environmental benefit over EVA and PU.

The main conclusions of this review are as follows:

(1) Banana peel waste is available in very large quantities (approximately 30 million tonnes per year), and its composition makes it suitable for use as a bio-filler in polymer composites and foams.
(2) Alkali treatment followed by grinding to fine particle sizes is the most practical and widely used pretreatment route for composite applications.
(3) Banana peel improves stiffness, thermal stability and biodegradability at optimum loadings, while excessive loadings cause agglomeration and loss of mechanical performance.
(4) Natural rubber latex foam is the most suitable matrix for banana peel-based insoles because it combines cushioning, commercial insole use and demonstrated biodegradability.
(5) No study has yet produced and tested banana peel-filled insoles; this is the main research gap identified in this review.

Future studies should produce banana peel-filled natural rubber latex foam insoles at different filler loadings, characterise them according to footwear and foam test standards, evaluate their plantar pressure performance against commercial EVA insoles, investigate the antimicrobial effect of banana peel compounds and assess the environmental performance of the entire production chain through life cycle assessment. Such work would provide the footwear industry with a practical circular-economy solution that simultaneously valorises food waste and reduces dependence on fossil-based materials.

Ethics Committee Approval
N/A. This study is a literature review and does not involve human participants or animals.

Author Contributions
Özlem Yılmaz Karaboyacı: conceptualisation, literature search, data curation, writing – original draft, writing – review and editing. The author has read and agreed to the published version of the manuscript.

Conflict of Interest
The author has no conflicts of interest to declare.

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Functional Antimicrobial Materials in Footwear: A Review of Active Agents, Mechanisms of Action, and Foot-Health Applications

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Abstract: Footwear constitutes an enclosed, poorly ventilated microenvironment that promotes microbial colonization, odor development, and infection risk, particularly at the insole–plantar skin interface. This review provides a systematic synthesis of functional antimicrobial materials developed for footwear and insole applications, structured around three principal agent classes: inorganic/metal-based agents (silver, copper, zinc oxide), natural/organic agents (chitosan, plant essential oils), and synthetic organic agents (quaternary ammonium compounds, triclosan). For each class, the underlying mechanisms of action—ion release, reactive oxygen species generation, membrane disruption, and enzyme inhibition—are compared, alongside the material integration methods used to incorporate them into footwear components, including electrospinning, coating, composite/compound fabrication, microencapsulation, and additive manufacturing. The review further evaluates the translation of these technologies into concrete foot-health outcomes, namely odor control, tinea pedis prevention, and diabetic foot care, and examines the testing standards (ISO 20743, AATCC 100, ISO 16187) used to validate antimicrobial efficacy claims. Safety and sustainability considerations, including nanoparticle cytotoxicity, environmental persistence, and regulatory status under the EU Biocidal Products Regulation, are also discussed. The findings indicate that inorganic agents offer superior efficacy and durability but require careful environmental risk management, natural agents provide a safer and more sustainable alternative constrained by stability limitations, and synthetic agents face increasing regulatory restriction. The review identifies a persistent gap between laboratory-demonstrated antibacterial efficacy and footwear-specific clinical validation, and proposes hybrid formulations, sensor-integrated insoles, and life-cycle assessment as priority directions for future research.

Keywords: antimicrobial insole, footwear hygiene, silver nanoparticles, chitosan, foot health, tinea pedis.

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1. INTRODUCTION

Footwear constitutes one of the most enclosed and least ventilated microenvironments in contact with the human body. The plantar surface of the foot contains one of the highest densities of eccrine sweat glands in the human body and continuously secretes considerable amounts of sweat throughout the day. When combined with the limited ventilation provided by footwear, this perspiration creates a warm and humid microclimate inside the shoe. A recent study comparing the internal microclimates of different types of footwear (casual shoes, running shoes, and perforated shoes) demonstrated that in-shoe temperature and absolute humidity were positively correlated with bacterial proliferation on the plantar skin, whereas ventilation rate exhibited a negative correlation. Among the footwear types investigated, casual shoes provided the most favorable conditions for bacterial growth (Miao et al., 2021). These findings indicate that footwear design and material selection are environmental factors that directly influence the microbial ecology of the foot.

The interface between the plantar skin and the insole represents one of the primary sites of bacterial colonization on the human body, with *Staphylococcus* species accounting for the vast majority of the bacterial population on the plantar surface (Stevens et al., 2015). Amino acids and lipids secreted in sweat are metabolized by these microorganisms, producing volatile fatty acids, particularly isovaleric acid, which is recognized as the principal chemical contributor to foot malodor (bromhidrosis). The prolonged use of closed footwear and elevated ambient temperatures further increase microbial proliferation, thereby accelerating this process.

The consequences of excessive microbial growth extend well beyond cosmetic concerns and user discomfort. Chronic moisture accumulation and skin maceration create favorable conditions for the development of dermatophyte infections such as *tinea pedis* (athlete's foot). As the infection progresses, secondary colonization by Gram-negative bacteria frequently occurs, contributing to the characteristic pungent odor associated with advanced cases. In individuals with diabetes, these issues become considerably more critical. Peripheral neuropathy diminishes protective sensation, preventing the recognition of repetitive mechanical trauma in high plantar pressure regions and consequently increasing the risk of ulcer formation. Once ulcers develop, microbial colonization substantially elevates the risk of severe infection, potentially leading to hospitalization or even lower-limb amputation (Ahmed et al., 2020). Therefore, in diabetic foot care, insole design should be considered not only as a pressure offloading strategy but also as an important component of microbial management.

In response to these health and comfort challenges, the footwear and textile industries have devoted increasing attention over the past two to three decades to the development of functional antimicrobial materials. Current approaches encompass a broad spectrum of antimicrobial agents, including inorganic metal and metal oxide nanoparticles such as silver, copper, and zinc oxide; naturally derived compounds including chitosan and plant essential oils (e.g., tea tree, bay, thyme, and lemongrass); and synthetic organic agents such as quaternary ammonium compounds, borates, and triclosan. Comprehensive investigations conducted by the Spanish Footwear Technology Institute (INESCOP) have significantly advanced this field by characterizing footwear microbiota using molecular techniques, including polymerase chain reaction (PCR) and denaturing gradient gel electrophoresis (DGGE), and by developing microencapsulation strategies for incorporating natural antimicrobial compounds into footwear materials (Sánchez-Navarro et al., 2013). Nevertheless, concerns regarding the environmental persistence, potential skin irritation, and toxicity of certain synthetic antimicrobial agents have shifted research and industrial interest toward safer and more sustainable alternatives.

Among footwear components, the insole has emerged as one of the most important targets for antimicrobial functionalization because it remains in continuous contact with the plantar surface, accumulates the highest amount of sweat, and experiences the greatest mechanical loading during walking. Electrospun nanofiber-coated insoles containing silver nanoparticles have demonstrated antibacterial efficiencies exceeding 99% against both *Escherichia coli* and *Staphylococcus aureus* (Du et al., 2019). Similarly, waste leather powder-based composite insoles reinforced with zinc oxide nanoparticles have exhibited significant antimicrobial activity (Dey et al., 2022). These studies clearly demonstrate that advances in materials engineering can be translated into measurable improvements in foot hygiene and health.

Despite these promising developments, the existing literature remains highly fragmented. Most published studies focus exclusively on a single category of antimicrobial agents, such as metal nanoparticles or natural compounds, while relatively few consider the combined effects of multiple antimicrobial strategies. Furthermore, many investigations evaluate antimicrobial materials within the broader context of textiles or leather products without adequately considering footwear-specific conditions, including the enclosed microclimate, repeated mechanical abrasion, moisture accumulation, and the multilayer architecture of shoe materials. In addition, only a limited number of review articles have systematically examined the relationship between antimicrobial performance and clinically relevant foot health outcomes, including odor reduction, prevention of fungal infections, and diabetic foot ulcer management.

This review aims to address these knowledge gaps by providing a comprehensive and systematic overview of antimicrobial agents used in footwear, with particular emphasis on insole materials. Specifically, the objectives of this review are to: (i) systematically classify the major categories of antimicrobial agents employed in footwear and insole materials, including inorganic, naturally derived, and synthetic organic compounds; (ii) comparatively discuss their cellular and molecular mechanisms of action, such as membrane disruption, reactive oxygen species (ROS) generation, ion release, and enzyme inhibition; (iii) critically evaluate the principal material integration strategies, including electrospinning, surface coating, composite fabrication, and microencapsulation; (iv) correlate antimicrobial functionality with practical foot health outcomes, including odor control, prevention of *tinea pedis*, and diabetic foot care; and (v) discuss current antimicrobial testing standards (ISO 20743 and AATCC 100), together with safety and sustainability considerations. Accordingly, this review is organized into sections covering the classification of antimicrobial agents, mechanisms of antimicrobial action, material integration technologies, applications in foot health, antimicrobial testing standards, and safety and sustainability issues, followed by a concluding discussion highlighting current limitations and future research directions in this rapidly evolving field.

