

Original Research Article

Association of internet addiction with sleep quality among university students

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ABSTRACT

Background: Initially an educational and entertainment tool, the internet has become addictive, impairing time management, circadian rhythm and sleep quality. The objective of the study is to observe the frequency of internet addiction (IA) and poor sleep quality among university students of Karachi, Pakistan and to determine the association of IA with sleep quality.

Methods: The cross-sectional study was conducted from 15th July 2025 to 21st January 2026 among 373 university students of Karachi. Students from public and private sector institutions were recruited through convenience sampling. Internet addiction test and pittsburgh sleep quality index assessed IA and sleep quality. The correlation between IA scores and sleep quality scores was assessed using Spearman's correlation test. Univariate and multivariable logistic regression identified predictors of poor sleep (vs. normal sleep) based on $p < 0.25$ selection criterion. Data were entered and analyzed using SPSS version 25.

Results: Of 373 participants (median age 21 years, 71.3% male), the prevalence of internet addiction was found to be 85.7% while 60.3% of our study participants reported poor sleep quality. A statistically significant, weak positive correlation was found between IA and sleep quality, $r_s = 0.295$, $p < 0.001$. Univariate analysis showed female sex (OR=2.18), asthma, other illnesses and IA severity were significantly associated with poor sleep ($p < 0.05$). Multivariable regression identified female sex (AOR=2.29), other illnesses (AOR=2.20) and moderate-to-severe IA (AOR=5.58) as independent predictors of poor sleep.

Conclusions: Internet addiction and poor sleep were highly prevalent, while moderate-to-severe internet addiction was the strongest independent predictor of poor sleep.

Keywords: Internet addiction, Mental health, Sleep quality, University students, Young's internet addiction test

INTRODUCTION

In today's digital era, the use of internet has been tremendously increased to approximately 68% of the total world's population among which 5.24 billion or 63.9 percent were social media users.¹ The use of internet is

highly incorporated in the lives of everyone especially in youth which is said to be normally beneficial for educational, communicational and entertainment purpose, has now taken shape of an addiction.² Internet addiction is described as an excessive time spent online, loss of control on mind during use, resulting in distress which

interferes in daily life functioning, improper time management and disrupted circadian rhythm.³ University students are said to be more at risk because of higher exposure to internet and widespread use of devices in universities and colleges that contribute to internet addiction producing negative impact on educational performance and health.⁴ Moreover, internet addiction may compromise sleep quality because of longer sleep latency and reduced duration of quality sleep.⁵

Pin et al reported that moderate to severe internet addiction was significantly associated with poor sleep quality.⁵ Studies have shown that people, especially young age group, with 7-8 hours of sleep have good physical and mental health, while individuals suffering from poor sleep quality not only suffer from physical health issues and distress but also physiological problems and uncontrolled emotional behavior.⁶

Various studies have shown strong relationship between internet addiction with sleep quality i.e., people having internet addiction have poor sleep quality.⁵ There is over twice the risk of having sleep disturbances in adolescents and young adults with internet addiction, then those of non-addicted individuals.⁷ Sleep required for an adult to have optimal health is of 7 or more hours per night on a regular basis. However, if an adult is having an irregular and less than 7 hours of sleep he will be labelled as sleep deprived.⁸ Sleep deprivation not only weakens immunity but also cause psychological issues such as depression, anxiety, bad mood which cumulatively further leads to chronic diseases like diabetes, obesity, cardiovascular, cancer and alzheimer etc.⁹ It can also decline memory function and loss in cognitive abilities.¹⁰ Furthermore, students with sleep related disorder spent more time on screens and internet sites and are more prone to substance abuse and can develop symptoms of depression.¹¹

Although past researches indicate that excessive internet use may disrupt sleep pattern but the specific association between internet addiction and sleep quality remains insufficiently unexplored among Pakistani university students which is essential for understanding their combined impact on student well-being, for promoting healthier digital habits and better sleep hygiene and for reforming effective prevention and intervention strategies.

Therefore, the study aims to observe the frequency of internet addiction and sleep quality among university students of Karachi and to find out the association of internet addiction with sleep quality that intends to contribute valuable insight on the issue at hand.

METHODS

The cross-sectional study was conducted from 15th July 2025 to 21st January 2026 among university students from four anonymized institutions in Karachi (two public and two private) to maintain institutional privacy and

eliminate organizational bias. Ethical approval was obtained from the Institutional Review Board, Karachi Institute of Medical Sciences (Ref: 20/25/IRB/KIMS).

