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Association between Sleep Quality, Internet Addiction and its Associated Factors among Bangladeshi University Students: A Cross-sectional Study

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Abstract

Background: This study explores the association between sleep quality and internet addiction among Bangladeshi university students. With increasing internet usage, particularly during the COVID-19 pandemic, concerns have arisen regarding its impact on sleep quality. This research aims to investigate this relationship and its demographic variations to provide targeted recommendations for improving student well-being.

Method: A cross-sectional study involving 587 university students (299 males, 288 females) from various regions in Bangladesh was conducted. Participants aged 18-26 years were selected through purposive and convenience sampling. Data were collected via the Personal Information Form (PIF), the Bengali version of the Pittsburgh sleep quality index (PSQI), and the Bengali version of the internet addiction test (IAT). Descriptive statistics, Pearson correlation, independent sample t-tests, and one-way ANOVA were used for data analysis with IBM-SPSS software version 29.0.

Results: The study revealed that 92.33% of the participants reported poor sleep quality, with moderate internet addiction being most common (48.22%). A significant positive correlation ($r = 0.608$, $p < 0.01$) was observed between internet addiction and poor sleep quality. Gender differences were significant for sleep quality but not for internet addiction. Socioeconomic status and residential division influenced both internet addiction and sleep quality. This research highlights a significant association between internet addiction and poor sleep quality among Bangladeshi university students.

Conclusion: The findings underscore the need for targeted interventions addressing internet use and sleep hygiene. Further, longitudinal studies are recommended to explore causal

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relationships and develop effective strategies for improving student health and academic performance.

Keywords: Bangladesh, Internet Addiction, Sleep Quality, University Students

Introduction

Sleep quality is defined as satisfaction with the sleep experience, incorporating aspects of sleep initiation, sleep maintenance, sleep quantity, and wakefulness (Kline, 2013). Among university students, maintaining good sleep quality is critical, given their demanding academic schedules and the stress associated with higher education (Ahmed et al., 2020). However, recent studies have indicated a concerning prevalence of poor sleep quality among university students globally (Mamun et al., 2020). One potential contributing factor to this problem is internet addiction, a behavioral state characterized by excessive or poorly controlled preoccupation, urges, or behaviors related to internet use that lead to impairment or distress (Kashfi et al., 2023).

The relationship between internet addiction and sleep quality has been extensively studied in various populations, including adolescents and medical students. For example, Çelebioğlu et al. (2020) reported a significant negative correlation between internet addiction and sleep quality among adolescents (Çelebioğlu et al., 2020). Similarly, a study conducted among Iranian medical students revealed that higher levels of internet addiction were associated with poorer sleep quality and diminished health-related quality of life (Karimy, et al., 2020). This association is particularly pertinent during the COVID-19 pandemic, which has led to a surge in internet usage due to lockdowns and the shift to online learning, exacerbating the potential for internet addiction and its adverse effects on sleep quality (Tahir et al., 2021).

In Bangladesh, internet usage has increased significantly over the past decade, with the Bangladesh Telecommunication Regulatory Commission (BTRC) reporting a significant increase in the number of internet users (*Internet Users*, 2024). This increase has been accompanied by growing concerns about internet addiction among university students, especially during the COVID-19 pandemic, when online activities have become the primary mode of interaction and learning (Biswas et al., 2022). Studies conducted in Bangladesh have highlighted the high prevalence of internet addiction among students and its adverse effects on sleep quality (Ali et al., 2022; Islam et al., 2021; Jahan et al., 2019).

The adverse effects of internet addiction on sleep quality are not limited to reduced sleep duration but also include disruptions in sleep patterns and reduced overall sleep satisfaction. Mahmoud et al. (2022) reported that internet addiction in medical students at Sohag University was significantly associated with poor sleep quality (Mahmoud et al., 2022). These results are consistent with those of Huang et al. (2023), who reported that internet addiction can lead to sleep disturbances, mainly due to factors such as depression (Huang et al., 2023).

