



Investigating Internet Addiction and Sleep Quality Correlation Among Students of Isfahan University of Medical Sciences in 2021

Mohammad Javad Tarrahi¹ and Mahdi Rezaei Kahkha Zhaleh^{1,*}

¹Department of Epidemiology and Biostatistics, School of Public Health Sciences, Isfahan University of Medical Sciences, Isfahan, Iran

*Corresponding author: Department of Epidemiology and Biostatistics, School of Public Health Sciences, Isfahan University of Medical Sciences, Isfahan, Iran. Email: m.kahkha@hlth.mui.ac.ir

Received 2022 May 01; Revised 2022 July 17; Accepted 2022 August 02.

Abstract

Background: The quality of sleep plays an important role in physical development, as well as maintaining physical and mental health. Approximately 20% of Iranian students suffer from Internet addiction, and 56% suffer from insomnia.

Objectives: This study aimed to investigate the relevance of Internet addiction and sleep quality among Isfahan University of medical sciences students.

Methods: This cross-sectional study was conducted as a questionnaire at the Medical Sciences University of Isfahan. The collected data had three components: (1) Demographic information, (2) sleep quality with the Pittsburgh Sleep Quality Index (PSQI), and (3) amount of internet use with a questionnaire of 20 Internet Addiction Tests (IAT). Logistic regression was used to find any association between Internet Addiction and Sleep quality.

Results: A total of 562 female and male students participated in the study, with a mean age of 21.41 ± 1.87 . Internet users with moderate and mild addiction had poorer sleep quality than those with normal and severe Internet addiction. Logistic regression analysis showed an association between Internet addiction scores and sleep quality (OR = 1.035: 1.02, 1.04, $P < 0.001$). In addition, poor sleep quality was also predicted by the subgroups "excessive internet use" and "anticipation".

Conclusions: The relationship between internet addiction and sleep quality was significantly negative. Universities and all educational institutions can use it to control the effects of Internet abuse and the quality of sleep of students.

Keywords: Sleep Quality, Internet Addiction, Students, Pittsburgh Sleep Quality Index, Internet Addiction Test

1. Background

There has been a dramatic increase in the use of electronic devices, such as computers and smartphones, which, while they provide obvious and extraordinary benefits for their users, can also have negative health effects if used excessively (1). This lack of control over the use of the Internet is considered to be maladaptive behavior (2). There are several types of addictions, and internet addiction is one of them. It is defined as excessive or poorly controlled preoccupations, urges, or behaviors related to computer use and internet access that result in impairment or distress (3). The problem of internet addiction has become a global health concern (1, 4). Internet addiction is reported to be prevalent in Iran at a rate of 20% (5) and at a rate of 23% (6) in another study. There is a prevalence of internet addiction among male and female students in Iran at 33.8% and 20%, respectively (7). Sixty-eight point eighty-three percent and 26.95% of students and graduates in the fields of epidemiology, clinical sciences, and basic sciences

in Iran were moderate and mild internet users, respectively, indicating a high risk of severe addiction (8). Meanwhile, Iranian internet users have increased from zero percent in 1990 to 70% in 2018 (9). Furthermore, the rate of internet growth in Iran is estimated to be 20 percent between 2006 and 2015 (5). Moreover, the increasing popularity of mobile phones and technological advancements have resulted in using electronic devices (10). In particular, young people use mobile phones before sleeping at night, leading to sleep disorders and late sleep (11). Internet use as one of the most important factors influencing sleep quality has become a major concern. One of the consequences of internet addiction is its effect on sleep quality. Sleep quality is defined by Kline as one's satisfaction with the sleep experience, incorporating aspects such as sleep initiation, sleep maintenance, sleep quantity, and refreshment upon waking (12). Studies have been conducted in Iran and around the world about the relationship between internet addiction and sleep quality which have re-

ported a relationship between the Internet and sleep quality (13, 14). A study by Nayak et al. in 2021 among medical students in India found that people with internet addiction had lower sleep quality (15). The study conducted by Wang et al. on 3,738 students in China shows that internet addicts have poorer sleep conditions than normal internet users (4). Another study by Arzani-Birgani et al. in Iran also substantiates this claim (16). Sleep quality can significantly impact a person's physical and mental performance (17). Also, poor sleep quality can cause a decrease in students' learning and academic performance (18). By investigating the relationship between internet addiction and sleep quality, we may be able to improve students' academic performance.

2. Objectives

In this study, we will try to establish a reliable source to minimize inappropriate use of the Internet to facilitate the improvement of sleep quality among students in order to examine: (1) The relationship between sleep quality and internet addiction in students, and (2) the changes in sleep quality among students with different levels of internet addiction.

