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Internet Addiction and Self-Reported Well-Being Among School-Going Adolescents in Bangladesh: A Cross-Sectional Study

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ABSTRACT

Background: Internet addiction (IA) is a growing concern among school-going teenagers worldwide, including in Bangladesh, which may affect their health and well-being. This study had two aims: first, to estimate the proportion of school-going adolescents reporting different health and well-being symptoms (headache, dizziness, fatigue, sleeping problems, depression, and palpitations); and second, to examine the association between internet addiction (IA) and these outcomes in both urban and rural areas of Bangladesh.

Methods: A cross-sectional survey was conducted in urban and rural areas from January to December 2021 among 384 school-going adolescents. Adolescents aged 10 to 19 years studying in school and using cellphones for at least 6 months were interviewed through a two-stage cluster sampling technique. The Pearson Chi-square test, bar charts, and binary logistic regression model were utilized to analyze the data.

Results: The majority of adolescents (86.06%) were aged 15–19 years, with 55.73% female, evenly split between rural and urban areas. The prevalence of mild, moderate, and severe Internet addiction (IA) was 24.48%, 13.8%, and 1.04%, respectively. Half of the respondents with severe IA reported headaches and palpitations, while 75.00% experienced fatigue, sleep problems, and depression. Moreover, dizziness, headache, and palpitations were reported by 50.00% of those with severe IA. Higher age (15 to 19) and females were associated with a greater risk of these symptoms, while rural adolescents suffered less, except for sleep problems. Severe IA significantly increased the likelihood of headaches [AOR: 3.96, CI: 0.54–28.83, $p = 0.17$], dizziness [AOR: 14.53, CI: 1.91–110.5, $p < 0.01$], fatigue [AOR: 11.27, CI: 1.15 - 110.69, $p = 0.04$], sleep problems [AOR: 35.83, CI: 3.54–362.34, $p < 0.01$], depression [AOR: 43.6, CI: 4.27–444.93, $p < 0.01$], and palpitations [AOR: 10.1, CI: 1.35–75.39, $p = 0.02$].

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Conclusion: Older age (15–19), females, and urban adolescents are more likely to experience poor levels of health-related well-being. Furthermore, Higher levels of IA among Bangladeshi school-going teenagers are significantly associated with their poor self-reported well-being.

1 | Introduction

The Internet has become an indispensable aspect of daily living in the modern world [1]. In 1996, Kimberly Young was the innovator of the notion of Internet addiction (IA) disease (IAD) [2]. The Diagnostic and Statistical Manual of Mental Disorders (DSM), Fourth Edition, was recommended by Kimberly Young [3]. A person who has lost control over their internet use and continues to use it constantly to the point that they face negative consequences that negatively impact their lives is said to be experiencing IA [4]. IA was defined by many researchers as internet use that causes problems in one's personal life [5–9].

After February 28, 2018, there were 83.141 million internet users worldwide, which was about half of the world's population. Of these, 77.495 million use mobile internet [10]. A global meta-analysis of 80 studies (from 1996 to 2012) with 89,281 participants from thirty-one nations revealed a 6.0% prevalence of IA worldwide, with the Middle East having the highest prevalence (10.9%) and the North and West having the lowest incidence (2.6%) [11]. The prevalence of IA in China varied from 6% to 10% [12, 13]. In Asia, there was a significant range in prevalence (from 8.1% to 50.9%) among youth and adolescents [14]. A small number of studies carried out in the US and Europe revealed that the incidence of IA among teenagers ranged from 7.9% to 25.2% [15–17] while studies of the Middle East and Africa, however, showed a range of 17.3% to 23.6% [18, 19]. In the case of South Asian nations, the frequency in Malaysia in 2019 was 23.0%, compared to just 13.3% in 2017. Furthermore, in the 2017–2018 brackets, the frequency was recorded as 24.4%, 21.2%, and 38.5% in Thailand, Vietnam, and Indonesia [20]. Bangladesh's internet user base has grown significantly over the last 20 years, from 0.1 million in 2000 to over 120 million in mid-2021 [21]. Additionally, 4% of teenagers aged 15 to 19 regularly use the Internet [22]. IA is a complicated and diverse condition. Adolescents are more likely to use the internet for enjoyment, informational purposes, educational requirements, and other reasons. Additionally, because they have extra time to explore the Internet, they are more likely to develop IA [23]. It has a detrimental impact on every aspect of an adolescent's life, manifesting itself in a range of abnormal behaviors and emotional states that can be categorized into detrimental outcomes such as substance abuse, academic conflict, depression, anxiety, and poor family and peer relationships [24–26].

Bangladesh has faced a variety of emerging and re-emerging diseases, among which IA is one of the most widespread problems affecting health and well-being [6, 9, 27–33]. As a result, self-reported health status, a measure that is becoming more widely used for community health monitoring and is a predictor of death in earlier research, will be used in this study to examine the effects of IA on health [34, 35]. Self-reported health status or well-being is a process where simple questions are asked of individuals regarding their health to measure their health status [36, 37].

Previous research shows that Bangladeshi teenagers face problems like loneliness, bullying, substance abuse, and smoking [38]. However, very few studies had been conducted on IA and teenagers, but they had not particularly investigated the association between IA and self-reported well-being using all six indicators [39–41]. This study fills an important gap by being the first to compare the effects of IA on self-reported well-being among adolescents in both rural and urban areas of Bangladesh. The present study had two specific aims: first, to estimate the proportion of school-going adolescents reporting different health and well-being symptoms (headache, dizziness, fatigue, sleep problems, depression, and palpitations); and second, to examine the association between levels of internet addiction and these outcomes in both urban and rural settings of Bangladesh.