In addition, the impact of internet addiction on sleep quality is heterogeneous and may be influenced by various factors, including the type of internet activity, duration of use, and individual psychological characteristics. Chatterjee and Kar (2021) noted that smartphone

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addiction, a component of internet addiction, was particularly detrimental to sleep quality in Indian medical students, suggesting that the means of internet use play an important role (Chatterjee & Kar, 2021). Furthermore, Singla et al. (2023) emphasized that during the COVID-19 lockdown, the association between internet use and sleep quality was influenced by physical activity levels and cognitive engagement (Singla et al., 2023).

In Bangladesh, the exploration of these associations and their determinants is still in its infancy. Existing studies have provided basic understanding but highlight the need for further research to identify specific factors contributing to poor sleep quality in college students and the role of internet addiction in this regard (Hossin et al., 2022). For example, factors such as academic pressure, social isolation, and mental health problems such as depression and anxiety have been identified as important mediators of the relationship between internet addiction and sleep quality (Huang et al., 2023; Saffari et al., 2022).

The importance of addressing these issues cannot be overstated. Poor sleep quality is associated with a range of negative outcomes, including lower academic performance, increased risk of mental health disorders, and physical health problems (Chatterjee & Kar, 2021; Kashfi et al., 2023). Therefore, it is essential to understand and mitigate the factors that contribute to poor sleep quality to promote the health and academic success of university students.

This study seeks to fill the existing gaps in the literature by providing a detailed examination of the association between internet addiction and sleep quality among Bangladeshi university students. This study builds on the findings of previous research and offers new insights into the specific factors that influence this relationship in the context of Bangladesh, particularly given the ongoing challenges posed by the COVID-19 pandemic. This research hopes to contribute to the development of targeted strategies to increase sleep quality and address internet addiction, thereby supporting the overall health and academic performance of university students in Bangladesh.

Research Objectives:

General Objective: To investigate the association between sleep quality and internet addiction among Bangladeshi university students.

Specific Objectives:

To assess the prevalence of internet addiction among Bangladeshi university students.

To evaluate the sleep quality of Bangladeshi university students.

To investigate gender differences in internet addiction and sleep quality.

To explore the impact of demographic factors on internet addiction and sleep quality.

Materials and Methods

Study Design

This study used a cross-sectional design to explore the association between sleep quality and internet addiction among Bangladeshi university students from 22 July 2024 to 15 September 2024.

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Study Population

This study included 587 university students (299 males, 288 females) from public and private universities in several regions of Bangladesh (Dhaka, Chittagong, Rajshahi, Khulna, Sylhet, Barisal, Rangpur, Mymensingh), aged 18-26 years, which is the typical age of university students in Bangladesh. Purposive sampling ensured the inclusion of students with specific characteristics relevant to the study, whereas convenience sampling facilitated the recruitment of willing participants. Eligible participants were Bangladeshi residents for at least three generations, full-time university students, aged 18-26 years, and had reliable access to the internet. Participants with significant cognitive impairment affecting their ability to participate in research or those who were unwilling or unable to provide informed consent were excluded to maintain ethical standards and ensure the reliability of the results.

Measures

Personal Information Form (PIF)

A predesigned and pretested Personal Information Form (PIF) was used to collect sociodemographic data from the participants. The form included questions on age, gender, family size, residential area, residential subdivision, education level, and socioeconomic status.

Bengali Version of the Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index is a self-report questionnaire assessing sleep quality and sleep disturbances over the past month, providing a total score and scores for seven sleep quality components (i.e., sleep quality, sleep latency, sleep duration, usual sleep efficiency, sleep disturbance, daytime dysfunction, use of sleep medications, etc.). An overall PSQI score of 4 or less indicates good sleep, whereas an overall PSQI score of 5 or more indicates poor sleep. The original version of the Pittsburgh Sleep Quality Index was developed in 1988 by Buysse, Reynolds, Monk, Berman, and Kupffer (Buysse et al., 1989). The Bengali version of this scale was adopted by Mondal, Mondal, and Baidya in 2018 (Mondal et al., 2018). Cronbach's alphas for the original PSQI and the adopted Bengali scores were .830 and .816, respectively. Cronbach's alpha in this study was measured as .740.