Students from medical and non-medical disciplines, across undergraduate and postgraduate levels (first year to final year), were recruited using a non-probability convenient sampling technique. This approach was chosen because the study focused on understanding the regional student population patterns, not on auditing individual institutions. The universities therefore served only as geographic locations for sampling. Inclusion criteria were students currently enrolled in undergraduate or postgraduate programs who consented to participate. Data were collected after verbal explanation of the study aim and maintenance of data confidentiality.

Participants with diagnosed chronic psychological conditions like insomnia or depression that may affect their sleeping quality and those unwilling to provide informed consent were excluded from the study. A written informed consent was obtained from all participant prior to participation. Because data collection relied on individual volunteers in open campus areas, without using university records or disrupting academic schedules, additional administrative approvals from each campus were not required, as the study met the criteria for minimal risk research

The sample size was calculated through OpenEpi. Sample size calculator keeping 95% confidence interval, 5% margin of error and 67% 12 expected prevalence of outcome i.e., sleep quality among medical students. The sample size was calculated to be 340, which was increased to 373 in order to strengthen the statistical power and external validity of the results.

The researchers approached the participants in person for the questionnaire-based survey (face to face survey). After a thorough literature search a structured questionnaire was developed for the socio-demographic information of participants. Internet addiction was assessed using the internet addiction test (IAT), a 20-item self-report instrument designed to evaluate symptoms of problematic internet use. Respondents rated the frequency of behaviours and feelings associated with internet use on a 6-point Likert scale, ranging from 0 (not applicable) to 5 (always).

The IAT yields a total score between 20 and 100, with higher scores indicating greater severity of internet addiction. The established IAT cut-off scores stratify individuals into four categories of internet addiction severity: scores below 30 indicate absence of addiction; 31–49 suggest mild addiction; 50–79 denote moderate addiction; and 80–100 signify severe addiction.¹³ Similarly, sleep quality was assessed using a standardized, self-rated questionnaire PSQI, designed to measure subjective sleep quality and differentiates between poor and normal sleep. The PSQI consists of 19

items divided into seven components such as subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction. Each component ranges from 0 (no difficulty) to 3 (severe difficulty) which are then collectively added to calculate a global PSQI score. The total PSQI score ranges from 0 to 21 and a score >5 be considered as a significant sleep disturbance. The cutoff value for poor and normal sleep is therefore taken as 5 where participants scoring >5 are rated as having poor or disturb sleep.¹⁴⁻¹⁶

Statistical analysis

Data were entered and analyzed using SPSS version 25. For the categorical variables, data were presented as frequencies and percentages. The quantitative data were tested for normality using Shapiro-Wilk test and were found deviated from normal distribution. Hence, numerical data (age, IA scores and sleep quality scores) were described as median and range. Further, the IA scores were categorized as the standardized cutoffs (described above) however, moderate and severe IA were merged together as severe IA showed expected count less than 5 in more than 20% cells.

The linear regression could not be performed because both variables were significantly skewed (Shapiro-Wilk $p<0.05$), violating the assumptions of normality of residuals and linearity. These violations persisted despite transformation attempts (log, square root). Univariate binary logistic analysis was used to compares the socio-demographic variables and IA between normal and poor sleep quality, with $p<0.05$ considered as statistically significant. Further a multivariable logistic regression model was performed to identify independent predictors of poor sleep (vs. normal sleep) based on $p<0.25$ selection criterion. The correlation between IA scores and Sleep quality scores was accessed using Spearman's correlation test. Results were reported as r_s and p value, with correlation significant at the 0.01 level (2-tailed).

RESULTS

The socio-demographic data of the 373 participants is described in table 1. Normality was checked through the Shapiro-Wilk test of normality. Results for the age (in years) data, internet addiction scores and the sleep quality score were not normally distributed ($p<0.001$, $p=0.017$ and $p<0.001$ respectively). The median age in years was calculated to be 21.00 with a range from 17 to 32 years. The surveyed sample was predominantly male (71.3%) and unmarried (91.7%).

Most were undergraduate students (91.4%), nearly equal split between medical and non-medical programs. The median scores of IA and sleep quality were 49.00, range 6 - 83 and 6.00, range 0 - 17 respectively. The prevalence of internet addiction was found to be 85.7% while 60.3%

of the study participants reported poor sleep quality. The categorized IA quality scores showed majority having moderate to severe internet addiction (48.2%).