2 | Methods

2.1 | Ethical Consent and Permission for Data Collection

The present study was approved by the institutional review board of the National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka-1212, Bangladesh, with the registration number: NIPSOM/IRB/2021/2018, dated on 13/12/2021. According to the Helsinki (revised version) Declaration, informed consent was obtained from each participant by posing the question, "Would you agree to take part in this survey? (Yes or No)" before they proceeded to the main section of the survey within the Google-based questionnaire form. For participants under the age of 18, consent was obtained from their parents/guardians before participation, and assent was obtained from the students themselves through the same consent question. By answering "Yes" the main survey questions were asked, whereas answering "No" was counted as no consent and excluded them from the interview. A brief of the objective and aims of this study was shared with the participants as well.

2.2 | Study Setting and Participants

A cross-sectional survey was conducted among 384 school-going teenagers (aged 10–18 years) from both urban (192 participants) and rural (192 participants) areas between January and December 2021.

2.3 | Sampling Technique and Sample Size

A two-stage cluster random sampling technique was adopted in this study. In the first stage, schools served as the primary sampling units (clusters). A list of all eligible schools in the rural and urban areas of the target region was compiled. From this list, one school was randomly selected from the rural area and one from the urban area using a simple random sampling

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method (using a random number generator). In the second stage, from each selected school, 192 students of BCIC School and College, Mirpur, Dhaka, for the urban area, and 192 students of Sreenagar Pilot School, Sreenagar Bazar, Munshigonj, for the rural area, who fulfilled the selection criteria, were included in the study. Thus, 384 samples (192 rural and 192 urban) were achieved within the time frame of data collection. The sample size (n) was calculated using the formula,

$$n = \frac{z^2 pq}{d^2} = 384.16 \approx 384$$

Here,

n = required sample size

z = The critical value from the standard normal distribution (1.96 for a 5% level of significance)

p = The estimated proportion of the population (0.5), assumed to get the maximum sample size

$$q = 1 - p = 0.5$$

Since earlier studies in Bangladesh reported very different prevalence rates depending on age group, setting, and measurement tools, this study chose $p = 0.5$ to handle this uncertainty. This value gives the most conservative (largest) sample size, ensuring that the study has enough participants to provide precise and reliable results even if the true prevalence in the population is higher or lower than expected [42]. In addition to this prevalence-based calculation, this study also considered the requirements for testing associations between internet addiction and health outcomes. Using the method of Hsieh, Bloch, and Larsen (1998) for logistic regression, detecting an odds ratio of approximately 2.0 for a symptom with a baseline prevalence of 15%, at $\alpha = 0.05\%$ and 80% power, requires around 330–380 participants [43]. This study achieved a sample of 384, therefore provided adequate power for the intended regression analyses.

2.4 | Selection Criteria

The Inclusion criteria were:

1. students studying in classes nine to twelve of the study area;
2. Both male and female students aged 10–19 years were included.

The exclusion criteria were

1. Those students aged 10–19 years who were using the internet for less than 6 months.
2. Guardian who did not give consent and
3. Respondents who did not give assents.

2.5 | Independent Variables

The socio-demographic factors were gender (male/female), age (10–14, and 15–19), religion (Muslim and Non-Muslim), marital status (married/Divorced/Separated/Widower, and Unmarried), residence (Rural and Urban), family type (Nuclear and Joint), number of family members (≤ 4, 5 to 8, > 8), family income (≤ 10000, 10001 to 20000, 30001 to 40000, and ≥ 40000), and most time spend with members (family or outside family members). To assess the IA score, this study used the Amharic version of the IA Test-20 scale [44]. The aggregate of all the examinee's ratings for the 20-item answers makes up the IAT total score. Every item was given a rating between 0 and 5 on a 5-point scale. There was a 100-point max score. The more severe the issue was, the greater the score was. Overall scores in the range of 0 to 30 were thought to represent normal Internet usage; Scores between 31 and 49 show a mild level of IA, scores between 50 and 79 show a moderate level, and scores between 80 and 100 show a severe dependence on the Internet [44].

2.6 | Assessment of Well-Being

To assess well-being score six illnesses were evaluated using a 5-point Likert scale (almost daily, several times a week, nearly every week, roughly once a month, seldom or never) and were obtained from the Health Behaviour in School-Aged Children (HBSC) survey questionnaire [45]. The assessment of well-being was based on students' self-reported experiences of specific illness over the preceding 6 months, that is, the 6 months immediately before the date of data collection. Participants were asked whether they had any of the symptoms (headache, feeling dizzy, fatigue, difficulty falling asleep, depression, and palpitations/rapid heartbeat) during that time frame. These symptoms were selected as indicators for self-reported well-being. If an illness was mentioned at least "nearly every week," it was deemed to be present.

2.7 | Data Collection Tool and Procedures

A semi-structured questionnaire was employed to gather data from the adolescents, capturing socio-demographic characteristics, patterns of internet use, and other associated factors affecting the well-being status of the respondents. To assess self-reported well-being, the study used a scale adapted from the Health Behaviour in School-aged Children (HBSC) survey, which used a five-point Likert response format ranging from 1 ("rarely") to 5 ("Always"). The well-being scale encompassed multiple domains, including somatic symptoms (headache, dizziness, fatigue), psychological distress (feelings of depression), and sleep-related issues (sleeping problems). These domains were chosen based on their relevance to adolescent health and were utilized to evaluate the frequency of symptoms experienced over the past 6 months.