Bengali Version of the Internet Addiction Test (IAT)

In 1998, Dr. Young developed the internet addiction test (IAT) as a psychometric tool to assess the severity of IA (Young, 1998). The Bengali version of this scale developed by Dr. A.K.M. Rezaul Karim and Nigar was used to measure IA in this study (Karim & Nigar, 2014). A 20-point Likert scale was used to measure personal addiction to the internet and its impact on mental health and daily life. A range from "strongly agree" to "strongly agree" or "never" to "always" is usually sufficient. A higher score from 0 to 80 indicates a greater degree of internet addiction. The original scale has a high degree of content validity. The split-half reliability of this scale is .90. The validated Bengali version of the internet addiction test showed strong convergent and discriminant validity, and good internal consistency (Cronbach's alpha = .917).

Data Collection Procedure

Eligible students who satisfied the inclusion requirements provided their written informed consent. The self-administered questionnaires have been completed at the convenience of the

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participants, who were guaranteed data anonymity and confidentiality. Following ethical standards for research involving humans, the study informed participants about its goals, risks, benefits, and privacy. The participants in this cross-sectional study completed a Google Forms personal information form as well as the PSQI and IAT in Bangla. They were thanked for their participation and urged to finish the survey as soon as possible, with a 10-to-15-minute projected completion time.

Data Analysis

IBM-SPSS software version 29.0 was used for statistical analysis to achieve the study's objectives. First, the data were visually inspected via box plots, histograms, normal Q-Q plots, and P-P plots to check for normality. The Shapiro-Wilk test was performed with a significance level of $p < 0.05$ to confirm normality even more. After that, descriptive statistics were computed to determine the variable means and standard deviations (SDs). To determine the association between the PSQI score and IA, Pearson correlation was used. To investigate any gender differences that might be significant for the PSQI and IA, an independent sample t-test was employed. Furthermore, one-way ANOVA was used to find any noteworthy variations in the PSQI score and IA among various demographic groups.

Ethical Considerations

This study was approved by the Institutional Review Board (IRB) at the Bangladesh Institute of Innovative Health Research (IRB Protocol Number: BIIHR-2024-003). All procedures followed the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from each participant prior to their involvement in the study. The participants indicated their consent by marking 'yes' on the Google Form. Additionally, participants' confidentiality and privacy were strictly maintained throughout the research process.

Results

The Shapiro-Wilk test revealed that all variables followed a normal distribution, confirming the use of parametric tests. Of the 587 participants, 299 (50. 9%) were male and 288 (49. 1%) were female. The majority of participants were first-year university students (52. 6%). In addition, the majority of participants were from the Dhaka region (65. 6%) and resided in urban areas (76. 5%) (Table 1).

Table 1. Sociodemographic characteristics of the participants (n=587).

Variables		Frequency	Percentage (%)
Gender	Male	299	50.9
	Female	288	49.1
Education qualification	Honors 1st Year	309	52.6
	Honors 2nd Year	78	13.3
	Honors 3rd Year	72	12.3
	Honors 4th Year	83	14.1
	Masters	45	7.7

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Socioeconomic status	Higher Class	5	.9
	Higher Middle Class	112	19.1
	Middle Class	398	67.8
	Lower Middle Class	70	11.9
	Lower Class	2	0.3
Residential division	Dhaka	385	65.6
	Rajshahi	21	3.6
	Chattogram	134	22.8
	Khulna	14	2.4
	Barisal	12	2.0
	Sylhet	2	0.3
	Rangpur	13	2.2
	Mymensingh	6	1.0
Residential area	Urban	449	76.5
	Sub-Urban	67	11.4
	Rural	71	12.1

Table 2. Descriptive statistics of different variables (n=587).