2. MATERIAL AND METHOD

This study was conducted as a narrative literature review. Relevant publications were identified through searches of Web of Science, Scopus, PubMed, and Google Scholar, using combinations of the keywords “antimicrobial”, “footwear”, “insole”, “silver nanoparticle”, “chitosan”, “essential oil”, “tinea pedis”, “diabetic foot”, and “antibacterial textile”. Peer-reviewed journal articles, book chapters, and relevant international standards, published predominantly between 2008 and 2025, were included, with priority given to studies directly addressing footwear or insole applications; sources on general textile antimicrobial finishing were included where directly relevant to mechanisms or integration methods applicable to footwear components. The retrieved literature was synthesized thematically around agent classification, mechanism of action, material integration method, foot-health application, testing standard, and safety/sustainability considerations.

3. RESULTS

3.1 Classification of Antimicrobial Agents

Antimicrobial agents used in footwear and insole materials can be addressed in three main categories according to their chemical origin and mode of action: (i) inorganic/metal-based agents, (ii) natural/organic agents, and (iii) synthetic organic agents. This classification reflects both the prevailing usage patterns in the literature and the mechanistic distinctions addressed in Section 3.2.

3.1.1 Inorganic/Metal-Based Agents

The most widely used and most effective agent class for functionalizing textile and leather surfaces consists of silver, copper, and zinc oxide metal and metal oxide nanoparticles. Silver nanoparticles (AgNPs) stand out particularly in insole applications owing to their broad-spectrum antibacterial activity and relatively low toxicity; insoles produced by applying green-synthesis-derived AgNPs incorporated into polyvinyl alcohol (PVA)-based nanofiber matrices, layered onto cotton substrates via electrospinning, have achieved antibacterial efficacy exceeding 99% against *E. coli* and *S. aureus* (Du et al., 2019).

Copper oxide (CuO) nanoparticles offer a lower-cost alternative compared with silver; they are incorporated into textile surfaces through two principal functionalization approaches—*in situ* (formed during weaving) and *ex situ* (application of a pre-synthesized nanoparticle)—although their susceptibility to surface oxidation and relatively higher effective concentration requirement are limitations that warrant attention in application (Román et al., 2020).

Zinc oxide (ZnO) nanoparticles are preferred for their cost-effectiveness, UV-blocking property, and relatively low toxicity profile; they rank as the third most-studied metal oxide agent after silver and copper (Nan et al., 2024; Sirelkhatim et al., 2015). In an application specific to footwear insoles, reinforcing waste leather (buffing dust) powder with ZnO nanoparticles to produce composite insoles stands as an exemplary approach in the literature, both in terms of waste valorization and imparting antimicrobial function (Dey et al., 2022). Titanium dioxide (TiO_2), meanwhile, is distinguished from other metal oxides by operating through a photocatalytic mechanism; the fact that its efficacy is dependent on the presence of UV irradiation is a significant factor limiting its use in the closed interior environment of footwear.

3.1.2 Natural/Organic Agents

Interest in naturally derived antimicrobial compounds, as an alternative to the potential toxicity and environmental persistence concerns of synthetic and inorganic agents, has increased markedly in recent years. This group can be divided into three subcategories.

Polysaccharide-based agents (chitosan): The antimicrobial activity of chitosan derives from the interaction of its cell-wall-disrupting positively charged amino groups with negatively charged components of the microbial cell wall, impairing membrane permeability. In leather insole/footbed applications, chitosan is used both as a direct coating agent and as a carrier/encapsulation matrix for other natural compounds (essential oils); it has been shown that, in drum impregnation using a 1% (w/v) chitosan content in formic acid solution, a 2-hour application time provides the best balance between antimicrobial efficacy and cost (Fernandes et al., 2013).

Plant essential oils: Essential oils obtained from plants such as tea tree, laurel, thyme, clove, and lemongrass cause increased permeability and cytoplasmic leakage in the microbial cell membrane through phenolic/terpenoid components such as eugenol, thymol, carvacrol, and terpinen-4-ol. The greatest disadvantage of these agents is their volatility and susceptibility to oxidation; for this reason, they are almost invariably stabilized through microencapsulation (melamine-formaldehyde or chitosan capsules) for use in the footwear industry (Sánchez-Navarro et al., 2013).

Other natural compounds: Aloe vera extract, tannins, and certain plant polyphenols (e.g., green tea polyphenols, which have also been used as reducing/stabilizing agents in silver nanoparticle synthesis) are among the complementary natural agents. As they generally do not show sufficient efficacy on their own, they are typically investigated in synergistic combinations with metal nanoparticles.

The common limitation of natural agents is that their efficacy is generally lower and shorter-lasting compared with inorganic agents, they exhibit batch-to-batch variability (dependent on plant source and harvest season), and their washing/wear durability is limited.

3.1.3 Synthetic Organic Agents

Synthetic organic agents have historically been the most widely used group in the footwear and textile industry, owing to their low cost, high efficacy, and ease of integration into production processes.

Triclosan was evaluated under the EU Biocidal Products Directive (98/8/EC) in the category of “preservative for fibres, leather, rubber and polymerized materials” (Product Type 9). However, following the European Chemicals Agency's (ECHA) determination of endocrine-disrupting potential and unacceptable risk to aquatic ecosystems, triclosan was not approved as a biocidal product in the EU in 2016; following the 2014 substance evaluation, its use in textiles, leather, rubber, and paints was also not approved, effectively removing it from the market. This development stands as one of the most significant regulatory turning points steering the sector toward alternative agents.

Quaternary ammonium compounds (QAC): The positively charged quaternary ammonium group binds electrostatically to the negatively charged bacterial cell wall, disrupting membrane integrity. While possessing a relatively favorable safety profile, efficacy loss after repeated washing and skin-sensitizing potential in certain formulations have been reported.

IPBC (3-iodo-2-propynyl butylcarbamate): Used primarily as an antifungal (fungicide), it is preferred in insole foams prone to moisture accumulation; however, its irritant effect at high concentrations means its usage level is restricted.

Table 1. Comparison of the three antimicrobial agent classes

Criterion	Inorganic (Ag, Cu, ZnO)	Natural/Organic	Synthetic Organic
Mechanism	Ion release, ROS, membrane/DNA damage	Membrane permeability disruption	Electrostatic membrane disruption (QAC); fatty-acid synthesis inhibition (triclosan)
Spectrum	Broad (bacteria, fungi, some viruses)	Moderate–broad, variable	Broad, fast and consistent
Potency	High (esp. Ag, Cu)	Moderate	High (resistance rising)
Stability	High; heat/moisture resistant	Low (needs encapsulation)	High
Wash durability	High (20+ cycles reported)	Limited	Generally high
Toxicity	Dose-dependent (esp. Ag)	Low, biocompatible	Endocrine risk (triclosan); sensitization (QAC)
Environmental persistence	Moderate–high (metal accumulation)	Low, biodegradable	High aquatic toxicity (triclosan)
EU regulatory status	Permitted, nano-labeling required	Generally unrestricted	Triclosan not approved (2016)
Cost	Moderate–high (Ag; ZnO/Cu economical)	Moderate–high (encapsulation)	Low–moderate
Batch consistency	High (synthesis-controlled)	Low (plant-source dependent)	High (standard synthesis)
Typical insole use	AgNP nanofiber; ZnO composite	Chitosan/EO microcapsule coating	Foam/EVA additive, lining finish
Representative source	Du et al. (2019); Dey et al. (2022); Román et al. (2020)	Fernandes et al. (2013); Sánchez-Navarro et al. (2013)	Sánchez-Navarro et al. (2013); European Commission (2016)

3.2 Mechanisms of Action

The efficacy of antimicrobial agents used in footwear and insole materials arises through cellular/molecular mechanisms that differ markedly across agent classes. In this section, mechanisms are addressed in parallel with the three agent classes defined in Section 3.1.

3.2.1 Mechanisms of Inorganic/Metal-Based Agents

Silver (Ag/AgNP): The antimicrobial effect of silver nanoparticles primarily relies on the slow, controlled release of Ag^+ ions from the particle surface. These ions adhere to the cell membrane, disrupting its permeability, inhibit the electron transport chain in bacterial respiration, and penetrate into the cell to inhibit DNA replication (Du et al., 2019). In addition, the high affinity of Ag^+ for thiol (–SH) groups in proteins leads to irreversible disruption of enzymatic function.

Copper (Cu/CuO): The antimicrobial effect of copper is explained by two complementary mechanisms: (i) "contact killing" — direct physical contact with the copper surface causing rapid, irreversible damage to the cell membrane; and (ii) generation of reactive oxygen species (ROS), particularly hydroxyl radicals (•OH), via Fenton/Haber–Weiss reactions. The redox cycling between released Cu^+/Cu^{2+} ions accelerates cell death by causing lipid peroxidation, protein denaturation, and DNA degradation (Vincent et al., 2018). This dual mechanism makes copper particularly effective on insole surfaces that remain in continuous, moist contact with the skin.