Table 2 compares the difference of independent variables with normal and poor sleep quality (dichotomized sleep quality scores at 5). The median age was 21.00 years in both the groups but, slightly older individuals experienced poor sleep (range, 17-29 vs 17-32) however, the difference was statistically insignificant ($p=0.816$). The univariate analysis shows that females were twice more likely to have poor sleep as compared to males (OR=2.177; 95% CI: 1.334 – 3.554, $p=0.002$). Education level showed some trend as the postgraduate participants had higher odds of poor sleep compared to undergraduates (OR=2.090; 95% CI: 0.912 – 4.786, $p=0.081$).

Regarding history of any illness, asthma ($p=0.029$) and other illnesses ($p=0.050$) were found significant. The median IA scores were significantly higher among people with poor sleep quality (50.20, range: 11-83) showing a strong association of IA with sleep quality ($p<0.001$). According to the univariate analysis, poor sleep was found to be increasing IA severity. Compared to participants with no IA, those with mild IA had over twice the odds of poor sleep (OR=2.18; 95% CI: 1.13 – 4.21, $p=0.020$), while those with moderate-to-severe IA had nearly five-and-a-half times higher odds (OR=5.50, 95% CI: 2.85 – 10.63, $p<0.001$). Other variables did not show any significant difference ($p>0.05$ for all).

Spearman's rank-order correlation performed between Internet Addiction (IA) and Sleep quality scores found a statistically significant, weak positive correlation, $r_s=0.295$, $p<0.001$ (Table 3). Participants with more severe IA had higher sleep scores indicating poor sleep quality. A Spearman's correlation test was also performed between age and total sleep score that revealed no significant relationship ($r_s=0.038$, $p=0.465$). While for age and total internet addiction score indicated a statistically significant but weak positive correlation ($r_s=0.20$, $p<0.001$) suggesting that older participants of our study had slightly higher levels of internet addiction, but age may not be only factor involved.

Table 4 shows the multivariable logistic regression model that was performed to identify independent predictors of poor sleep (vs. normal sleep) based on $p<0.25$ selection criterion, adjusting for sex, education level, history of any illness and IA categories.

Authors did not found education level significantly associated with poor sleep ($p=0.709$) however, females (AOR=2.287; 95% CI: 1.331–3.931, $p=0.003$), other illnesses (AOR=2.197; 95% CI: 1.292–3.737, $p=0.004$) and moderate to severe IA (AOR=5.575; 95% CI: 2.768–11.229, $p<0.001$) were significant independent predictors of poor sleep.

Table 1: Sociodemographic profile of the participants (n=373).

Variable	Category	Frequency (N)	(%)
Age (in years)	Median (Range)	21.00 (17-32)	
Sex	Male	266	71.3
	Female	107	28.7
Religion	Islam	342	91.7
	Others	31	8.3
Marital status	Married	31	8.3
	Unmarried	342	91.7
Monthly household income	Below 50k	65	17.4
	51-80k	69	18.5
	81-100k	78	20.9
	Above100k	161	43.2
Residence	Urban	233	62.5
	Rural	140	37.5
Education level	Undergraduate	341	91.4
	Postgraduate	32	8.6
Educational program	Medical	204	54.7
	Non-medical	169	45.3
History of any illness	None	202	54.2
	Diabetes	11	2.9
	Hypertension	7	1.9
	Asthma	17	4.6
	Migraine	19	5.1
	Others	117	31.4
Internet addiction	Median (range)	49.00 (6-83)	
	No IA (0–30)	53	14.2
	Mild IA (31–49)	140	37.5
	Moderate to Severe IA (50–100)	180	48.2
Sleep quality		6.00 (0-17)	
	Normal sleep (6-21)	148	39.7
	Poor sleep (0-5)	225	60.3

Table 2: Univariate analysis of predictors of poor sleep (vs. normal sleep): binary logistic regression model (n=373).

