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Relationship between internet addiction and sleep quality in the students of Ilam University of Medical Sciences in 2023

Mohsen Jalilian [1]✉, **Reza Pakzad** [2], **Amin Mirzaei** [1], **Malihe Saeedfiroozabadi** [3], **Hadis Maleki** [1], **Parisa Shahbazi** [1], **Ali Khorshidi** [4,2], **Roghayeh Chenary** [1]

[1] Department of Public Health, Faculty of Health, Ilam University of Medical Sciences, Ilam, Iran
[2] Department of Epidemiology, Faculty of Health, Ilam University of Medical Sciences, Ilam, Iran
[3] The Persian Gulf Tropical Medicine Research Center, the Persian Gulf Biomedical Sciences Research Institute, Bushehr University of Medical Sciences, Bushehr, Iran
[4] Health and Environment Research Center, Ilam university of medical sciences, Ilam, Iran

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✉ ***Correspondence to:***
Mohsen Jalilian
Department of Public Health, Faculty of Health, Ilam University of Medical Sciences, Ilam, Iran

Email:
jalilian91@yahoo.com

A B S T R A C T

Introduction: Today, internet usage has become an integral part of daily life, but excessive use can harm sleep quality. This study aims to explore the relationship between internet addiction and sleep quality among students at Ilam University of Medical Sciences in 2023.

Material & Methods: In 2023, 400 students from Ilam University of Medical Sciences participated in this study. They were selected using simple random sampling and met the study criteria. Data were collected through Young's Internet Addiction Test (IAT) and the Pittsburgh Sleep Quality Index (PSQI). Simple and multiple regression analyses were conducted with a significance level of $\alpha \leq 0.05$.

Results: The findings showed that 320 (80%) of students exhibited mild to severe internet addiction, with an average total sleep quality falling within the poor range (6.30 ± 2.51). Subjective sleep quality was particularly poor (2.03 ± 0.662) compared to other dimensions ($p > 0.05$). Simple linear regression revealed significant associations between mild (coefficient = 1.03; $p = 0.002$) and moderate (coefficient = 2.05; $p < 0.001$) internet addiction and poor total sleep quality, compared to normal individuals. Additionally, graduate students had better sleep quality than undergraduates (coefficient = -1.03; $p = 0.016$). Multiple regression analysis, adjusted for educational level, confirmed the association between mild (coefficient = 0.98; $p = 0.003$) and moderate (coefficient = 1.97; $p < 0.001$) internet addiction and poor total sleep quality.

Conclusion: Internet addiction is linked to poor sleep quality among Ilam University of Medical Sciences students, especially undergraduates. It underscores the need for interventions to raise awareness about internet addiction and its detrimental effects on sleep quality.

Keywords: Sleep Quality, Internet Addiction, Students

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Introduction

By facilitating access to information and improving communication, the Internet is involved in many people's routine activities (1, 2). Therefore, nowadays, using the internet is an integral part of daily life activities (3). The use of the internet has increased significantly. This is due to several factors, including the ease of internet access, the ability to connect to the internet with multiple devices, and the affordability of internet services (4). The growth of internet use has occurred in different age groups, but it is more obvious among teenagers and young adults (3, 5, 6).

While the internet has provided advantages and conveniences for daily life, excessive use can be detrimental to individuals, disrupting their family, social, academic, and occupational relationships (7). The World Health Organization (W.H.O.) has expressed concern about the public health relevance of physical and mental conditions associated with excessive use of the Internet and other communications, gaming platforms, or digital technologies (8). Evidence indicates that with the increasing prevalence of internet usage, internet addiction (IA) is recognized as one of the emerging health issues in the technology era (5). The prevalence of IA worldwide has been reported to be approximately 14.22% (9). In the Middle East region, Iran has the highest prevalence rate. IA among Iranian students is reported to be 13.51% (2).