Zinc oxide (ZnO): ZnO nanoparticles exert antibacterial effects through three principal pathways: (i) release of Zn^{2+} ions, which bind to the thiol groups of bacterial respiratory enzymes and impair their activity; (ii) light-dependent or light-independent generation of ROS (H_2O_2, OH^-, O_2^{-2}) at the particle surface, causing oxidative damage to the cell membrane, proteins, and DNA; and (iii) direct physical disruption of membrane integrity through nanoparticle–membrane interaction (Sirelkhatim et al., 2015; Nan et al., 2024). The simultaneous operation of these three mechanisms explains why ZnO can achieve broad-spectrum efficacy even at relatively low concentrations.

Titanium dioxide (TiO_2): Unlike the other inorganic agents, the antimicrobial effect of TiO_2 relies on a photocatalytic mechanism: upon UV absorption, electron–hole (e^-/h^+) pairs form at the particle surface; these pairs react with surrounding water and oxygen molecules to generate strongly oxidizing ROS species such as hydroxyl radicals (•OH) and superoxide ions (O_2^-). These radicals oxidize lipids and proteins in the microbial cell membrane, leading to cell death. However, the dependence of this mechanism on UV irradiation renders TiO_2 significantly disadvantaged relative to the

other agents (Ag, Cu, ZnO) in the enclosed, dark interior environment of footwear; for this reason, TiO_2 is generally used not on its own but in combination with a continuously active agent (e.g., Ag).

3.2.2 Mechanisms of Natural/Organic Agents

Chitosan: The antimicrobial action of chitosan is based on the polycationic structure formed by its amino groups ($–NH_3^+$), which become protonated at physiological pH, interacting electrostatically with negatively charged components of the bacterial cell wall (lipopolysaccharides, teichoic acids). This interaction increases membrane permeability, leading to leakage of intracellular components (proteins, nucleic acids); additionally, chitosan's ability to chelate metal ions may further limit microbial access to trace elements required for growth (Fernandes et al., 2013).

Plant essential oils: The efficacy of these compounds is based on lipophilic phenolic/terpenoid components—such as eugenol, thymol, and carvacrol—penetrating the bacterial phospholipid bilayer and disrupting membrane fluidity and permeability. Loss of membrane integrity leads to ion imbalance, ATP leakage, and ultimately cell death. This mechanism explains both the effectiveness of essential oils against Gram-positive and Gram-negative bacteria alike, and why their efficacy is so sensitive to concentration and exposure duration (Sánchez-Navarro et al., 2013).

3.2.3 Mechanisms of Synthetic Organic Agents

Quaternary ammonium compounds (QAC): The positively charged quaternary ammonium group interacts electrostatically with the negatively charged phospholipids of the bacterial membrane; the hydrophobic alkyl chain penetrates the membrane, disrupting its structural integrity and causing intracellular components to leak out.

Triclosan: Unlike the other agents discussed, triclosan operates through an enzyme-targeted rather than membrane-targeted mechanism; it specifically inhibits enoyl-acyl carrier protein reductase (ENR/FabI), an enzyme involved in bacterial fatty acid biosynthesis, thereby halting the production of membrane components. This specific, single-target mechanism is also cited as a primary reason why the risk of bacterial resistance development against triclosan is higher compared with other agents (Sánchez-Navarro et al., 2013).

3.2.4 General Assessment

At the mechanistic level, the fact that inorganic agents (Ag, Cu, ZnO) exhibit multiple, simultaneous targeted effects (membrane, protein, DNA) explains why resistance development against them is more difficult compared with single-target synthetic agents (particularly triclosan). Natural agents, on the other hand, generally operate through membrane-targeted, physical/electrostatic mechanisms; this renders them both effective and relatively low in toxicity, though their duration of efficacy and durability remain limited. These mechanistic differences also directly influence the choice of integration method discussed in Section 3.3—for example, carrier systems that provide sustained ion release within the material (nanofibers, composite matrices) are preferred for ROS-dependent agents, whereas microencapsulation is favored for membrane-targeted natural agents.

3.3 Materials Integration Methods

The efficacy an antimicrobial agent demonstrates in a laboratory setting can only translate into a commercial product once it is incorporated into the material in a durable and homogeneous manner through an appropriate integration method. This section addresses the principal integration methods used in insole and footwear components in terms of process principle, suitable agent/material combinations, and limitations.

3.3.1 Electrospinning (Nanofiber Production)

Electrospinning is a technique based on converting a polymer solution into fine nanofiber filaments under high voltage. This technique enables homogeneous distribution of antimicrobial nanoparticles (particularly AgNPs) within a polymer matrix (e.g., PVA) with a high surface-area-to-volume ratio. Insoles produced by applying a PVA nanofiber layer containing green-synthesis-derived Ag nanoparticles as a multilayer coating onto a cotton substrate have been shown to achieve both high antibacterial efficacy and mechanical durability (Du et al., 2019). The main advantage of this method is that nanoparticles are immobilized within the fiber structure, providing controlled, long-term ion release; its limitation is the relatively high production cost and scale-up difficulty.

3.3.2 Coating Methods

Coating refers to the subsequent (*ex situ*) application of the antimicrobial agent onto a pre-manufactured textile, leather, or foam surface. The most common techniques in this category are:

- **Dip-coating and spray-coating:** Used to deposit agents such as nano-silver solutions as a thin, durable layer onto textile surfaces; a cost-effective method owing to its easy integration into existing textile finishing lines.

- **Pad-dry-cure method:** Consists of dipping the fabric into the antimicrobial solution, squeezing (padding), drying, and thermally fixing it; a standard finishing method in the textile industry.
- **Drum and calender coating:** Used particularly for leather insole/footbed components. In chitosan-based coatings, the drum impregnation method has been shown to provide higher antimicrobial efficacy and better coating homogeneity compared with calender and spray application (Fernandes et al., 2013).

3.3.3 Composite and Compound Fabrication

In this approach, the antimicrobial agent is directly incorporated into the matrix during the material's manufacturing process (weaving/molding stage) (*in situ*). In synthetic polymer-based insoles (polyurethane, polyethylene), nanoparticles are mixed into the polymer melt and processed via extrusion; this "compounding" process ensures the agent is permanently integrated into the material structure. In foam/EVA-based insoles, the antimicrobial agent is entrapped within the cellular structure as liquid precursors polymerize during the foaming stage; this allows the agent to be distributed throughout the material's entire volume and provides long-lasting efficacy. In a waste-valorization-focused example, blending waste leather (buffing dust) powder with ZnO nanoparticles to produce composite insoles is notable both for sustainability and for imparting antimicrobial function (Dey et al., 2022).

3.3.4 Microencapsulation

Used particularly to preserve the stability of natural/volatile agents (plant essential oils), this method involves coating the active component with a wall material such as melamine-formaldehyde or chitosan to form micron-sized capsules. These capsules are then applied to the footwear component (typically leather insole) through coating or impregnation. Microencapsulation prevents efficacy loss due to volatility/oxidation of the agent while also providing controlled release, thereby extending the duration of efficacy (Sánchez-Navarro et al., 2013).

3.3.5 Additive Manufacturing (3D Printing) — A Next-Generation Approach

In recent years, additive manufacturing technologies have emerged as a novel alternative for the antimicrobial functionalization of footwear components. In one exemplary industrial application, silver-nanoparticle-doped thermoplastic polyurethane (TPU) filament was processed via fused deposition modeling (FFF/FDM) 3D printing to produce replaceable, antimicrobial-functional sole tread inserts (footprints); this approach was developed specifically to prevent cross-contamination in occupational footwear used in the food and healthcare sectors (Davia-Aracil et al., 2020). This method is regarded as a promising integration strategy for the future, both for reducing material waste and for offering customized/replaceable design possibilities.

3.3.6 Determinants of Method Selection

The choice of integration method varies depending on the agent class used (Section 3.1), the targeted mechanism of action (Section 3.2), and the base structure of the material (textile, leather, foam, thermoplastic). As a general trend, *in situ* composite/compounding methods are preferred for inorganic agents requiring sustained ion release; microencapsulation for stability-sensitive natural agents; and coating methods where fast, economical surface application is required.

3.4 Foot-Health Applications

The agent classes, mechanisms, and integration methods addressed in the preceding sections gain practical value only once they translate into concrete foot-health outcomes. This section evaluates the impact of functional antimicrobial footwear/insole materials across four principal application domains.

3.4.1 Odor Control (Management of Bromhidrosis)

The chemical source of foot odor is the breakdown of amino acids and lipids secreted with sweat by the *Staphylococcus* population dominant on plantar skin, producing volatile fatty acids such as isovaleric acid (Stevens et al., 2015). Antimicrobial insole materials achieve odor control by suppressing the bacterial population and thereby interrupting this metabolic process at its source—this is the fundamental distinction from cosmetic-masking approaches (perfumes, odor-absorbing powders). Since in-shoe microclimate (temperature, humidity, ventilation) has been shown to directly affect bacterial growth (Miao et al., 2021), antimicrobial material use achieves its highest efficacy when combined with moisture-management strategies (breathable upper materials, perforated design).