3. Methods

3.1. Type of Study Design and Selection of Participants

In this study, a cross-sectional design was used. Students at the Isfahan University of Medical Sciences in Iran have been selected as the intended community for this study. The questionnaires were completed between August and September of 2021. It is important to note that the participants were fully informed at the beginning of the questionnaire that they had the complete authority to fill out or not fill out the questionnaire. It was necessary to include participants who were (1) studying at the undergraduate and general doctoral levels (basic sciences) at Isfahan University of Medical Sciences and Medical Services, (2) attempting to fill out the questionnaire, and (3) completing the questionnaire completely. In accordance with self-reports, individuals with different levels of psychiatric disorders have been excluded from the study. Ethical approval was obtained from the Ethics Committee of Isfahan University of Medical Sciences (IR.MUI.RESEARCH.REC.1400.139). A total of 562 cases participated in this study. Multi-stage sampling was used in this study. In this case, colleges were selected as categories, and a college was located at each level. Then, in the next stage, the degrees of education in different educational sections (including undergraduate courses, Basic medical students) were placed in the next

layer. In the following, different entries were placed in each section. After that, different entries were placed in each section. Finally, a number of last-layer students with an emphasis on maintaining gender balance were selected as the final sample. This sample size was determined by the correlation between sleep quality score and internet addiction score in the same literature as 0.406, with an alpha of 1% and a beta of 10% and the average cluster size of 20 individuals, and the coefficient of 0.3 and 10% drop was 562.

3.2. Research Instrument

In order to collect data, the structural questionnaire consists of three sections. In addition to demographic information, two Persian versions of the Pittsburgh Sleep Quality Index (PSQI) and Internet Addiction Test (IAT) standard questionnaires were provided to students of Isfahan University of Medical Sciences and Health Services via the Internet using online questionnaires (Google Forms). The first part of the questionnaire included demographic information such as age and gender as well as other information such as using a smartphone before going to bed (19). The second part includes the PSQI, which has been selected as the indicator of student sleep quality assessment. This questionnaire consists of 18 items consisting of 7 components. Scores greater than 5 indicate poor sleep quality (20) in the range of 0 to 21. Based on the seven component scores of the PSQI, the overall reliability coefficient (Cronbach's alpha) was 0.83, and in Iran, it was 0.77, indicating a high degree of internal consistency (20, 21). The third part of the questionnaire was done using the IAT with 20 items and six subgroups with a score of 0 to 100 to measure internet addiction, which Yang et al. first evaluated (11). A score of 0 - 19 indicates a lack of dependence on the Internet, while a score of 20 - 39 indicates a mild degree of internet addiction. On the other hand, 40 - 69 points indicate moderate internet addiction (at risk), while 70 to 100 points indicate severe internet addiction (22-24). In Iran, Cronbach's alpha coefficient of 0.917 was the acceptable level (25), indicating the validity and reliability of the internet addiction questionnaire.

3.3. Statistical Analysis

SPSS statistical software version 25 of the Windows operating system was used throughout the study. Mean (\bar{X}) and standard deviation (SD) were used to report average values. Independent *t*-test and diffraction analysis (continuous variables) and chi-square test (classification variables) were also used to analyze the significance of differences in demographic data and IAT scores between the two groups of sleep quality. One-way ANOVA analysis was used to determine the significance of differences in scores Total

sleep quality and its seven subgroups among normal, mild, moderate, and severe internet addiction users. Post hoc test was done using Tukey adjustment. Logistic regression was used to associate the scores of internet addiction and six IAT subgroups with sleep quality. A P-value less than 0.05 was considered statistically significant.

4. Results

4.1. Demographic Information, Internet Addiction Levels, and Sleep Quality

Demographic information, as well as the internet addiction score for sleep quality, is shown in [Table 1](#). Participants were 18 to 29 years old with a mean age of (21.41 ± 1.87) . Regarding gender distribution, there were 370 (65.8%) female students and 192 (34.2%) male students. The sample distribution between undergraduate and public doctoral students was 328 (58.4%) and 234 (41.6%), respectively. Four hundred seventy-seven participants (84.9%) lived with their families, and 85 (15.1%) lived alone. Of these, 509 (90.6%) were single. In the case of using a smartphone, 517 people (92%) used smartphones against 45 people (8%) before sleep. In accordance with the internet addiction scores, 77.4 percent of the participants were classified as mild or moderately addicted to the Internet.