According to Griffiths, IA is a behavioral problem that negatively affects individuals' daily functions (10). The terms problematic and pathological internet use are considered synonymous with IA disorder. This disorder is distinguished by uncontrolled internet usage and a diminished interest in participating in other activities. Affected individuals may experience feelings of anger, tension, or depression when they do not have access to the internet. Moreover, IA has adverse effects on life domains such as education, professional performance, and social relationships (11). Although IA is not included in the International Classification of Diseases (ICD-11 - Mortality and Morbidity Statistics, n.d.) and the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), there is evidence that digital technology can be addictive and cause maladaptive mental health consequences in susceptible individuals (12). Several studies have reported impaired sleep quality as a result of IA (11, 13-15). Sleep is a basic need, and poor sleep quality can impair cognitive skills, learning, and emotional regulation (16). Both the quantity and quality of sleep may greatly affect mood and mental well-being. Especially in young people, poor sleep quality can also impact academic performance (16, 17). Earlier studies have reported the prevalence of poor sleep quality among students to be between 30% and 70% (18-20). In Iran, the prevalence of poor sleep quality has also been reported to be 70% (21).

Excessive internet use disrupts the sleep quality of students and can lead to physical and psychosocial problems. This impact can result in decreased concentration and decision-making abilities for daily activities and academic progress (22, 23). Given the increasing growth of internet usage in Iran, especially among students, this study aimed to investigate the relationship between IA and sleep quality among students at Ilam University of Medical Sciences.

Materials and methods

The characteristics of participants

The current research was a cross-sectional study conducted on 400 students enrolled at Ilam University of Medical Sciences pursuing degrees in various fields, including health sciences, paramedicine, nursing, midwifery, general medicine, and general dentistry during the academic year 2022-2023. The sampling method employed was proportional sampling, where samples were selected from five faculties based on the number of students in each faculty. Students who met the inclusion criteria were included in the study after providing informed consent. Inclusion criteria comprised being enrolled in education, having no medical problems

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that cause sleep disturbances, and having access to the Internet 24 hours per day. This study was approved by the Research Ethics Committee of Ilam University of Medical Sciences and Health Services with the code IR.MEDILAM.REC.1396.61.

Instrument

The data collection instrument was a questionnaire completed as a self-report. The first part comprised demographic variables such as age, gender, marital status, residence status, and education level. The second part was the Pittsburgh Sleep Quality Index (PSQI). This questionnaire, developed by Buysse DJ in 1989, assesses sleep quality over the last month. The PSQI consists of 19 self-rated questions and evaluates overall sleep quality along with 7 subdomains: subjective sleep quality, sleep latency (the time from going to bed until falling asleep), sleep duration, habitual sleep efficiency (the ratio of actual sleep time to time spent in bed), sleep disturbance, use of sleep medication, and daytime dysfunction. The total score of the index ranges from 0 to 21, with a score of 6 and above indicating poor sleep quality. The subdomains are scored from 0 to 3, with a higher score indicating poorer sleep quality (24).

This questionnaire has been utilized in numerous studies, and its validity and reliability have been confirmed (25, 26). The third part consisted of Young's Internet Addiction Test (IAT), developed by Young in 1998. It comprises 20 questions designed to assess the presence of Internet Addiction (IA) in individuals. The questions in this questionnaire are graded using the 5-point Likert method. Scores range from 0 to 100, with IA severity categorized as follows: normal (0-30), mild (31-49), moderate (50-79), and severe (80-100) (27).

Data analysis

Data were analyzed using SPSS version 16 software. Simple linear regression and multiple linear regression tests were employed for analysis. The significance level was set at $\alpha \leq 0.05$.

Results

The average age of students was 22.42 ± 3.19 years. The majority of them were women (55.75%), and 91.75% were single. According to the findings, 80% of the students exhibited IA. More details are provided in Table 1.

Table 1. Demographic Characteristics and Internet Addiction of Participants.

Variables		N (%)	95% CI
Gender	Male	177 (44.25)	39.36 - 49.14
	Female	223 (55.75)	50.86 - 60.64
Marital status	Single	367 (91.75)	89.04 - 94.46
	Married	33 (8.25)	5.54 - 10.96
Residency	Living in the dormitory	292 (73)	68.63 - 77.37
	Living in private home	108 (27)	22.63 - 31.37
Grade	Bsc	246 (61.5)	56.71 - 66.29
	Master	44 (11)	7.92 - 14.08
	M.d	110 (27.5)	23.11 - 31.89
Internet addiction	Normal	80 (20)	16.06 - 23.94
	Mild	200 (50)	45.08 - 54.92
	Moderate	119 (29.75)	25.25 - 34.25
	Sever	1 (0.25)	-0.24 - 0.74

BSc: bachelor; MSc: master; M.D: general medicine/ general dentistry; CI: confidence interval

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As depicted in Table 2, the total average sleep quality of students was 6.30 ± 2.51. Among the dimensions of sleep quality, the average score for subjective sleep quality was particularly poor (2.03 ± 0.662) compared to other dimensions. However, the average scores for the other dimensions were relatively good. Notably, the average score for the dimension of Use of sleep medication (0.8116 ± 0.77) was lower than that of other dimensions, indicating students' reluctance to use sleep medication.