2.8 | Data Quality Control

This study applied reliability analysis to test the reliability and internal consistency of the data. Here, the Cronbach's alpha, the

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reliability coefficient value for IAT, was 0.93, and the Wellbeing Score was 0.81. Therefore, the data was reliable for further analysis.

2.9 | Statistical Analysis

Descriptive statistics were applied to summarize the self-reported well-being and socio-demographic variables. To identify whether the IA score follows a normal distribution, this study applied the Kolmogorov–Smirnov and Shapiro–Wilk tests (Supplementary Table 1). Since IA score did not follow a normal distribution, the Mann–Whitney *U* Test was applied to check the significant difference in mean IA among self-reported well-being. The Pearson chi-square test was then utilized to examine the associations between self-reported well-being, IA categories, and demographic variables. Furthermore, to identify the risk factors for self-reported well-being, binary logistic regression was conducted. Additionally, bar charts were used to visualize the findings. A *p*-value of 5% was deemed significant at the 95% confidence interval. SPSS (Version 26) and Microsoft Office 2019 software were used for all of the analysis.

3 | Results

The Kolmogorov–Smirnov (K–S) test ($D = 0.098$, $p < 0.001$) and the Shapiro-Wilk test ($W = 0.946$, $p < 0.001$) both indicated that the total IAT score significantly deviated from a normal distribution. This result suggests that the IAT score was not normally distributed (Supplementary Table 1).

From Table 1, most of the respondents (89.1%) were between the ages of 15 and 19, while the remaining (10.9%) were aged between 11 and 14. More than half, 55.7%, of the respondents were female. On the other hand, 93.8% of the respondents were Muslim while just 6.3% were Non-Muslim. Moreover, 98.2% of the respondents are unmarried, whereas 1.8% were married, divorced, separated, or widowed. In the case of residence, 50% of respondents were from urban areas and 50% were from rural areas. In contrast, the majority had a nuclear family, and the percentage was 79.2%, while 20.8% lived in a joint family. Most of the respondents spent their maximum time with family members, and the percentage was 80.2%, while just 19.8% spent time with nonfamily members. 31.5% of respondents' family income was between 20001 and 30000 BDT, whereas 9.6% monthly income was less than 10000 BDT. Additionally, the prevalence of severe levels of IA was 1.04%, while the percentage was 13.8% for moderate levels. Furthermore, 24.48% of adolescents were experiencing mild levels of IA.

Figure 1 shows that the p-value is less than 0.05 for all self-reported well-being, except headache. Therefore, there was a significant mean difference in the IA test score across self-reported well-being (absence or presence), except for headache. Here, participants who reported headaches (IA test = 36), dizziness (IA test = 45), fatigue (IA test = 37), sleeping problems (IA test = 42), depression (IA test = 46), and palpitations (IA test=41) had higher IA scores compared to those who did not report those problems.

From Table 2, headache had a significant association ($p < 0.001$) with gender, where 16.47% of males had headaches while 39.25% of females had headaches. On the other hand, there was a significant association ($p < 0.01$) between dizziness and residence. Here, people who lived in urban areas had 19.27% dizziness, but only 9.90% in rural areas. Furthermore, fatigue had a significant association with gender ($p = 0.03$), religion ($p < 0.01$), residence ($p < 0.001$), and time-spending persons

TABLE 1 | Frequency table of Demographic Variables and Internet Addition.

Variables	*n*(%)
Age	
11–14	42 (10.9%)
15–19	342 (89.1%)
Gender	
Male	170 (44.3%)
Female	214 (55.7%)
Religion	
Muslim	360 (93.8%)
Non-Muslim	24 (6.3%)
Marital Status	
Married/Divorced/Separated/Widower	7 (1.8%)
Unmarried	377 (98.2%)
Residence	
Urban	192 (50.0%)
Rural	192 (50.0%)
Family Type	
Nuclear	304 (79.2%)
Joint	80 (20.8%)
Family Member	
Small (≤ 4)	194 (50.5%)
Medium (5–8)	162 (42.2%)
Large (> 8)	28 (7.3%)
Most Time Spend with Members	
Family members	308 (80.2%)
Outside Family members	76 (19.8%)
Family Income	
≤ 10000	37 (9.6%)
10001–20000	96 (25.0%)
20001–30000	121 (31.5%)
30001–40000	43 (11.2%)
≥ 40001	87 (22.7%)
Internet Addition	
Normal level (0–30)	233 (60.7%)
Mild level (31–49)	94 (24.5%)
Moderate level (50–79)	53 (13.8%)
Severe dependence (80–100)	4 (1.0%)