3.4.2 Tinea Pedis Prevention and Adjunctive Treatment

Clinical-level studies indicate that antimicrobial-functionalized footwear products can play a complementary role in tinea pedis management. In a pilot study conducted with socks made from copper-oxide-impregnated fibers, 56 patients showed marked improvement or resolution of symptoms such as erythema, fissuring, vesicular eruptions, and scaling over a 9-

day average follow-up period (Zatcoff et al., 2008). In a more recent clinical study, specially designed antifungal socks separating the interdigital region demonstrated a statistically significant protective effect against tinea pedis development in healthy participants compared with standard socks (Du et al., 2024). These findings suggest that similar principles (moisture control + antimicrobial fiber) could also be adapted to insole design; indeed, given that tinea pedis infection develops within the enclosed, moist footwear environment—of which the insole is the most critical component—it appears reasonable to consider antimicrobial insole use as both a primary preventive and an adjunctive treatment strategy.

3.4.3 Diabetic Foot Care and Infection/Ulcer Prevention

In individuals with diabetic neuropathy, the function of the insole extends beyond microbial control to encompass biomechanical safety as well. Loss of protective sensation due to peripheral neuropathy leads to unnoticed trauma in high plantar-pressure regions; for this reason, clinical guidelines place priority emphasis on optimizing pressure distribution (offloading) in the design of diabetic footwear and insoles (Ahmed et al., 2020). However, once an ulcer forms, microbial colonization exponentially increases infection risk and can lead to complications that are difficult to treat and may progress to amputation. At this point, antimicrobial insole materials, when combined with pressure-management strategies, provide two-layered protection: mechanical trauma risk is reduced, and microbial load is kept low in the event of potential micro-injuries. Integrating ZnO-nanoparticle-reinforced composite insoles (Dey et al., 2022) or AgNP-nanofiber-coated insoles (Du et al., 2019) into diabetic foot care protocols in this context can be regarded as an important component of preventive care; however, it should be noted that studies providing direct clinical efficacy data in this specific population (diabetic neuropathy) remain limited in the literature.

3.4.4 Athletes and High-Risk Populations

Individuals engaged in intense physical activity (athletes, military personnel, industrial workers) carry elevated risk for both tinea pedis and bromhidrosis due to prolonged occlusive footwear use and increased sweating. In these populations, antimicrobial insole use stands out as a dual-function intervention targeting both performance-related comfort (odor, moisture sensation) and infection prevention. The elevated cross-contamination risk in shared-use settings (locker rooms, communal showers) indicates that antimicrobial functionalization in these populations carries a public-health dimension extending beyond individual protection.

3.5 Testing Standards

For an efficacy claim regarding an antimicrobial footwear/insole material to gain scientific and commercial validity, it must be verified through standardized, reproducible test methods. This section addresses the most widely used testing standards in the literature and industry.

3.5.1 General Textile Antimicrobial Testing Standards

ISO 20743:2013 is a standard that quantitatively determines antibacterial activity in textile products, applicable to both built-in antimicrobial fibers and subsequently applied coatings/finishes; it defines three distinct inoculation methods—absorption, transfer, and printing (International Organization for Standardization, 2013a).

AATCC TM100, developed by the American Association of Textile Chemists and Colorists, is a quantitative method that evaluates the efficacy of antibacterial finishes on textile materials in terms of both bacteriostatic (growth inhibition) and bactericidal (killing) activity; *Staphylococcus aureus* and *Klebsiella pneumoniae* are typically used as test microorganisms (American Association of Textile Chemists and Colorists, 2019).

In addition to these two core standards, complementary standards frequently cited in the literature include: AATCC 147 (qualitative evaluation via the parallel streak method), ASTM E2149 (a method suitable for irregular/rough surfaces that measures the activity of immobilized agents under dynamic contact conditions), and JIS L 1902 (the Japanese Standards Association's standard, which includes both a qualitative halo test and a quantitative absorption test) (ASTM International, 2013).

3.5.2 A Footwear-Specific Standard: ISO 16187

Unlike general textile standards, ISO 16187 was developed specifically to evaluate the antibacterial activity of footwear and footwear components, and is applicable to all types of footwear and components subjected to non-diffusing antimicrobial treatments (International Organization for Standardization, 2013b). The standard offers users a choice between two methods: (a) the qualitative halo test—based on the presence of an inhibition zone, used when the antimicrobial chemical readily diffuses into agar medium; and (b) the quantitative absorption test—in which a bacteriostatic or bactericidal activity value is calculated. The standard's initial version, published in 2013, was updated in 2025, indicating that footwear-specific testing methodologies continue to be actively developed. The existence of ISO

16187 points to the fact that direct application of general textile standards (ISO 20743, AATCC 100) to multilayer, non-absorbent, or foam-based footwear components such as insoles may not always be sufficient.

3.5.3 Limitations of Standards and Footwear-Specific Challenges

Several methodological challenges arise when applying general textile standards to footwear components: (i) methods such as AATCC 100 can be difficult to apply to materials that do not absorb liquid well (e.g., synthetic foams, coated leather); (ii) standard tests are generally conducted on flat, single-layer specimens, whereas actual insoles are multilayer structures with irregular surfaces; (iii) no standard fully simulates real-use conditions such as mechanical wear, repeated moisture-drying cycles, or sweat pH during actual footwear use. For this reason, it should be emphasized that caution is warranted when directly equating high antibacterial efficacy rates obtained in laboratory tests (e.g., above 99%) with long-term performance under real-world use conditions.

3.6 Safety and Sustainability

For an antimicrobial agent to be durably adopted in the footwear industry, it must meet not only efficacy and cost criteria but also human health safety and environmental sustainability criteria. This section addresses these two dimensions.

3.6.1 Cytotoxicity and Human Health Safety

The same mechanisms that underlie the efficacy of inorganic nanoparticles (particularly AgNPs)—ROS generation, membrane damage—also carry a dose-dependent cytotoxicity risk toward human cells at high concentrations. For this reason, in applications involving continuous, direct skin contact such as footwear insoles, the potential for nanoparticles to leach from the material matrix into the skin is an important safety-assessment criterion. Natural agents (chitosan, essential oils) generally exhibit a lower cytotoxicity profile and offer an advantage in terms of biocompatibility (Fernandes et al., 2013), although the skin-sensitizing potential of certain essential-oil components at high concentrations should also not be overlooked.

3.6.2 Environmental Release and Ecotoxicity

Nanoparticles released into the environment throughout the use-life of antimicrobial footwear products (washing, wear) can reach wastewater treatment systems and natural aquatic environments, posing ecotoxicological risks. It has been shown that silver nanoparticle release from textiles and plastics constitutes a significant portion of the total silver released into water in the European Union, and that predicted environmental concentrations (PECs) in river systems can exceed predicted no-effect concentrations (PNECs), particularly in sediments (Blaser et al., 2008). This finding indicates that the cumulative environmental burden of AgNP-based systems—which demonstrate high efficacy in laboratory settings—must also be carefully evaluated across the product life cycle. Natural agents (chitosan, plant essential oils), by contrast, generally do not carry this risk owing to their biodegradable properties.

3.6.3 The Sustainability Dimension

Sustainability assessment should not be limited to the agent itself but should also encompass the production/integration process. Using waste leather (buffing dust) powder blended with ZnO nanoparticles to produce composite insoles (Dey et al., 2022) is an approach that aligns with circular economy principles, both in terms of valorizing industrial waste and imparting antimicrobial function. Similarly, the fact that natural agents (plant essential oils) are derived from renewable sources also offers a sustainability advantage relative to synthetic agents; however, the low-yield, land-intensive production of these agents remains a contentious point in terms of scalability.

3.6.4 Regulatory Framework

In the European Union, the use of antimicrobial agents is regulated under the Biocidal Products Regulation (BPR); as discussed in Section 3.1.3, triclosan has not been approved for textile/leather/rubber use under this framework. For products containing nanomaterials, additional nanomaterial labeling and notification obligations apply under the EU Cosmetics Regulation and the REACH Regulation. This regulatory framework requires manufacturers, when selecting a new antimicrobial agent, to consider not only technical efficacy but also current and future regulatory compliance.

4. DISCUSSION AND CONCLUSIONS

This review synthesizes three recurring patterns. First, a **mechanism–integration correspondence** emerges: the sustained, multi-target mechanisms of inorganic agents favor composite/compounding integration, while the stability constraints of natural agents make microencapsulation nearly essential. Second, an **efficacy–safety trade-off** is evident: the most effective agents (Ag, triclosan) also carry the highest regulatory and environmental risk, indicating that the most effective agent is not always the most appropriate one. Third, a **laboratory–clinical gap** persists: high in vitro

antibacterial efficacy (>99%) does not guarantee clinical outcomes, and direct clinical validation—particularly for diabetic foot populations—remains scarce.