Table 2. Mean and Standard Deviation of Global PSQI Score and Subscales.

Variables	N	Mean±SD	CI 95%
Global PSQI score	384	6.30 ± 2.51	6.04 - 6.56
Subjective sleep quality	400	2.03 ± 0.662	1.98 - 2.11
Sleep latency	393	0.89 ± 0.83	0.8 - 0.97
Sleep duration	400	0.6825 ± 0.95	0.58 - 0.78
Habitual sleep efficiency	399	0.9165 ± 0.23	0.9 - 0.94
Sleep disturbances	393	0.7484 ± 0.51	0.7 - 0.8
Use of sleep medication	400	0.21 ± 0.56	0.15 - 0.26
Daytime dysfunction	398	0.8116 ± 0.77	0.73 - 0.88

Table 3 demonstrates the association between total sleep quality and IA, as well as other determinants. Based on the results of simple linear regression, compared to individuals categorized as normal, those with mild (coefficient = 1.03; p = 0.002) and moderate (coefficient = 2.05; p < 0.001) IA exhibited a significant association with overall poor sleep quality. Additionally, graduate students demonstrated better sleep quality compared to undergraduate students (coefficient = -1.03; p = 0.016). However, this association was not significant for other demographic variables (p > 0.05).

Table 3. Correlation between Sleep Quality and Internet Addiction, and Other Determinants in the Simple Linear Regression Model.

variables		Coefficient	p-value
IA	Normal	Reference	1
	mild	1.03 (0.39 - 1.67)	0.002*
	Moderate	2.05 (1.34 - 2.75)	<0.001*
	sever	2.66 (-2.13 - 7.44)	0.276
Gender	Male	Reference	1
	Female	-0.22 (-0.73 - 0.29)	0.389
Age (yrs. old)		-0.01 (-0.09 - 0.06)	0.715
Marital	Single	Reference	1
	Married	-0.12 (-1.05 - 0.81)	0.798
Residency	Dormitory	Reference	1
	Private home	-0.29 (-0.86 - 0.27)	0.309
Education level	BSc	Reference	1
	Master	-1.03 (-1.87 - -0.19)	0.016*
	M.D	-0.12 (-0.7 - 0.45)	0.671
Average		0.12 (-0.13 - 0.36)	0.346

*: significant at 0.05

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IA: Internet Addiction; BSc: bachelor; MSc: master; M.D: general medicine/ general dentistry

As illustrated in Table 4, when adjusted for educational level, mild (coefficient = 0.98; p = 0.003) and moderate (coefficient = 1.97; p < 0.001) IA showed a significant association with overall poor sleep quality based on the multiple linear regression model. However, when additional variables such as age, gender, marital status, and type of residence were included in the model, the coefficients changed to (coefficient = 1.04; p = 0.002) for mild IA and (coefficient = 2.04; p < 0.001) for moderate IA, respectively.

Table 4. Correlation between Overall Sleep Quality and Internet Addiction Adjusted for Determinants by Multiple Linear Regression Model.

Models	Addiction	Coefficient	P-value
1. Crude model	Normal	Reference	1
	Low	1.03 (0.39 - 1.67)	0.002*
	Moderate	2.05 (1.34 - 2.75)	<0.001*
	Intensive	2.66 (-2.13 - 7.44)	0.276
2. Adjusted model	Normal	Reference	1
	Low	0.98 (0.34 - 1.63)	0.003
	Moderate	1.97 (1.25 - 2.68)	<0.001*
	Intensive	2.51 (-2.28 - 7.30)	0.304
3. Full adjusted model	Normal	Reference	1
	Low	1.04 (0.40 - 1.69)	0.002
	Moderate	2.04 (1.32 - 2.76)	<0.001*
	Intensive	2.36 (-2.44 - 7.16)	0.334