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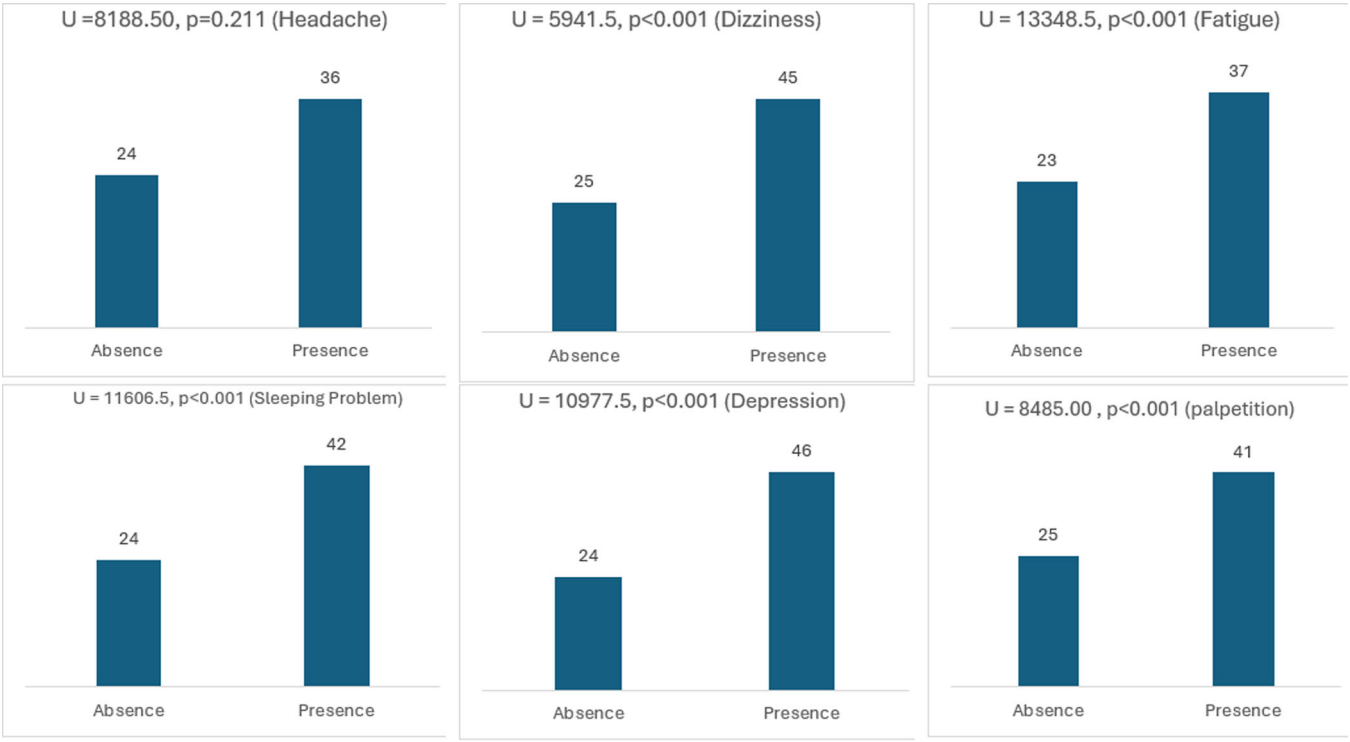


FIGURE 1 | Average Difference in Internet Addiction Across Self-Reported Well-being.

($p = 0.02$). 27.06% of males feel fatigue, whereas the percentage was 37.85% for females. Moreover, people who were Muslim had more fatigue problems than non-Muslims, and the percentages were 35.00% and 4.17%. For residents, 42.19% of urban individuals had this problem, but only 23.96% of them faced fatigue problems in rural areas. In contrast, almost 30.19% of respondents who spent most of their time with family face fatigue problems, whereas the percentage was higher, at 44.74% of those who spent most of their time outside of the family. Surprisingly, none of the demographic variables had an association with sleeping problems. On the other hand, depression has associated factors, which were religion ($p = 0.03$) and residence ($p < 0.001$), where 16.67% of Muslim individuals had depression, but none of the Non-Muslim individuals (0.00%) had this problem. In the case of residence, 21.88% and 9.88% of urban and rural respondents had depression. Finally, palpitation had a significant association with age ($p < 0.01$) and residence ($p = 0.02$). Here, people aged between 11 and 14 years had 2.38% palpitation, whereas the percentage was 19.88% for those aged 15–19 years. Additionally, around 22.40% of urban people had palpitations, whereas it was only 13.54% of rural people.

Binary logistic regression from Table 3 highlighted the associated demographic factors of self-reported well-being variables. Here, gender is highly significant with headaches at a 5% level of significance. On the other hand, residence had a high impact on dizziness and depression. Moreover, gender, residence, and individuals who spend most of their time had a higher impact on fatigue. Surprisingly, there were no demographic factors that were influential for sleeping problems. Finally, palpitation was influenced by the factor of age.

The adjusted model found that females were 3.97 [AOR: 3.97, 95% CI: 2.29–6.88, $p < 0.001$] times higher risk to have headache problems than males. Moreover, females had a 2.05 [AOR: 2.05, 95% CI: 1.24–3.38, $p < 0.01$] times higher chance of having fatigue than males. On the other hand, for dizziness, rural respondents had 0.39 [AOR: 0.39, 95% CI: 0.19–0.82, $p < 0.01$] times lower risk of having dizziness than urban respondents. Similarly, individuals who lived in rural areas were 0.42 [AOR: 0.42, 95% CI: 0.21–0.84, $p < 0.01$] and 0.47 [AOR: 0.47, 95% CI: 0.28–0.80, $p < 0.01$] times lower risk of having fatigue and depression than in urban areas. In contrast, Individuals who spent most of their time with those other than family members were more likely to have a 1.96 [AOR: 1.96, 95% CI: 1.10–3.51, $p = 0.02$] times higher chance of having fatigue compared to those who spent most of their time with family members. Finally, people aged between 15 and 19 years had a 9.72 [AOR: 9.72, 95% CI: 1.26–74.75, $p = 0.03$] times higher risk of having palpitation than people aged 11–14 years.

The binary logistic regression results (Table 4) indicate that high levels of internet addiction (IA) were significantly associated with higher odds of having headaches, dizziness, fatigue, sleeping problems, depression, and palpitations with the comparison to normal-level IA. Here, severe dependence consistently showed the highest risks across all health outcomes. Moderate and mid-level IA also showed significantly high risks, though to a lesser extent than severe dependence.

4 | Discussion

4.1 | Prevalence of IA and Self-Reported Well-Being

One of the main issues concerning health these days is IA among children [46]. These findings provided some insight into

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TABLE 2 | Association of demographic variables with self-related health status.