The literature exhibits three notable limitations: (1) footwear-specific randomized controlled clinical studies are far scarcer than laboratory efficacy studies; (2) despite the existence of ISO 16187, most studies still rely on general textile standards, weakening comparability for multilayer insole components; and (3) footwear-specific life-cycle assessment data remain rare relative to general textile/plastic environmental-release studies (Blaser et al., 2008).

Future research should prioritize: hybrid formulations combining the low toxicity of natural agents with the high efficacy of inorganic agents (e.g., chitosan-stabilized AgNPs); sensor-integrated insoles capable of monitoring moisture and microbial load to enable proactive diabetic foot care; wider academic adoption of ISO 16187; randomized controlled trials evaluating antimicrobial insole efficacy in diabetic and high-risk athletic populations; maturation of additive-manufacturing-based, replaceable antimicrobial footwear components; and footwear-specific life-cycle assessment studies.

In conclusion, inorganic agents (Ag, Cu, ZnO) offer high efficacy and durability but require careful environmental risk management; natural agents (chitosan, essential oils) provide a safe, sustainable alternative constrained by stability and duration-of-efficacy limitations addressable through microencapsulation; and synthetic agents face an increasingly narrow scope of use under regulatory pressure. Owing to its critical position at the foot–footwear interface, the insole remains the natural focal point of antimicrobial functionalization efforts, and progress in this field requires a multidisciplinary approach spanning agent selection, integration method, test standardization, and clinical validation.

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The Advantages Of Using Textile Surfaces In Shoe Uppers

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Abstract: The selection of materials utilised in the fabrication of shoe uppers is a pivotal design consideration, as it directly influences the final product's performance in terms of comfort, durability, moisture management and sustainability. Leather has historically dominated the field, but recent years have seen textile surfaces (including knitted, woven and non-woven structures) emerge as a significant alternative due to their advantageous properties, including flexibility, breathability, lightness and cost-effectiveness. The present study aims to evaluate the use of textile surfaces in shoe uppers within the context of comfort, functional performance, design flexibility and sustainable production approaches. A comparative analysis of the technical and design possibilities offered by knitted, woven, jacquard, coated, natural fibre-based, biocomposite and 3D-printed textile structures on shoe uppers was conducted through a literature review. The review revealed that textile surfaces are not merely a secondary material group providing aesthetic diversity in footwear uppers; rather, they are positioned as a decisive design component in terms of breathability, thermal balance, moisture transfer, lightness, flexibility, mechanical strength and user comfort. It is understood that multi-layered knitted and embroidered structures improve the microclimate inside the shoe, whilst jacquard-woven structures offer balanced solutions between design variety and physical-mechanical performance. In particular, it has been established that knitted sandwich fabrics provide functional advantages in shoe linings through their air permeability, water vapour transmission, thermal regulation and cushioning properties; whilst knitted upper structures offer a higher potential for physiological comfort compared to leather alternatives. In addition, natural dyes, bamboo-based surfaces, bacterial cellulose composites and digital production techniques are contributing to the development of ecological, functional and customisable approaches in the field of footwear design. Consequently, textile surfaces can be regarded not merely as an alternative to traditional materials in shoe uppers, but as a strategic component of sustainable, user-centred and high-value-added shoe design.

Keywords: Footwear design; textile surfaces; physiological comfort; technical textiles; sustainable materials

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1. INTRODUCTION

Although footwear originally emerged with the function of protecting the foot from external factors, today it is not merely a protective object; it is a multi-layered design product in which comfort, ergonomics, aesthetics, performance, material technology and sustainability are all taken into account. The structure of the shoe that comes into direct contact with the wearer transforms material selection from a mere formal or visual preference into a decisive design decision in terms of physiological comfort, mechanical durability, service life and environmental impact. In this context, footwear should be regarded as a complex product system, comprising the upper, lining, sole, insole and various support components. The impact of each material used on product performance must be assessed holistically (Kaziur & Mikołajczyk, 2023).

In the context of conventional footwear manufacturing, leather has historically been the predominant material due to its favourable properties, including dimensional stability, water resistance, strength, flexibility and breathability. However, the environmental impact of leather production processes, changing consumer expectations, advances in technical textiles and the growing possibilities of digital production have significantly increased the importance of textile-based uppers in footwear design. The utilisation of textile uppers in sports footwear witnessed a marked increase from the late 19th century to the early 20th century. Subsequently, the advent of synthetic fibres, advancements in knitting technologies, and the emergence of high-performance textile structures have profoundly transformed the landscape of footwear design. Advancements in knitted upper technologies have been shown to offer distinct advantages, including foot conformity, lightness, breathability, and a reduction in production waste (Kaziur & Mikołajczyk, 2023).

In the field of footwear industry, the design of the upper component is recognised as a crucial structural element, integrating the product's functional performance with its aesthetic value. Historically, leather has maintained its dominant position as the material of choice in this field due to its durability, mouldability and perception of prestige. However, from the beginning of the 20th century onwards, designers' efforts to incorporate textile surfaces into upper applications have pioneered the systematic development of an alternative material category (Yüksel, 2019). This development has not been limited solely to the pursuit of aesthetic diversity; it has also been supported by the possibilities for lightness, flexibility, breathability and functional integration offered by knitted, woven and non-woven structures, as well as coated

textile technologies (Sen, 2008). In addition to these technical advantages, the literature has also addressed the decisive impact of material and design innovation on companies' market positioning and competitive strategies as a separate area of research (Çakıroğlu Başar, 2013). In recent years, there has been an observable shift in material choices within the footwear sector towards sustainability concerns and circular economy approaches (Kocabıyık Çaşkurlu & Kır, 2025). However, a review of the current literature reveals that the studies in question proceed along distinct lines of inquiry: the historical-design perspective (Yüksel, 2019), the materials engineering perspective (Sen, 2008), the competitive strategy perspective (Çakıroğlu Başar, 2013) and the sustainability/circular economy perspective (Kocabıyık Çaşkurlu & Kır, 2025) have been addressed separately; however, a comprehensive synthesis that evaluates all four dimensions of the use of textile surfaces as lining materials—namely, performance, aesthetics, competitive advantage and sustainability—has not yet been presented.

The significance of textile surfaces in the field of footwear design extends beyond their utilisation as upper materials. Textile structures are of critical importance in the field of footwear, particularly in the context of regulating the microclimate within the shoe. These structures facilitate moisture and heat transfer, reduce friction, and enhance user comfort. They are particularly useful in the design of linings, insoles, toe caps, reinforcements, and functional coverings. Research conducted on flat-knit sandwich fabrics and interlock structures employed in the manufacture of shoe linings has demonstrated that such fabrics possess considerable potential for utilisation in the composition of shoe interiors. The properties of these fabrics, which include high compressibility, cushioning, air permeability, breathability, thermal regulation and surface durability, are particularly well-suited to such applications. In addition, it is emphasised that lining materials must possess properties such as good water vapour permeability, air permeability, abrasion resistance, flexibility and resistance to perspiration (Blaga et al., 2015).

When evaluating the level of comfort experienced by the wearer of footwear, it is necessary to consider not only the physical properties of the material from which the footwear is constructed, but also its biomechanical effects. Research conducted on three-dimensional sandwich fabric insoles demonstrates that textile-based insoles have the capacity to modify plantar pressure distribution and perceived comfort. In comparison with conventional EVA insoles, it has been observed that sandwich fabric insoles have the capacity to diminish peak pressure and the pressure-time integral in designated areas. Moreover, insoles comprising a two-layer sandwich fabric have been shown to yield superior outcomes with regard to perceived comfort. The findings demonstrate that textile surfaces offer functional contributions in footwear components not only in terms of lightness and breathability, but also in terms of biomechanical adaptation and pressure management (Lo et al., 2018).

The domain of sports footwear design offers a remarkable opportunity to showcase the technical and functional capabilities of textile surfaces. The terms "sports textiles" and "technical textiles" are defined as groups of materials developed with a focus on performance, durability and functional requirements rather than aesthetic characteristics. In the contemporary context, the attributes desired in sports products, including lightness, flexibility, breathability, water repellency, antibacterial properties, odour control, and heat and moisture management, facilitate the integration of advanced and intelligent textiles in the realm of footwear design. The development of smart textiles, which are capable of detecting environmental stimuli and responding to or adapting to changing conditions, suggests the potential for footwear components to evolve into systems that monitor user performance and adapt to environmental conditions (Kanat 2023).

Advancements in textile technologies are furthermore effecting a transformation of production methodologies. Research into jacquard-woven fabrics for sports shoes has demonstrated that different structural components are linked to performance parameters such as tensile strength, elongation, pilling, abrasion resistance and breathability. This underlines the fact that the combination of pattern, structure and material on textile surfaces is not merely an aesthetic choice, but a technical design area that directly determines performance. In addition, it is evident that the production of sports shoe fabrics using jacquard looms is also being evaluated in terms of production speed and cost advantages, which could offer an alternative to knitting technologies (Attia & El Belbesi, 2024).