Variables	Category	Sleep quality N (%)		OR	95% CI	P value
		Normal sleep n=148	Poor sleep n=225			
Age (in years)	Median (range)	21.00 (17-29)	21.00 (17-32)			0.816*
Sex	Male	119 (44.7)	147 (55.3)	2.177	1.334, 3.554	0.002
	Female	29 (27.1)	78 (72.9)			
Religion	Islam	134 (39.2)	208 (60.8)	0.782	0.373, 1.639	0.515
	Others	14 (45.2)	17 (54.8)			
Marital status	Married	10 (32.3)	21 (67.7)	0.704	0.322, 1.541	0.380
	Unmarried	138 (40.4)	204 (59.6)			
Monthly household income	Below 50k	23 (35.4)	42 (64.6)	Reference		
	51-80k	28 (40.6)	41 (59.4)	0.802	0.398, 1.614	0.536
	81-100k	36 (46.2)	42 (53.8)	0.639	0.325, 1.256	0.194
	above100k	61 (37.9)	100 (62.1)	0.898	0.493, 1.636	0.724
Residence	Urban	88 (37.8)	145 (62.2)	0.809	0.528, 1.240	0.331
	Rural	60 (42.9)	80 (57.1)			
Education level	Undergraduate	140 (41.1)	201 (58.9)	2.090	0.912,	0.081

Continued.

Variables	Category	Sleep quality N (%)		OR	95% CI	P value
		Normal sleep n=148	Poor sleep n=225			
	Postgraduate	8 (25.0)	24 (75.0)		4.786	
Educational program	Medical	84 (41.2)	120 (58.8)	1.148	0.756, 1.744	0.516
	Non-medical	64 (37.9)	105 (62.1)			
History of any illness	None	95 (47.0)	107 (53.0)	Reference		
	Diabetes	6 (54.5)	5 (45.5)	0.740	0.219, 2.502	0.628
	Hypertension	3 (42.9)	4 (57.1)	1.184	0.258, 5.425	0.828
	Asthma	3 (17.6)	14 (82.4)	4.143	1.155, 14.860	0.029
	Migraine	5 (26.3)	14 (73.7)	2.486	0.863, 7.160	0.092
	Others	36 (30.8)	81 (69.2)	1.998	1.236, 3.229	0.05
Internet Addiction (IA)	Median (Range)	42.00 (6-82)	50.20 (11-83)			<0.001*
	No IA (0-30)	35 (66.0)	18 (34.0)	Reference		
	Mild IA (31-49)	66 (47.1)	74 (52.9)	2.180	1.129, 4.211	0.020
	Moderate to Severe IA (50-100)	47 (26.1)	133 (73.9)	5.502	2.848, 10.631	<0.001

* Mann-Whitney U Test

Table 3: Spearman's correlation between internet addiction and sleep quality scores (n=373).

Test statistic	Variable	Correlation coefficient (r _s)	Significance (2-tailed)
Spearman's rho	Total IA score vs. total sleep score	0.295	< 0.001

Table 4: Multivariable binary logistic regression predicting poor sleep (vs. normal sleep).

Predictors	Category	B (SE)	Wald	P value	AOR	95% CI (for AOR)
Sex	Male	Reference				
	Female	0.827 (0.276)	8.973	0.003	2.287	1.331, 3.931
Education level	Undergraduate	Reference				
	Postgraduate	0.176 (0.471)	0.139	0.709	1.192	0.474, 3.001
History of any illness	None	Reference				
	Diabetes	-0.699(0.683)	1.049	0.306	0.497	0.130, 1.894
	Hypertension	-0.228(0.826)	0.076	0.783	0.796	0.158, 4.018
	Asthma	1.225 (0.692)	3.134	0.077	3.404	0.877, 13.210
	Migraine	0.827 (0.581)	2.024	0.155	2.286	0.732, 7.142
	Others	0.787 (0.271)	8.448	0.004	2.197	1.292, 3.737
IA categories	No IA (0-30)	Reference				
	Mild IA (31-49)	0.691 (0.355)	3.796	0.051	1.996	0.996, 4.001
	Moderate-Severe IA (50-100)	1.718 (0.357)	23.138	<0.001	5.575	2.768,11.229
Constant		-1.016 (0.446)	5.195	0.023	0.362	

DISCUSSION

The cross-sectional study found a high burden of Internet addiction i.e., 85.7% and 60.3% prevalence of poor sleep

quality. A statistically significant positive correlation was found between IA scores and sleep quality scores ($r_s=0.295$, $p<0.001$), indicating that greater internet addiction severity is associated with poorer sleep quality.