Variables	Frequency *n* (%)	Headache			Dizziness			Feel fatigue			Sleeping problem			Depression			Palpitation		
		Absence *n* (%)	Presence *n* (%)	*p*-value	Absence *n* (%)	Presence *n* (%)	*p*-value	Absence *n* (%)	Presence *n* (%)	*p*-value	Absence *n* (%)	Presence *n* (%)	*p*-value	Absence *n* (%)	Presence *n* (%)	*p*-value	Absence *n* (%)	Presence *n* (%)	*p*-value
Age																			
10–14	42 (10.94)	33 (78.57)	9 (21.43)	0.24	40 (95.24)	2 (4.76)	0.06	31 (73.81)	11 (26.19)	0.32	38 (90.48)	4 (9.52)	0.12	38 (90.48)	4 (9.52)	0.25	41 (97.62)	1 (2.38)	**< 0.01**
15–19	342 (89.06)	239 (69.88)	103 (30.12)		288 (84.21)	54 (15.79)		226 (66.08)	116 (33.92)		276 (80.70)	66 (19.30)		286 (83.63)	56 (16.37)		274 (80.12)	68 (19.88)	
Gender																			
Male	170 (44.27)	142 (83.53)	28 (16.47)	**< 0.001**	148 (87.06)	22 (12.94)	0.42	124 (72.94)	46 (27.06)	**0.03**	141 (82.94)	29 (17.06)	0.60	147 (86.47)	23 (13.53)	0.31	142 (83.53)	28 (16.47)	0.50
Female	214 (55.73)	130 (60.75)	84 (39.25)		180 (84.11)	34 (15.89)		133 (62.15)	81 (37.85)		173 (80.84)	41 (19.16)		177 (82.71)	37 (17.29)		173 (80.84)	41 (19.16)	
Religion																			
Muslim	360 (93.75)	251 (69.72)	109 (30.28)	0.64	306 (85.00)	54 (15.00)	0.37	234 (65.00)	126 (35.00)	**< 0.001**	291 (80.83)	69 (19.17)	0.07	300 (83.33)	60 (16.67)	**0.03**	292 (81.11)	68 (18.89)	0.07
Non-Muslim	24 (6.25)	21 (87.50)	3 (12.50)		22 (91.67)	2 (8.33)		23 (95.83)	1 (4.17)		23 (95.83)	1 (4.17)		24 (100.00)	0 (0.00)		23 (95.83)	1 (4.17)	
Marital status																			
Married/ Divorced/ Separated/ Widower	7 (1.82)	3 (42.86)	4 (57.14)	0.10	6 (85.71)	1 (14.29)	0.98	3 (42.86)	4 (57.14)	0.17	4 (57.14)	3 (42.86)	0.09	6 (85.71)	1 (14.29)	0.92	4 (57.14)	3 (42.86)	0.08
Unmarried	377 (98.18)	269 (71.35)	108 (28.65)		322 (85.41)	55 (14.59)		254 (67.37)	123 (32.63)		310 (82.23)	67 (17.77)		318 (84.35)	59 (15.65)		311 (82.49)	66 (17.51)	
Residence																			
Urban	192 (50.00)	131 (68.23)	61 (31.77)	0.26	155 (80.73)	37 (19.27)	**0.01**	111 (57.81)	81 (42.19)	**< 0.001**	154 (80.21)	38 (19.79)	0.43	150 (78.13)	42 (21.88)	**< 0.001**	149 (77.60)	43 (22.40)	**0.02**
Rural	192 (50.00)	141 (73.44)	51 (26.56)		173 (90.10)	19 (9.90)		146 (76.04)	46 (23.96)		160 (83.33)	32 (16.67)		174 (90.63)	18 (9.38)		166 (86.46)	26 (13.54)	
Family type																			
Nuclear	304 (79.17)	212 (69.74)	92 (30.26)	0.36	260 (85.53)	44 (14.47)	0.91	199 (65.46)	105 (34.54)	0.23	248 (81.58)	56 (18.42)	0.85	255 (83.88)	49 (16.12)	0.60	248 (81.58)	56 (18.42)	0.65
Joint	80 (20.83)	60 (75.00)	20 (25.00)		68 (85.00)	12 (15.00)		58 (72.50)	22 (27.50)		66 (82.50)	14 (17.50)		69 (86.25)	11 (13.75)		67 (83.75)	13 (16.25)	
Number of family members																			
Small (≤ 4)	194 (50.52)	139 (71.65)	55 (28.35)	0.77	166 (85.57)	28 (14.43)	0.99	130 (67.01)	64 (32.99)	0.95	155 (79.90)	39 (20.10)	0.12	167 (86.08)	27 (13.92)	0.58	161 (82.99)	33 (17.01)	0.87
Mediam (5–8)	162 (42.19)	112 (69.14)	50 (30.86)		138 (85.19)	24 (14.81)		109 (67.28)	53 (32.72)		139 (85.80)	23 (14.20)		133 (82.10)	29 (17.90)		131 (80.86)	31 (19.14)	
Large (> 8)	28 (7.29)	21 (75.00)	7 (25.00)		24 (85.71)	4 (14.29)		18 (64.29)	10 (35.71)		20 (71.43)	8 (28.57)		24 (85.71)	4 (14.29)		23 (82.14)	5 (17.86)	
Most time spend with members																			
Family Members	308 (80.21)	221 (71.75)	87 (28.25)	0.43	266 (86.36)	42 (13.64)	0.29	215 (69.81)	93 (30.19)	**0.02**	252 (81.82)	56 (18.18)	0.96	263 (85.39)	45 (14.61)	0.27	258 (83.77)	50 (16.23)	0.07
Outside Family Members	76 (19.79)	51 (67.11)	25 (32.89)		62 (81.58)	14 (18.42)		42 (55.26)	34 (44.74)		62 (81.58)	14 (18.42)		61 (80.26)	15 (19.74)		57 (75.00)	19 (25.00)	
Family income (months)																			
≤ 10000	37 (9.64)	28 (75.68)	9 (24.32)	0.83	30 (81.08)	7 (18.92)	0.49	25 (67.57)	12 (32.43)	0.55	32 (86.49)	5 (13.51)	> 0.99	35 (94.59)	2 (5.41)	0.15	31 (83.78)	6 (16.22)	0.57