The concept of sustainability is gaining increasing importance in the evaluation of footwear materials. The linear production-consumption model is being superseded by the principles of the circular economy, which include recycling, reuse, waste reduction and the search for environmentally friendly materials. In the context of upper materials, the joint evaluation of leather, synthetic leather, microfibre and textile-based surfaces demonstrates that material selection must now be considered not only in terms of aesthetics and functionality, but also in terms of environmental and ethical responsibility. The sources cited emphasise that innovative textile surfaces, recycled raw materials and ecological production methods will find wider application in the footwear sector (Kocabıyık et al., 2025).

In this context, the utilisation of textile surfaces in the field of footwear design is identified as an interdisciplinary domain of research that must be addressed at the intersection of materials science, textile technology, ergonomics, biomechanics, sustainability and digital manufacturing. The extant literature demonstrates that textile surfaces make significant contributions to footwear in terms of comfort, performance, aesthetic diversity, production flexibility and sustainability.

The present study aims to systematically discuss the technical, ergonomic and sustainability-focused advantages of textile surfaces used in footwear design, in line with the cited sources.

2. LITERATURE REVIEW

The objective of the present study was to determine the effectiveness of therapeutic shoes with increased depth and width, when used in combination with two types of insoles covered with different textile surfaces, in reducing recurrence rates among diabetic patients with a history of foot ulcers. In accordance with the research methodology, a group of 400 diabetic patients without severe foot deformities was observed over a period of two years. Participants were randomly assigned to three groups: The experiment comprised three groups: (1) a group using medium-density polyurethane insoles covered with neoprene (closed-cell); (2) a group using prefabricated polyurethane insoles covered with brushed nylon; and (3) a control group using their own footwear. Analyses revealed that insoles with different textile interfaces, such as neoprene and nylon, yielded similar results in terms of performance; however, the production of neoprene-coated foam insoles was found to be significantly more expensive and time-consuming. Consequently, the present study does not provide substantial evidence to support the widespread distribution of therapeutic shoes and inserts containing specific textile components among diabetic patients without severe foot deformities (Reiber et al. 2002).

As part of a study conducted in 2007, compact coated fabrics, leather-cloth (artificial leather) structures and materials defined as second-generation synthetic leather—all of which are widely used in the footwear industry—were analysed. In particular, it was found that microporous polyurethane (PU) coatings, produced using the coagulation (precipitation) method, simulate the breathability properties of natural leather thanks to their interconnecting pore structure. The findings demonstrate the effectiveness of porous vinyl structures in linings designed for moisture management, whilst PTFE (Gore-Tex) laminates prove effective in waterproof and breathable outer layers requiring high performance. Furthermore, it has been observed that microencapsulation techniques applied to textile surfaces offer innovative functions such as controlled odour release in insole linings. Consequently, the findings of this study demonstrate that the integration of textile engineering and coating technologies is a fundamental strategy for optimising durability, cost-effectiveness and user comfort in footwear design (Sen 2007).

A study carried out in 2013 examined the effects of chemical and mechanical surface treatments applied during the adhesion of upper and sole materials—commonly used in the manufacture of footwear—on peel strength. However, within the scope of the experimental research, leather was selected as the upper material and thermoplastic rubber (TR) and polyurethane (PU) samples as the sole materials in order to simulate the most challenging bonding conditions. The research methodology focused on the performance characterisation of bonds prepared using a solvent-based PU adhesive, in accordance with the ISO 20344 and EN ISO 11339 standards. Consequently, this study emphasises the strategic importance of selecting surface preparation protocols in accordance with material specifications during the process of bonding textile or leather-based upper components to soles, in terms of production efficiency and the sustainability of quality standards (Pavia et al. 2013).

A study in 2014 investigated the antibacterial effects of coating 100 per cent polyester knitted fabrics — used as shoe lining (lining material) — with titanium dioxide (TiO2) on Staphylococcus epidermidis, a bacterium found on the skin. Consequently, the findings of this research study demonstrate that TiO2-based photocatalytic textile surfaces offer an effective, wash- and wear-resistant, and biosafe hygiene strategy for the footwear industry. The findings indicate that these innovative, solar-activated surfaces can be used as a sustainable solution for preventing odours and bacterial contamination inside footwear (Rodriguez et al., 2014).

The objective of the study was to investigate systematically the physical and thermal comfort parameters of flat-knit sandwich (spacer) and interlock fabrics designed for use as shoe linings, and to determine the most suitable material combinations for different conditions of use. As part of the research methodology, 10 different fabric samples with a count of Nm 20/1 were produced using cotton (ring and open-end), cotton/bamboo, and two different high-performance cellulosic blended yarns (Type A: pure cellulose; Type B: a blend of Lyocell and seaweed). An analysis was conducted on the physical properties of the samples, which were produced on an electronic flat knitting machine. The properties investigated included thickness, mass per unit area, porosity, elongation capacity and coefficient of friction. In addition, thermal comfort parameters such as air permeability, water vapour permeability, thermal conductivity, thermal resistance and thermal absorptance were analysed. In the thermal comfort analyses conducted, it was determined that sandwich fabrics exhibit superior thermal resistance in comparison to interlock fabrics. This is attributable to the presence of a layer of stagnant air that is effectively trapped between their layers. Consequently, the study recommends a range of material strategies, depending on the prevailing climatic conditions: Cotton/Type B and Cotton/Bamboo interlock fabrics, with their high water vapour permeability and initial cool-to-the-touch sensation, are suitable for hot climates; whilst Cotton/Type A sandwich fabrics, with their high thermal resistance and breathability, offer high-performance alternatives for cold climates (Blaga et al. 2015).

A study conducted in 2019 also aimed to undertake a systematic investigation into the potential applications of graphene and aerogel – new-generation nanomaterials – in winter running shoes, their preparation processes, and the effects of

these materials on the overall performance of the product. In the course of the research methodology, the high mechanical strength, thermal conductivity and antibacterial properties of graphene were analysed, as well as the ultra-low density and superior thermal insulation characteristics of aerogel. The findings demonstrate that graphene-reinforced fibres maintain the structural integrity of the shoe upper whilst providing a hygienic internal environment; furthermore, the addition of graphene to the outsole rubber increases wear resistance and traction performance by 50 per cent compared to standard materials. The study also found that 'smart fibres' (graphene-aerogel), produced through the hybrid use of these two materials, create a functional synergy by overcoming the limitations of individual materials, such as durability and flexibility. Consequently, the utilisation of graphene and aerogel in the design of winter running footwear offers a novel framework that is consistent with the objectives of lightness, high performance and environmental sustainability. The utilisation of these technologies has the capacity to enhance technical efficiency and to support environmentally friendly production practices in the sports footwear industry (Hong & Xinqiao 2019).

In a further study in 2019, a wide spectrum of designers was systematically classified and analysed in terms of fabric structure (woven, knitted, non-woven surfaces), embellishment techniques and heel shapes. The designers included in the study ranged from François Pinet to Manolo Blahnik, and from Salvatore Ferragamo to contemporary Turkish designers. The findings indicate that textile surfaces in footwear design are not merely an aesthetic choice, but also a functional solution that ensures comfort and ergonomics. In particular, it was found that shoes produced using the knitted technique—which is becoming increasingly widespread today—are in high demand due to their breathability and ability to wrap the foot perfectly. In addition, it was determined that the malleability of textiles facilitates the conception of avant-garde and futuristic designs that transcend conventional moulding methodologies. Concurrently, conventional techniques such as dival embroidery, when integrated with contemporary designs, contribute to cultural sustainability. Consequently, this research confirms the critical role of interdisciplinary synergy between textile engineering and footwear design in the creation of high value-added and innovative products. The study provides a scientific framework for future ergonomic design processes in the footwear sector by demonstrating the direct influence of textile surfaces on form and style (Yüksel 2019).

The present study (2019) has been developed with the aim of analysing the hygienic properties of the various textile linings employed in the manufacture of shoe uppers. In addition, an attempt will be made to evaluate the changes occurring in the microclimate inside the shoe during physical exertion using the 'Discomfort Index' (DI). In the course of the research methodology, a variety of material packages comprising three different high-quality leather uppers (full-grain and top-grain calf leathers) alongside 3D knitted fabrics (PA-yarn), Trevira, PE knitted and microfibre lining textiles were tested. The findings demonstrated that the choice of upper and lining materials has a statistically significant effect on the circulation of the biophysical environment inside the shoe. In particular, it was found that 3D knitted fabrics (e.g. MP2), which facilitate moisture dispersion and promote air exchange thanks to their porous structure, demonstrated superior performance compared to other lining materials in minimising discomfort. Consequently, the selection of appropriate lining and upper materials in footwear production is of strategic importance for controlling the microclimate inside the shoe and preventing pathogenic microorganisms or unpleasant odours (Serweta et al 2019).