According to the Univariate analysis moderate-to-severe IA had significantly increased odds of poor sleep (OR=5.50), the results strengthened after adjusting for significant covariates (AOR=5.58). The high prevalence of internet addiction observed in our study is contrary to a recent study of our region, revealing only 20.3% prevalence of internet addiction among university students which was significantly associated with low socioeconomic status.¹⁵ However, authors were consistent with findings from a 2025 systematic review and meta-analysis comprising over 128,000 participants across 38 countries that the global prevalence of internet addiction among university students was 41.84% but they found significant variances in prevalence regarding socioeconomic status while IA was more in males.¹⁷ This may justify our results as majority of our participants had higher monthly household income and were males. Our figure of 85.7% also reflects the intensified dependence on digital devices among Pakistani students, both for academic and social purposes.

Auhthors found more than 60% prevalence of poor sleep quality in our sample which aligns with previous research on university students of our country, that a significant proportion of medical (67.3%) and non- medical (50.4%) college students experience inadequate sleep, due to irregular schedules, academic pressure and excessive technology use.¹⁸ Similarly, a 2021 study by Nizamuddin et al, revealed 71% prevalence of poor sleep quality among undergraduate college and university students of Karachi mainly owing to increased screen time.¹⁹

Female students were significantly twice more likely to report poor sleep quality in the study while multivariable model confirms female sex as a strong independent predictor of poor sleep quality. This is consistent with existing literature potentially due to biological and hormonal differences, higher rates of anxiety and depression and greater sensitivity to stress. Moreover, in context to IA, social media interactions in female students may lead to emotionally driven psychological arousal before sleep, further disrupting sleep onset.^{6,20} Majority of students did not have any history of illness however, those having asthma and other illness had poor sleep quality. This is expected and well-supported in the clinical literature that chronic conditions including respiratory illnesses and headache disorders are strongly predictive of short sleep duration and poor sleep quality, due to nocturnal pain, symptom exacerbation and/or disease-related anxiety.^{21,22} The statistically significant positive correlation between IA and sleep quality scores ($rs=0.295$, $p<0.001$) is supported by a growing body of literature. Lin et al found a significant correlation between quality of sleep and total IAT scores, showing worse sleep quality associated with moderate to severe internet addiction among female students of Taiwan.⁵ Similarly, results from a 2019 meta-analysis demonstrated the odds of sleep disturbances twice as high among internet-addicted individuals compared to non-addicted peers.⁷ Several studies across the country also

found internet addiction as a strong predictor of sleep deprivation and psychological distress in university students.^{19,23} This high correlation might be due to the evening use of blue light emitting electronic devices that prolongs sleep latency and reduces REM sleep. The blue light is known to suppress melatonin secretion, thereby delaying sleep onset and reducing total sleep duration.²⁴ Moreover, the secretion of melatonin can also be reduced by excessive release of adrenaline, caused by watching thrilling content on television and mobile.¹⁹ Similarly, entertaining continuous posts on social media releases dopamine that leads to addiction, ultimately hindering sleep hormone production.¹⁹ Proper brain functioning requires proper sleep. Therefore, bedrooms should be devoid of internet, televisions and other screens to circumvent IA, secure good quality sleep, improves cognition and learning capacity, ultimately leading to healthy mental and physical health.

As students' progress academically, their internet use for research, social connectivity and professional development tends to increase.²⁵ We found postgraduate students had higher odds of poor sleep in univariate analysis but were not significant and this association did not persist after adjusting for confounders in multivariable analysis suggesting the effect was mediated by other factors such as IA severity or female sex. This may explain our finding that older participants had slightly higher IA scores ($rs=0.20$, $p<0.001$). Notably, age showed no significant correlation with sleep quality, suggesting that internet addiction is the more proximate determinant of sleep disturbances in this population.

Limitations

Some limitations worth acknowledgement as the cross-sectional design impedes causal inference while, the non-probability sampling strategy limits generalizability. Additionally, reliance on self-reported data may introduce recall bias. However, future longitudinal studies employing objective measures like actigraphy to evaluate sleep disorders, including insomnia and circadian rhythm disorders plus digital screen-time logging for objective time tracking on screen would substantially strengthen the findings.

CONCLUSION

Internet addiction and poor sleep quality were highly prevalent and significantly related among university students in Karachi. Moderate-to-severe internet addiction was the strongest independent predictor of poor sleep quality followed by female sex and other illnesses. There is a need of awareness programs deemed to internet addiction and structured sleep health education campaigns within universities. Moreover, to safeguard the academic performance and overall well-being, interventions in education system with controlled internet use and education strategies aiming good sleep quality habits should be developed.

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