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TABLE 2 | (Continued)

Variables	Frequency *n* (%)	Headache		*p*-value	Dizziness		*p*-value	Feel fatigue		*p*-value	Sleeping problem		*p*-value	Depression		*p*-value	Palpitation		*p*-value
		Absence *n* (%)	Presence *n* (%)		Absence *n* (%)	Presence *n* (%)		Absence *n* (%)	Presence *n* (%)		Absence *n* (%)	Presence *n* (%)		Absence *n* (%)	Presence *n* (%)		Absence *n* (%)	Presence *n* (%)	
10001–20000	96 (25.00)	71 (73.96)	25 (26.04)		84 (87.50)	12 (12.50)		70 (72.92)	26 (27.08)		83 (86.46)	13 (13.54)		82 (85.42)	14 (14.58)		80 (83.33)	16 (16.67)	
20001–30000	121 (31.51)	82 (67.77)	39 (32.23)		106 (87.60)	15 (12.40)		80 (66.12)	41 (33.88)		102 (84.30)	19 (15.70)		104 (85.95)	17 (14.05)		102 (84.30)	19 (15.70)	
30001–40000	43 (11.20)	30 (69.77)	13 (30.23)		38 (88.37)	5 (11.63)		29 (67.44)	14 (32.56)		34 (79.07)	9 (20.93)		36 (83.72)	7 (16.28)		36 (83.72)	7 (16.28)	
≥ 40000	87 (22.66)	61 (70.11)	26 (29.89)		70 (80.46)	17 (19.54)		53 (60.92)	34 (39.08)		63 (72.41)	24 (27.59)		67 (77.01)	20 (22.99)		66 (75.86)	21 (24.14)	

the issue of IA and its impact on people's health, particularly teenagers' physiological health. This study found that for those who had moderate to severe levels of IA, 52.83% and 50.00% had headaches. On the other hand, 35.85% and 50.00% had dizziness. In the case of fatigue, the percentages were 60.38% and 75.00%, respectively, and they had moderate to severe levels of IA. Moreover, those percentages were 39.62% and 75.00% for those with sleeping problems. Of people with problems of depression, 45.28% and 75.00% had moderate to severe levels of IA. Of respondents who suffer from palpitations/rapid heartbeat, 41.51% and 50.00% had IA, and the levels were moderate to severe.

4.2 | Impact of IA on Self-Reported Well-Being Across Countries

A study from northwest Romania stated that young people who are frequent users of the internet reported that most of them suffer from dizziness (14.03%), sleeping problems (23.36%), and headaches (14.99%) [47]. However, research from Turkey said that those individuals who were internet addicts reported headaches (55.5%), and dizziness (38.5%), and the results justify this present finding [48]. A study conducted in Pakistan also revealed that who were internet addicted 74.5%, and 39.3% of them had headaches and dizziness [49]. Moreover, the same study from northwest Romania found that 11% of the respondents had palpitations, and they used the internet for a longer time [47]. Another study from India stated that of those who were internet addicts, almost 65.45% ($n = 288$) had depression [50]. The study from Pakistan showed that the percentage of fatigue was only 6.61% for those who were internet addicted [49]. This percentage was lower compared to the present study in Bangladesh for various reasons, such as differences in screen time duration of digital devices, limited awareness of digital health literacy, lack of sleep disorders, and parental monitoring [10, 51, 52]. In addition, extra academic load, lots of mobile phones used for academic and entertainment purposes, and limited access to recreational outlets had the physiological effects of IA among Bangladeshi teenagers [53].

4.3 | Sociodemographic Variation in IA Effects

This study found that females were at higher risk of headaches and fatigue than males. Other studies agreed with the statement [54–57]. There could be biological, cultural, and experiential reasons for these gender disparities [54, 55]. Moreover, the gender difference was because of hormonal variations responsible for ovarian cycles and menopause [58]. On the other hand, people who lived in rural areas had a lower chance of having dizziness, fatigue, and depression in urban areas, meaning that rural people had better self-reported well-being than urban people. Some research previously proved these findings [59, 60]. A previous study stated that urban individuals with higher rates of depression also displayed higher levels of deprivation, unfavorable living conditions, and stress in their lives [60]. Nevertheless, we did not discover any significant explanations for why fatigue and dizziness are more common in rural than urban areas. Still, the causes could be adverse living conditions,

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TABLE 3 | Binary logistic regression model of demographic variables.