The aim of this study (2019) is to examine new material packages developed using bamboo-based textile materials for use in shoe uppers, and the performance characteristics of these packages. In accordance with the research methodology, three-layer material combinations comprising an inner layer, a 2 mm thick polyurethane (PU) foam middle layer and an outer layer were designed. The developed bamboo-based woven and knitted fabric packages were compared with the standard cotton-PU-cotton composition in terms of both hygienic parameters, such as water vapour absorption and permeability, and mechanical indicators, such as elongation at break and maximum force. Consequently, the utilisation of textile surfaces derived from bamboo fibres, when employed as both inner and outer layers in the composition of shoe uppers, presents a sustainable and high-performance material alternative that optimises foot health and physiological comfort (Ławińska et al. 2019).

The present study, carried out in 2020, aims to examine, from a systematic perspective, the latest technological developments regarding the functionalisation of textile and leather-based materials used in the production of footwear, the integration of smart features, and sustainability criteria. The critical role of antimicrobial, antifungal and aromatic finishing treatments—applied to textile surfaces made of cotton, silk and synthetic fibres using microencapsulation methods—in footwear hygiene and user health was analysed. Furthermore, the study evaluated 'reactive footwear' prototypes—developed using layered manufacturing (3D printing) technologies on textile soles—which can change shape in response to user reactions without the need for sensors, as well as the contribution of these digital fabrication processes to design freedom. The findings demonstrate that nanotechnological treatments applied to textile surfaces and microencapsulated natural components (tea tree oil, essential oils, etc.) offer high efficiency in optimising the microclimate inside footwear and preventing unwanted odours. Consequently, the findings of this research demonstrate that the integration of advanced chemical technologies with textile engineering in the footwear industry is a fundamental requirement for the design of future high-performance and environmentally friendly products (Kutnjak-Mravlinčić et al. 2020).

In their 2022 study, Kaizur and colleagues aimed to investigate the design methodology and performance characteristics of multi-layered textile packages optimised for shoe uppers. To this end, they used an innovative hybrid technology that

combines 2D/3D knitting technologies with embroidery techniques. In accordance with the established research methodology, a shoe upper was designed utilising CAD (ZW3D) and graphics software, incorporating two fundamental components. The designed structure is based on a three-layer package system comprising a hydrophobic polyester sandwich (spacer) knitted fabric in the inner layer in contact with the foot, a hydrophilic cotton knitted fabric in the middle layer, and recycled polyester embroidery threads in the outermost layer to provide mechanical resistance. The findings demonstrated that the knitted textile components exhibited two to four times higher strength compared to traditional leather materials. In the course of the physiological comfort analyses, it was determined that the incorporation of sandwich knitted fabric within the shoe results in a significant enhancement of air circulation and moisture transfer. This enhancement is attributed to the 'chimney effect' and 'pumping' mechanisms. The multi-layered textile structure was found to offer 100 times greater air permeability and three times higher thermal resistance in comparison to the reference cowhide. Consequently, this study demonstrates that hybrid knitting-embroidery technology provides a scientific basis for the production of customisable, high-performance footwear with superior thermophysiological properties compared to traditional materials (Kaizur et al. 2022).

The present study, (2022), aims to systematically investigate the effects of different upper materials (synthetic leather, mesh fabric and multi-layered textile structures) on changes in foot skin temperature and relative humidity (RH) and their distribution in older adults. In accordance with the research methodology, 40 healthy elderly volunteers (25 women, 15 men) with an average age of 70 participated in sitting and walking activities (30 minutes at a speed of 3 km/h) in a climate-controlled chamber. The experiments were conducted under four experimental conditions: bare feet (A), synthetic leather trainers (B), mesh fabric trainers (C) and closed slippers with a multi-layered fabric structure (D). In the course of data collection, the distribution of foot skin temperature was measured using an infrared thermography camera, relative humidity changes were recorded using humidity sensors, and subjective comfort perception was assessed using visual analogue scales. The study concluded that the pore structure and permeability properties of the shoe upper material are the most strategic factors in determining the microclimate inside the shoe. In footwear designed for older adults, the use of textile surfaces with high permeability and strategically placed air vents is recommended as a key design parameter to optimise thermal comfort and minimise the risk of moisture-related infections (Li et al., 2022).

The present study (2023) aims to assess the feasibility of using banana fibre fabrics as shoe upper materials by comparing them with cow and goat nubuck leathers in terms of their physical, comfort, structural and thermal properties. In accordance with the established research methodology, two distinct types of banana fibre fabric (designated S1 and S2) and the reference nubuck leathers were subjected to a series of mechanical tests. These included tensile strength, tongue tear resistance, elongation at break and seam strength. In addition to these empirical assessments, the study also involved the conducting of FTIR, SEM and TGA analyses. Furthermore, a series of experiments were conducted on prototypes manufactured from the developed materials to assess their performance in various mechanical and physical properties. These experiments included assessments of sole cohesion, the overall flexural resistance of the footwear, the tensile strength of eyelets, and the thermal insulation properties of the materials. This research confirms that banana fibre fabrics represent a technically suitable, high-performance and environmentally friendly alternative raw material for the footwear industry. The evidence suggests that the material can be used both on its own as an upper material and in combination with leather (Murali et al., 2023).

The objective of the present study, (2023), is to comparatively examine the structural characteristics and thermophysiological parameters. These parameters are key determinants of footwear comfort and performance. The study will examine 12 different knitted textile uppers and two reference leather materials (vaketa and patent cowhide). As part of the research methodology, structural properties such as thickness and mass per unit area were measured for textile samples produced using flat-knit, large- and small-diameter circular knitting machines. These samples were then tested on air permeability (ISO 9237), thermal insulation properties (Alambeta), water vapour permeability (Permetest) and liquid moisture management (M290 MMT). The findings demonstrated that shaped knitted fabrics offer several times higher air permeability than leather materials and significantly optimise air circulation within footwear. The analysis revealed that knitted fabrics produced on large-diameter circular knitting machines exhibited the most desirable functional and hygienic properties. In contrast, it was observed that patent leather is characterised by its complete airtightness and its demonstration of the lowest level of hygienic performance. In relation to thermal comfort, it was determined that textile materials exhibit thermal conductivity values that are comparable to those of leather. However, textile materials demonstrate superior performance in safeguarding the foot against heat loss (high thermal resistance) when compared to leather. Consequently, this research demonstrates that textile uppers produced using knitting technologies constitute a strategic alternative to leather in the footwear industry, offering not only advantages such as lightness, seamless foot fit and minimisation of production waste, but also superior physiological comfort values (Kaziur & Mikołajczyk, 2023).

In the study 'Development of Innovative Jacquard Weave Patterns for Sports Footwear Fabrics', published by Ahmed Attia and Mayada El Belbesi in 2024, it is stated that the use of textile materials in the sports footwear industry is of critical importance due to their capacity to provide comfort, protection and biomechanical efficiency. The contemporary conception of footwear is predicated on the convergence of three fundamental criteria: visual appeal, functionality and fit. The objective of this study is to methodically examine the impact of varying jacquard weave pattern structures, which are characterised by a uniform fabric construction, on the physical and mechanical characteristics of sports shoe fabrics.

This study provides a scientific framework for footwear designers to maintain product durability whilst offering aesthetic diversity that meets user expectations (Attia & El Belbesi, 2024).

In a study published in 2024 by Firkiadis et al., the authors examined the methods and tools featured in the literature over the past twenty years within a systematic framework, analysing the emerging trends regarding the use of textile surfaces in the footwear sector and the role of digital production technologies in this field. The research findings reveal that 3D knitting technology has brought about a revolutionary change in the textile sector, particularly in the field of footwear production. In contradistinction to conventional methodologies, 3D knitting enables the direct integration of complex patterns and precise structures into the footwear design, thereby paving the way for seamless designs. This technology ensures that footwear is lighter, more breathable and more comfortable, whilst reducing material waste and thereby contributing to the sector's sustainability goals. Moreover, it has been demonstrated that the integration of textile innovations with three-dimensional printing technologies facilitates the simulation of complex geometries and mesh structures that would be unfeasible to produce using conventional methods. The study also explores the integration of smart materials and sensor technologies into fabric structures as part of the functionalisation of textile surfaces. It has been observed that sensors embedded in fabrics produced using 3D knitting methods have the capacity to perform biomechanical monitoring by identifying pressure concentrations and activity levels. This data is then utilised to optimise the user experience. Consequently, textile surfaces have evolved from being merely an aesthetic layer in footwear design to becoming a technological interface that directly influences personalisation, performance and ergonomics. This study emphasises that the integration of digital fabrication tools with textile engineering is a fundamental requirement for the user-centred and sustainable footwear models of the future (Firtikiadis et al., 2024).