2. Adjusted for education
3. Adjusted for gender, age, marital status, residency, education level

Discussion

IA is prevalent among young people and is associated with negative health consequences (28). This cross-sectional study examined the relationship between IA and sleep quality among students at Ilam University of Medical Sciences. The prevalence of IA was found to be high. In a meta-analysis by Zhang et al., it was revealed that the prevalence of IA among students is "almost 5 times higher than that of the general population" (29). With the dramatic increase in the number of Internet users worldwide, reports indicate that 43% of adults globally own smartphones, leading to excessive Internet use becoming a significant social issue, particularly among young individuals (30). Therefore, considering the easy access and growing use of the Internet, the high prevalence of IA among the students in this study seems logical.

Moreover, in this study, students' subjective sleep quality was found to be poorer compared to other dimensions. Studies conducted in Asia and Europe have demonstrated a correlation between subjective sleep quality and high blood pressure (31-33). As sleep disorders can act as both a consequence and a catalyst for other medical conditions, it becomes imperative to modify sleep patterns to prevent the onset of diseases (34).

The findings revealed that both mild and moderate IA were significantly associated with overall sleep quality. Individuals experiencing any degree of IA

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exhibited poorer sleep quality compared to those without IA. Moreover, individuals with moderate addiction demonstrated even poorer average sleep quality than those with mild IA. This observation is supported by the study of Wang et al., where the use of Internet games was linked to decreased sleep quality and increased psychological distress (35).

Additionally, a meta-analysis investigating the association between IA and sleep disorders, sleep problems, and decreased sleep duration found a significant odds ratio among Internet addicts (36). Tokiya et al. also found that high IA scores were correlated with a high prevalence of sleep disorders in both boys and girls (28). Similar results were obtained in the studies conducted by Tan et al., Chen et al., and Jiang et al. (37-39). Jahan et al. demonstrated that students with moderate and severe IA are at a higher risk of poor sleep quality compared to those without IA (40).

It appears that IA can disrupt students' sleep quality and daily functioning, potentially impacting their ability to fulfill academic requirements. Therefore, implementing intervention programs and strategies to reduce IA and improve students' sleep quality can be beneficial (22).

In our study, it was observed that master's degree students exhibited better sleep quality compared to undergraduate students. This finding is consistent with the study by Norbury et al., where poor sleep quality was found to be more common among first-year university students (41). Previous research has highlighted that good sleep quality serves as an important predictor of academic progress (42-44).

Given that graduate students tend to spend less time on the internet and demonstrate better sleep quality compared to their undergraduate counterparts, it is reasonable to expect that they would be more successful in completing their assignments and achieving better academic performance.

Conclusion

The findings of this study highlight that IA can disrupt circadian rhythm function and sleep quality among university students. Interestingly, our findings suggest that while the scientific use of the Internet is more prevalent among individuals with a higher level of education, addictive and problematic Internet use is higher among undergraduate students. Therefore, it is recommended that future studies focus on implementing intervention programs aimed at increasing students' awareness of the adverse effects of IA on sleep quality and academic progress. Such interventions could play a crucial role in mitigating the negative impact of IA and promoting healthier Internet usage habits among university students.

Limitations

Our study had several limitations that should be acknowledged. Firstly, despite demonstrating a correlation between IA and subjective sleep quality, the cross-sectional nature of the study prevents definitively establishing causality between IA and sleep quality. Future longitudinal studies are needed to better understand the temporal sequence of these effects.

Secondly, while we examined the correlation between IA in general and sleep quality, further research is required to investigate whether specific types of IA, such as internet gaming or social networking, have a more pronounced impact on sleep quality.

Thirdly, the variables in our study were assessed via self-report measures, which may introduce bias due to social desirability, despite assurances of confidentiality. Future studies could benefit from utilizing objective measures to complement self-report data.

Lastly, the participants in this study were students of the University of Medical Sciences, whose sleep quality may be compromised due to their participation in evening and night-time internships. Therefore, we cannot confidently generalize the findings of this study to students of other majors.

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Conducting studies involving students from diverse academic backgrounds could provide a more comprehensive understanding of the relationship between IA and sleep quality across different student populations.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this study.

Authors' contributions

MJ and RC contributed to the study design and implementation. HM and PS were involved in data collection. RP and AK conducted the statistical analysis. AM and MS critically revised the manuscript.

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