Variables		Headache		Dizziness		Feel fatigue		Sleeping problem		Depression		Palpitation	
		AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Age	11–14	Reference Category											
	15–19	1.07 (0.46–2.45)	0.88	3.14 (0.71–13.84)	0.13	1.02 (0.47–2.22)	0.96	2.40 (0.79–7.33)	0.12	1.40 (0.46–4.30)	0.56	9.72 (1.26–74.75)	0.03
Gender	Male	Reference Category											
	Female	3.97 (2.29–6.88)	< 0.001	1.34 (0.71–2.54)	0.36	2.05 (1.24–3.38)	< 0.001	1.09 (0.61–1.96)	0.76	1.54 (0.83–2.88)	0.17	1.19 (0.66–2.15)	0.56
Religion	Muslim	Reference Category											
	Non-Muslim	0.47 (0.13–1.74)	0.26	0.78 (0.16–3.79)	0.76	0.14 (0.02–1.12)	0.06	0.22 (0.03–1.71)	0.15	0.00 (0.00–0.00)	> 0.99	0.25 (0.03–2.00)	0.19
Marital Status	Married/ Divorced/ Sperated/ Widower	Reference Category											
	Unmarried	0.36 (0.07–1.77)	0.21	0.69 (0.08–6.42)	0.75	0.33 (0.07–1.61)	0.17	0.27 (0.06–1.34)	0.11	0.73 (0.08–6.72)	0.78	0.20 (0.04–1.06)	0.06
Residence	Urban	Reference Category											
	Rural	0.84 (0.49–1.45)	0.54	0.39 (0.19–0.82)	< 0.01	0.47 (0.28–0.80)	< 0.01	1.08 (0.59–2.01)	0.80	0.42 (0.21–0.84)	< 0.01	0.60 (0.31–1.14)	0.12
Family Type	Nuclear	Reference Category											
	Joint	0.83 (0.4–1.75)	0.63	1.41 (0.57–3.50)	0.46	0.81 (0.39–1.70)	0.58	0.81 (0.33–2.01)	0.65	1.05 (0.42–2.64)	0.92	0.98 (0.41–2.34)	0.97
Number of Family Members	Small (<= 4)	Reference Category											
	Mediam (5 to 8)	1.01 (0.61–1.68)	0.96	0.91 (0.48–1.73)	0.77	0.94 (0.58–1.54)	0.82	0.69 (0.38–1.26)	0.23	1.29 (0.70–2.39)	0.41	1.18 (0.66–2.13)	0.58
	Large (> 8)	0.71 (0.22–2.34)	0.57	0.48 (0.11–2.08)	0.33	0.93 (0.30–2.83)	0.89	1.49 (0.42–5.28)	0.53	0.55 (0.13–2.36)	0.42	0.76 (0.20–2.98)	0.70
Peer GP	Family Members	Reference Category											
	Outside Family Members	1.8 (0.96–3.36)	0.07	1.24 (0.60–2.56)	0.56	1.96 (1.10–3.51)	0.02	0.92 (0.45–1.87)	0.82	1.21 (0.59–2.47)	0.60	1.46 (0.76–2.83)	0.26
Family Income	<= 10000	Reference Category											
	10001 to 20000	1.49 (0.59–3.75)	0.40	0.53 (0.18–1.55)	0.24	0.84 (0.35–1.99)	0.68	1.08 (0.34–3.40)	0.89	3.32 (0.70–15.77)	0.13	0.99 (0.34–2.92)	0.99
	20001 to 30000	1.69 (0.68–4.23)	0.26	0.37 (0.12–1.09)	0.07	0.76 (0.32–1.80)	0.53	1.22 (0.40–3.77)	0.73	1.97 (0.41–9.45)	0.40	0.71 (0.24–2.10)	0.54

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TABLE 3 | (Continued)

Variables		Headache		Dizziness		Feel fatigue		Sleeping problem		Depression		Palpitation	
		AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
	30001 to 40000	1.57 (0.55–4.53)	0.40	0.36 (0.10–1.36)	0.13	0.80 (0.29–2.18)	0.66	1.71 (0.49–5.93)	0.40	2.58 (0.48–13.86)	0.27	0.78 (0.22–2.75)	0.70
	> = 40000	1.81 (0.69–4.75)	0.23	0.7 (0.24–2.09)	0.53	1.07 (0.44–2.60)	0.89	2.49 (0.80–7.71)	0.11	4.27 (0.89–20.47)	0.07	1.39 (0.46–4.17)	0.56

TABLE 4 | Binary logistic regression model of internet addiction test.

Variable		Headache		Dizziness		Feel fatigue		Sleeping problem		Depression		Palpitation	
		AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Internet addiction test	Normal Level	Reference Category											
	Mild Level	2.35 (1.39–3.97)	< 0.01	3.93 (1.91–8.07)	< 0.001	3.17 (1.89–5.29)	< 0.001	5.07 (2.64–9.74)	< 0.001	3.44 (1.65–7.17)	< 0.001	3.46 (1.82–6.6)	< 0.001
	Moderate Level	4.43 (2.37–8.3)	< 0.001	8.12 (3.77–17.49)	< 0.001	5.72 (3.03–10.79)	< 0.001	7.84 (3.77–16.28)	< 0.001	12.03 (5.67–25.53)	< 0.001	7.16 (3.53–14.53)	< 0.001
	Severe Dependence	3.96 (0.54–28.83)	0.17	14.53 (1.91–110.5)	< 0.01	11.27 (1.15–110.69)	0.04	35.83 (3.54–362.34)	< 0.01	43.6 (4.27–444.93)	< 0.01	10.1 (1.35–75.39)	0.02

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which are more common in urban than rural locations [60]. However, some studies found no significant difference between urban and rural areas in fatigue [56, 61].

4.4 | Impact of IA on Sleeping Problems

This study suggested that there was a significant association between sleep problems and IA. A study that concluded in Korea also found similar results. They suggested that higher use of the internet can cause more irregular sleep patterns [62]. Previous research indicated that the light of computer screens could have bad effects on the circadian rhythm and lead to sleep phase delay [63]. Another study highlighted that IA was associated with insomnia, apnea, and nightmares which caused sleeping problems as well [64]. Therefore, those who were internet addicts were more likely to face physical and mental health-related problems [62].