Variable		Mean	Standard Deviation (SD)	Min.	Max.
Age	Male	22.08	2.100	18	26
	Female	21.39	1.738	19	26
	Pooled	21.74	1.960	18	26
Family members	Male	4.65	1.597	2	11
	Female	4.64	1.444	2	11
	Pooled	4.64	1.523	2	11
IA	Male	40.28	16.130	15	79
	Female	39.83	15.268	11	85
	Pooled	40.99	15.741	11	85

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SSQ	Male	1.76	1.004	0	11
	Female	1.57	1.016	0	11
	Pooled	1.67	1.013	0	11
SL	Male	3.14	1.485	0	6
	Female	2.78	1.547	0	6
	Pooled	2.97	1.525	0	6
SD	Male	1.90	1.030	0	3
	Female	1.75	1.028	0	3
	Pooled	1.83	1.031	0	3
SE	Male	.86	1.044	0	3
	Female	.76	1.077	0	3
	Pooled	.81	1.061	0	3
SDi	Male	1.56	.644	0	3
	Female	1.52	.646	0	3
	Pooled	1.54	.645	0	3
USM	Male	.33	.787	0	3
	Female	.38	.859	0	3
	Pooled	.36	.823	0	3
DD	Male	1.46	.963	0	3
	Female	1.54	.940	0	3

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	Pooled	1.50	.952	0	3
PSQI	Male	11.15	3.892	0	23
	Female	10.48	4.054	1	23
	Pooled	10.82	3.983	0	23

EI: emotional intelligence; SSQ: subjective sleep quality; SL: sleep latency; SD: sleep duration; SE: sleep efficiency; SDi: sleep disturbance; USM: use of sleep medication; DD: daytime dysfunction; PSQI: global PSQI score

The mean age (±SD) of the participants was 21.74 (±1.960), with an age range of 18-26 years., whereas the mean ages (±SD) of the male and female participants were 22.08 (±2.100) and 21.39 (±1.738) respectively. The mean PSQI score (±SD) of the male participants was 11.15 (±3.892) and the mean IA score (±SD) of the male participants was 42.11 (±16.130). The mean PSQI score (±SD) of the female participants was 10.48 (±4.054) and the mean IA score (±SD) of the female participants was 39.83 (±15.268). The highest PSQI score recorded was 23, whereas 0 was the lowest. The IA score ranged from 11-85 (Table 2).

Table 3. Distribution of internet addiction (IA) level and sleep quality.

Variable	Sub category	Male	Female	Total
IA Level	Minimal	115 (38.46%)	121 (42.01%)	236 (40.20%)
	Moderate	145 (48.49%)	138 (47.92%)	283 (48.22%)
	Excessive	39 (13.05%)	29 (10.07%)	68 (11.58%)
Sleep Quality	Good Quality	15 (5.02%)	30 (10.42%)	45 (7.67%)
	Poor Quality	284 (94.98%)	258 (88.58%)	542 (92.33%)

The distributions of internet addiction (IA) levels and sleep quality among males and females are presented in Table 3. Table 3 shows that the majority of participants had moderate internet addiction (48.22%) with minimal (40.20%) and excessive (11.58%) levels also observed. Poor sleep quality was prevalent in 92.33% of the participants, with only 7.67% reporting good sleep quality.

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Table 4. Pearson correlation coefficient among different variables.

Variables	Age	FM	IA	PSQI
Age	1			
FM	.045	1		
IA	-.105*	.072	1	
PSQI	.003**	.054	608**	1

FM: numbers of family member; IA: internet addiction; PSQI: global PSQI score
** Correlation is significant at the .01 level (2-tailed)
Correlation is significant at the .05 level (2-tailed)
A Pearson correlation coefficient ($r = 0.608$) indicated a significant ($p < 0.01$) moderate positive correlation between IA and PSQI, suggesting that higher IA scores were associated with higher PSQI scores (Table 4).

Table 5. Regression Analysis results of the ability of the PSQI score to predict EI

Regression Weights	Beta Coefficient	R^2	F	p-value
IA → PSQI	.608	0.370	343.877	<.001

IA: internet addiction; PSQI: global PSQI score
The regression analysis assessed the ability of IA to predict PSQI score (Table 5). The beta coefficient of .608 indicated a significant positive relationship between IA and the PSQI. The R-squared (R2) value of 0.370 indicated that about 37.0% of the variance in EI ($R^2 = 0.370$) was explained by the PSQI. The overall regression model was statistically significant, as evidenced by the F-value of 343.877 ($p < 0.001$).

Table 6. Independent sample t tests for gender effects on internet addiction and the global PSQI scores.