A study in 2025 also noted that the use of natural leather, which has traditionally dominated footwear production, is now being displaced by textile-based alternatives such as woven, knitted and non-woven materials, in line with technological advancements and growing environmental awareness. The present study aims to systematically examine the potential applications of textile surfaces in shoe uppers, the performance characteristics of these materials, and sustainable material approaches within the context of the circular economy. As part of the research, conventional textile surfaces such as gabardine, satin, mesh, knitwear, scuba, velvet and linen—which are widely used in shoe uppers, linings and collars—were analysed. The advantages of these materials, such as breathability, lightness and cost-effectiveness, were evaluated alongside their limitations, including durability, water resistance and maintenance difficulties. Moreover, the study examined the role of auxiliary components, including fleece, mouflon and felt, which provide thermal insulation in winter footwear. It also investigated the importance of antimicrobial textiles coated with silver nanoparticles (nanosilver) for enhancing footwear hygiene. The findings demonstrate that textile surfaces are not merely an aesthetic element in footwear design, but also a functional necessity. In particular, it has been established that the use of environmentally friendly and biodegradable materials—such as fibres derived from hemp, organic cotton, jute, soya fibre, bamboo, Lyocell and seaweed—plays a critical role in minimising the sector's ecological footprint. The integration of modern production technologies, such as 3D knitting, with these materials is paving the way for personalised and seamless designs. The study's findings indicate that, in order to achieve a sustainable transformation within the footwear industry, it is essential to integrate traditional leather craftsmanship with innovative, circular textile solutionsb(Kocabıyık Çaşkurlu & Kır, 2025)

In their study, Battal and colleagues analyse the textile surfaces used in footwear production processes, the structural properties of these materials, and their roles within the framework of sustainability, which is one of today's most critical requirements. In the scope of the research, poromeric structures featuring woven or non-woven textile bases were examined. Such bases include polyurethane (PU) or polyvinyl chloride (PVC)-coated fabrics, which are becoming increasingly common as alternatives to leather in the 'upper' (top) component of the shoe. The present study investigates the impact of contemporary synthetic textile materials with foam backing, which have superseded traditional cotton and rayon fabrics, on the parameters of comfort, moisture management and durability. This investigation is conducted by assessing the effects of these materials on the shoe lining. Furthermore, the use of jute-based textile materials in sole components for espadrille-style footwear and their integration with natural rubber were addressed. The findings demonstrate that textile innovations in the footwear sector offer a number of benefits. These include cost advantages and standard quality, as well as superior ventilation, energy absorption and elasticity. These benefits are achieved through structures such as three-dimensional (3D) spacer (sandwich) fabrics. In the context of sustainability-focused approaches, the potential of surfaces derived from recycled polyester (r-PET), organic cotton, hemp and bamboo fibres to minimise the sector's ecological footprint has been identified. This study demonstrates that the use of textile surfaces in the footwear industry, in accordance with the principles of the circular economy and Life Cycle Assessment (LCA) methodology, constitutes an indispensable group of raw materials for future high-performance and environmentally friendly design strategies (Battal et al. 2025).

The present study (2025) aims to systematically investigate the mechanical properties of textile materials used in the production of footwear, the relationship between these properties and the fabric structure and fibre composition, and to develop a mathematical model for the optimisation of processes. As part of the research methodology, methods for determining the mechanical and surface properties of textile materials were analysed, with a particular focus on performance indicators such as abrasion resistance and strength. Consequently, the systematic body of knowledge regarding the mechanical properties of textile surfaces provides a scientific basis for the design and development of high-

quality textile materials that are optimised for different application areas and meet predefined performance criteria (Bektayev et al. 2025).

This study, which was conducted in 2026, proposes a three-dimensional (3D) knitting technology that is both innovative and fully fashioned. The technology has been developed in order to eliminate the need for sole and heel seams, and it utilises Shima Seiki's four-needle-bed computerised flat knitting technology to overcome the aforementioned limitations. The primary objective of the research is to determine the optimal fabric structures and yarn combinations to meet the specific performance requirements of the different functional areas of the shoe (toe, tongue, heel, sides and sole). As part of the methodology, 13 different fabric structures were designed and produced using high-strength polyester filament, standard polyester multifilament, monofilaments and thermoplastic polyurethane (TPU) melt-blown yarns. The research findings revealed that fabric performance is influenced by both structural design and yarn combinations, although the structural effect is more dominant in terms of mechanical properties. Consequently, this study demonstrates that 3D knitting technology provides a scientific design framework for the footwear industry that reduces material waste, lowers production costs and enables personalised, sustainable production (Dong et al. 2026).

A review of the existing literature on the subject reveals that the use of textile surfaces in footwear offers various advantages. The following table (Table 1) is intended to facilitate a more profound comprehension of the advantages discussed.

Table 1. Advantages of textile materials used in shoe uppers and shoes

Advantage	Materials / Structures	References
Better breathability and moisture management	Mesh, fitted knits, large-air-hole uppers	Mesh uppers reduced foot temperature and humidity changes and improved perceived comfort (Li et al. 2022); fitted knitted uppers were low-weight and breathable (Kaziur & Mikołajczyk, 2023).
Higher comfort through microclimate control	Distance fabrics, multilayer textile packages, spacer knits	Appropriate packages improved discomfort index and user comfort (Serweta et al. 2019); openwork spacer knits improved air circulation and heat transfer (Kaziur et al. 2022)
Light weight and good foot fit	Flyknit/Primeknit-type knitted uppers, polyester athletic textiles	Fitted knitted uppers provided good fit and low weight (Kaziur & Mikołajczyk, 2023); polyester is lightweight and supports comfort and fit (Attia & El Belbesi, 2024).
Design flexibility and zoned performance	3D fully fashioned knits, jacquard woven uppers, warp-knitted jacquards	Different structures and yarns enabled different mechanical and comfort zones (Dong et al 2026); pattern variety had weak negative effects on mechanics in one jacquard study (Attia & El Belbesi 2024).
Lower production waste and shaped manufacturing	Fully fashioned knitted uppers, 3D knitting	Knitted upper production reduced waste (Kaziur & Mikołajczyk, 2023); 3D fully fashioned knitting addresses cutting-process limitations (Dong et al. 2026)
Mechanical tunability for different shoe zones	High-strength polyester yarns, single/double-face knits, nonwovens	Structure and yarn choice strongly affected strength, abrasion, breathability, and moisture permeability (Dong et al. 2026); textiles can be engineered for required mechanical properties (Bektayev et al. 2025).
Sustainability and alternative fibers	Recycled textiles, lyocell-modal, bamboo, banana fabrics	Bamboo improved hygienic and mechanical properties in many packages (Ławińska et al. 2019) banana fabrics showed comparable mechanics to nubuck leathers (Murali et al. 2023).
Better breathability and moisture management	Mesh, fitted knits, large-air-hole uppers	Mesh uppers reduced foot temperature and humidity changes and improved perceived comfort (Li et al 2022); fitted knitted uppers were low-weight and breathable (Kaziur & Mikołajczyk, 2023).
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Design flexibility and zoned performance	3D fully fashioned knits, jacquard woven uppers, warp-knitted jacquards	Different structures and yarns enabled different mechanical and comfort zones (Dong et al 2026); pattern variety had weak negative effects on mechanics in one jacquard study (Attia & El Belbesi, 2024).

Overall, textiles in uppers and shoes provide strong advantages in comfort, breathability, lightweight fit, and design freedom, but their disadvantages are real and usually center on durability trade-offs, processing constraints, and material-specific maintenance or permeability limits.

3. CONCLUSION

Accordingly, textile surfaces used in the footwear industry should be regarded not merely as secondary surfaces that serve as alternatives to traditional leather-based materials, but as strategic material groups that integrate comfort, performance, sustainability and design innovation within a single structure. A review of the existing literature indicates that knitted sandwich fabrics, mesh structures, jacquard-woven surfaces, three-dimensional textile insoles and high-performance technical textiles are particularly significant in regulating the microclimate inside footwear. These textiles enhance air permeability and water vapour transfer, improve thermal comfort and provide the user with a lighter, more flexible and ergonomic experience. In addition, three-dimensional textile insoles and multi-layered textile packages have been shown to make significant biomechanical contributions, improving plantar pressure distribution and enhancing perceived comfort. Concurrently, digital manufacturing, 3D knitting and jacquard weaving technologies have enabled the development of regional performance structures, which can be tailored to specific requirements in diverse shoe-making areas. These technologies have introduced a novel degree of flexibility to footwear production processes, including seamless manufacturing, material conservation, personalisation and waste reduction. Moreover, the utilisation of sustainable textile-based materials, including recycled fibres, natural fibres, biocomposites, vegan leather alternatives and bacterial cellulose nanocomposites, has the potential to enhance the footwear sector's capacity to reduce its environmental impact and to develop products that are in accordance with the principles of the circular economy. In this context, textile surfaces are not merely a surface option that supports aesthetic diversity in footwear design; they are emerging as a high-value-added area of innovation in the development of user-centred, functional, lightweight, comfortable, manufacturable, customisable and sustainable footwear.

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