4.5 | Impact of IA on Fatigue

Fatigue is another physical and mental health-related problem that causes musculoskeletal pain or feeling weak [65]. This study suggested that moderate to severe level internet addicts had a higher risk of fatigue problems. Another study showed that there was a relationship between sleeping problems and fatigue. The study stated that an increase in sleeping problems can cause a high risk of fatigue, and sleeping problems could occur due to IA [62, 66].

4.6 | Impact of IA on Depression

The present study confirmed that there was a significant association between depression and IA. Some other studies also agreed with the present findings [67, 68]. Low self-esteem, fear of rejection, lack of self-motivation, and desire for approval were associated with depression, which finally made a person use the internet more [69]. On the other hand, depression severity has a significant association with poor diet, which is a high risk of poor health [70].

4.7 | Impact of IA on Dizziness

Dizziness or loss of balance was a major public health problem that affects an individual's balance, and it was the most serious problem of dizziness [71]. This study found that dizziness or loss of balance was one of the major factors influenced by IA. Moreover, a previous study also found that there was a significant association between dizziness and IA, where if the IA score got higher, the dizziness or loss of balance would get higher [72]. Previous studies indicated that daily internet users through computers and mobiles mainly face dizziness or loss of balance [73]. However, the frequency of the mobile causes dizziness, according to a study [74].

4.8 | Impact of IA on Headaches

Another health-related issue caused by IA or high internet use was headaches. Some studies agreed with the statement and concluded that spending a long time (greater number of hours per week) using the internet through computers was one of the major reasons for headaches [75, 76]. This study similarly suggested that the moderate to severe level of IA had a higher chance of having headaches.

4.9 | Impact of IA on Palpitations

A painful sensation in one's heartbeat was palpitations, which was another health issue associated with IA. The present study highlighted that with an increment of IA, there was a high chance of having palpitations among individuals. The same findings were also found in previous research [77]. A study identified that higher sympathetic activity, lower parasympathetic activity, and overall autonomic activity were responsible for irregular heartbeat or palpitations [78].

5 | Strengths and Limitations

This study is among the first to include an equal representation of school-going adolescents from both rural and urban areas, which strengthens the generalizability of the findings. Although several studies in Bangladesh have explored internet addiction and specific health outcomes such as depression, sleep problems, or loneliness among adolescents, very few have examined multiple physical and psychological symptoms together within the same school-based sample. The study used different statistical tests, such as the Mann-Whitney U test, chi-square test, and logistic regression, to look at both the frequency of problems and their links with internet addiction. Using several methods makes the results more reliable. However, this study has some limitations. There might be some recall bias as the information was self-reported by the respondents. Participants may not have provided fully accurate responses regarding their cellphone use or well-being, not due to misunderstanding the questions but because of recall issues or limited awareness of their own habits and health status. Although the sample size was large enough for both estimating proportions and testing associations or impact, the two-stage cluster design (choosing whole schools as clusters) may have reduced the effective number of independent observations. This study recognizes this as a limitation when interpreting the results.

6 | Recommendations

To identify the growing problem of IA and health problems among school-going adolescents, several steps should be taken into consideration. First, it is critical to restrict daily internet usage to no more than 3 h per day for adolescents. Because more than 3 h on the internet via computer or mobile phone can cause health-related issues, such as depressive symptoms [79, 80]. Furthermore, awareness attempts must be launched in both rural and urban regions to encourage a favorable mindset toward responsible internet use. Programs for health education aimed at parents, teachers, and teenagers can improve knowledge of IA signs and effective screen time management. Gender-sensitive medications should consider biological, cultural, and hormonal

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aspects that may impact health disparities, as females are more likely than males to have headaches and fatigue. Moreover, compared to their urban neighbors, people in rural areas typically report higher levels of self-reported well-being. Thus, enhancing urban living conditions, lowering stress levels, and encouraging a better way of life may help lessen the negative effects of IA on one's health. To obtain a more thorough grasp of IA and its consequences on various demographics, future studies should finally broaden the scope of investigations to wider geographic areas.

7 | Conclusion

The study revealed that a significant number of adolescents exhibit mild and moderate levels of IA. On the other hand, females, older age, and urban adolescents suffer more from headaches, dizziness, fatigue, depression, and palpitations. Internet addicted adolescents, especially in urban areas, face sleeping problems due to heavy use of social media and mobile devices. Depression relates to low self-motivation, fear of rejection, and the need for approval, which finally makes a person use the internet more. Extended internet use significantly affects fatigue, palpitations, and dizziness. Therefore, increasing awareness and promoting healthy internet use are important for improving adolescent well-being.

Author Contributions

Saida Ahmed: Writing – review and editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Md. Shihab Mostafa:** Writing – review and editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis. **Quazi Umme La-sani Haque:** Writing – review and editing, Visualization, Funding acquisition. **Zaki Farhana:** Writing – review and editing, Writing – original draft, Data curation, Funding acquisition. **Saida Sharifun Naher:** Writing – review and editing, Data curation, Supervision. **Humaira Tul Jannat:** Writing – review and editing, Investigation, Data curation. **Sharmin Sultana:** Writing – review and editing, Writing – original draft, Funding acquisition, Funding acquisition. **Anton Abdulbasah Kamil:** Writing – review and editing, Writing – original draft, Funding acquisition. **Mohammad Meshbahur Rahman:** Writing – review and editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

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Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Transparency Statement

The lead author Mohammad Meshbahur Rahman affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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