Variable		N	t value	df	P value
IA	Male	299	1.760	585	.079
	Female	288			
PSQI	Male	299	2.047	585	.041
	Female	288			

IA: internet addiction; PSQI: global PSQI score
**p<0.01, *p<0.05

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Independent sample t tests were done to see the significant differences in internet addiction and global PSQI score due to gender (Table 6). Table 6 illustrates that there was no significant difference in internet addiction for gender (t= 1.760, df =585, P=.079), but that there was a significant difference in the global PSQI score for gender (t= 2.047, df=585, P=.041).

Table 7. One-way ANOVA of internet addiction (IA) among university students according to educational qualification, socioeconomic status, residential division, residential area.

IA						
Variables		**Sum of squares**	**Df.**	**Mean square**	**F**	**Sig.**
EQ	Between groups	1425.411	4	356.353	1.443	.218
	Within groups	143770.562	582	247.028		
	Total	145195.9730	586			
SES	Between groups	5859.639	4	1464.910	6.119	<.001
	Within groups	139336.333	582	239.410		
	Total	145195.973	586			
RD	Between groups	3766.492	7	538.070	2.203	.033
	Within groups	141429.480	579	244.265		
	Total	145195.973	586			
RA	Between groups	435.255	2	217.628	.878	.416
	Within groups	144760.718	584	247.878		
	Total	145195.973	586			

EQ: educational qualification; SES: socioeconomic status; RD: residential division; RA: residential area

One-way between-groups analysis of variance (ANOVA) was used to investigate the impact of educational qualification, socioeconomic status, residential division, residential area on the IA score (Table 7). Table 7 indicates that there was a statistically significant difference at the .05 level in job satisfaction for the two groups: socioeconomic status (F= 6.119, p<.01), and residential division (F= 2.203, p<.05).

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Table 8. One-way ANOVA of the global PSQI score (PSQI) among university students according to educational qualification, socioeconomic status, residential division, residential area.

PSQI						
Variables		**Sum of squares**	**Df.**	**Mean square**	**F**	**Sig.**
EQ	Between groups	23.421	4	5.855	.367	.832
	Within groups	9274.797	582	15.936		
	Total	9298.218	586			
SES	Between groups	193.190	4	48.297	3.087	.016
	Within groups	9105.028	582	15.644		
	Total	9298.218	586			
RD	Between groups	251.612	7	35.945	2.301	.026
	Within groups	9046.606	579	15.625		
	Total	9298.218	586			
RA	Between groups	40.835	2	20.417	1.288	.277
	Within groups	9257.383	584	15.852		
	Total	9298.218	586			

EQ: educational qualification; SES: socioeconomic status; RD: residential division; RA: residential area

One-way between-group analysis of variance (ANOVA) was used to investigate the impact of educational qualification, socioeconomic status, residential division, residential area on the global PSQI score (Table 8). Table 8 indicates that there was a statistically significant difference at the .05 level in job satisfaction for the two groups: socioeconomic status ($F= 3.087$, $p<.05$), and residential division ($F= 2.301$, $p<.05$).

Discussion

The primary aim of this study was to investigate the association between sleep quality and internet addiction among Bangladeshi university students. Additionally, the research sought to assess the prevalence of internet addiction, evaluate the sleep quality of students, explore gender differences, and examine the impact of demographic factors on these variables. This study is critical because it provides insight into the growing issue of internet addiction and its adverse effects on sleep quality, especially in the context of increased internet usage during the COVID-19 pandemic.

The significance of this study lies in its contributions to understanding the intricate relationship between internet addiction and sleep quality among university students in Bangladesh. Given the increasing internet usage in the country and the consequent concerns about internet

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addiction, this research offers valuable data that could inform interventions and policies aimed at improving student health and academic performance.

The results revealed that a significant majority of participants exhibited poor sleep quality, with a notable prevalence of moderate to excessive internet addiction. The study revealed a moderate positive correlation between internet addiction and poor sleep quality, indicating that higher levels of internet addiction are associated with worse sleep quality. Gender differences were significant for sleep quality but not for internet addiction, suggesting that while both male and female students are equally likely to develop internet addiction, female students tend to experience poorer sleep quality. Additionally, socioeconomic status and residential division were found to significantly impact both internet addiction and sleep quality.

These findings align with those of previous studies conducted in various populations. Çelebioğlu et al. reported a significant negative correlation between internet addiction and sleep quality among adolescents, supporting our finding of a similar relationship among university students (Çelebioğlu et al., 2020). Karimy et al. also reported that higher levels of internet addiction were associated with poorer sleep quality and diminished health-related quality of life among Iranian medical students, mirroring our results in the Bangladeshi context (Karimy, et al., 2020). Furthermore, Tahir et al. highlighted the exacerbation of internet addiction and its adverse effects on sleep quality during the COVID-19 pandemic, a trend also evident in our study (Tahir et al., 2021). The high prevalence of poor sleep quality and internet addiction observed in this study is consistent with the findings of Biswas et al., Islam et al., and Mamun et al. regarding Bangladeshi university students (Biswas et al., 2022; Islam et al., 2021; Mamun et al., 2020).

Unexpectedly, the study did not find significant gender differences in internet addiction, contrary to findings by Mahmoud et al., which suggested that male students are more prone to internet addiction (Mahmoud et al., 2022). This discrepancy may be due to cultural factors or the homogenization of internet usage patterns among male and female students in Bangladesh. Additionally, the significant impact of socioeconomic status and residential division on internet addiction and sleep quality may reflect disparities in access to resources, stress levels, and lifestyle differences across different regions and social strata.

From a managerial perspective, the findings underscore the need for university administrators and policymakers to address internet addiction and its impact on sleep quality among students. Interventions could include promoting healthy internet usage habits, providing resources for managing stress and mental health, and incorporating sleep education programs into the university curriculum. Additionally, targeted strategies to support students from lower socioeconomic backgrounds and those living in urban areas might be necessary to mitigate the negative effects observed.

Despite its contributions, the study has several limitations that could affect its internal and external validity. The use of self-reported measures for assessing sleep quality and internet addiction may introduce response bias. The cross-sectional design limits the ability to establish causality between internet addiction and sleep quality. Additionally, the study's reliance on

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purposive and convenience sampling methods may limit the generalizability of the findings to all Bangladeshi university students.

Future research should consider longitudinal designs to explore the causal relationship between internet addiction and sleep quality over time. Investigating the underlying psychological and environmental factors contributing to these issues would also be valuable. Moreover, studies could explore the effectiveness of specific interventions aimed at reducing internet addiction and improving sleep quality among students. Expanding the research to include diverse populations, such as students from different academic disciplines or universities in rural areas, would increase the generalizability of the findings.

This study highlights the significant association between internet addiction and poor sleep quality among Bangladeshi university students, emphasizing the need for targeted interventions and policies to address these issues. By understanding the factors influencing internet addiction and sleep quality, stakeholders can develop more effective strategies to support the health and academic success of university students in Bangladesh.

Conclusion

This study provides critical insights into the significant association between internet addiction and poor sleep quality among Bangladeshi university students. The findings revealed a high prevalence of poor sleep quality and moderate to excessive internet addiction, with a moderate positive correlation between the two. While gender differences were observed in sleep quality, they were not significant for internet addiction, indicating the need for gender-specific interventions. The impact of socioeconomic status and residential division on these variables further highlights the influence of demographic factors on students' health and well-being. Despite its limitations, including reliance on self-reported data and a cross-sectional design, this research underscores the urgency for university administrators and policymakers to address these issues through targeted programs and policies. Future research should adopt longitudinal approaches to establish causality and explore the underlying factors contributing to internet addiction and poor sleep quality. Interventions promoting healthy internet use, stress management, and sleep education, particularly for students from lower socioeconomic backgrounds and urban areas, are essential. Ultimately, by understanding and addressing the factors influencing internet addiction and sleep quality, stakeholders can better support the health and academic success of university students in Bangladesh, fostering a healthier and more productive academic environment.

Declaration

The author declares that there are no conflicts of interest and that this study is original work, and is free from any financial or personal bias.

Declaration of generative AI in scientific writing

During the preparation of this work, the author used ChatGPT to assist in drafting and refining various sections of the manuscript. After this tool was utilized, the author reviewed and edited the content as needed and takes full responsibility for the content of the published article.

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