The ANOVA analysis among internet addiction degrees was carried out for variables of total sleep quality and seven components, whose results are visible in [Table 2](#). A significant ($P < 0.001$) increase in the average scores of sleep quality and its components was observed, and internet addiction exhibited an upward trend among users. This did not apply only to the level of severe Internet addiction and was different from other subgroups. In all three levels of normal internet users, users with mild and moderate internet addiction had lower sleep quality scores, habitual sleep efficiency, use of sleeping medication, and daytime dysfunction than students with severe internet addiction. Tukey's post hoc test, which shows a significant difference between the groups, is shown in [Table 2](#).

[Table 3](#) illustrates the relationship between the total score of internet addiction and sleep quality based on the logistic regression. Sleep quality was significantly predicted by the total score of internet addiction, with an odds ratio of 1.035 with a confidence interval of (1.023, 1.048). It is important to note that when the score of Internet addiction is more than one, it means that the increase in the odds ratio of Internet addiction decreases the quality of sleep. (Code 1: poor sleep quality, code 0: good sleep quality).

Using logistic regression, [Table 4](#) examines the relationship between internet addiction subgroups and sleep

quality. Among the salience subgroup, the odds ratio is 0.95 (CI 95% = 0.90, 0.99) and less than one, meaning that as salience scores increase, the odds of poor sleep quality decrease, and this relationship is significantly predicted ($P = 0.038$). These results were shown after controlling for the effect of independent variables. The odds ratio in the subgroup of Excessive use of the Internet (OR = 1.02, CI 95% = 1.05, 1.18) had a direct and significant relationship ($P < 0.001$) with sleep quality. Moreover, this positive and significant relationship ($P < 0.001$) was also seen in the subgroup of Anticipation and Sleep Quality (OR = 1.40, CI 95% = 1.23, 1.52). Other subgroups of neglect of work, lack of control, and neglect of social life did not significantly correlate with sleep quality (P-value: 0.46, 0.66, 0.46, respectively). The gender variable did not significantly correlate with sleep quality ($P = 0.66$). Regarding the age variable, the odds ratio was 1.15 (CI 95% = 1.08, 1.28). A significant inverse relationship was also predicted between using a smartphone before bed and sleep quality ($P = 0.007$, OR = 0.35, CI 95% = 0.16, 0.75).

5. Discussion

This study examined the impact of internet addiction on sleep quality among students. According to the results of this study, 46.6% of users have a mild internet addiction, and 30.8% have a moderate internet addiction. The results of a similar study conducted in Iran are close to those of this study. The same study by Yarahmadi et al. in Iran in 2020 found that 34.6% of the participants had mild internet addiction, and 57.6% had moderate to severe internet addiction (26). A systematic and meta-analysis study conducted by Salarvand et al. in 2020 on internet addiction among 16,585 Iranian students revealed that 31.51% were addicted to the Internet (27). A systematic study carried out by Modara et al. in Iran in 2017 found that internet addiction is prevalent in various parts of the country, ranging from 70% in southern Iran to 15% in western Iran (5). The high prevalence of internet addiction is due to the increasing availability of communication devices such as mobile phones (28) and laptops (29), as well as the development of technology, which affects all aspects of our daily lives. In addition, frequent and increasing internet use may also contribute to the fact that many users have some degree of internet addiction (30). In addition, the outbreak of the COVID-19 disease at the time of this study is another factor contributing to this access and excessive use of the Internet (31). Tahir conducted a similar study among 2749 medical students in 2021, finding that 67.6% were addicted to the Internet (32). Moreover, in a 2014 study by Mak et al. on the epidemiology of internet behavior and addiction among six Asian countries, the Philippines and Japan were

Table 1. Demographic Information and Internet Addiction Levels for Sleep Quality^a

Variables	Sleep Quality			Sig
	Total (n = 562)	Poor (n = 294)	Good (n = 268)	
Age	21.41 ± 1.87	21.68 ± 1.88	21.11 ± 1.81	< 0.001
Gender				0.04
Woman	370 (65.8)	182 (61.9)	188 (70.1)	
Men	192 (34.5)	112 (38.1)	80 (29.9)	
Grade				0.679
Undergraduate	328 (58.4)	174 (59.2)	154 (57.5)	
General Doctorate	234 (41.6)	120 (40.8)	114 (42.5)	
Live with family				
Yes	477 (84.9)	250 (85)	227 (84.7)	0.912
Marital status				
Single	509 (90.6)	267 (90.8)	242 (90.3)	0.834
Married	53 (9.4)	27 (9.2)	26 (9.7)	
Smartphone use before sleep				
Yes	517 (92)	283 (3.96)	234 (3.87)	< 0.001
Internet addiction test level				< 0.001
Normal	117 (20.8)	27 (9.2)	90 (33.6)	
Mild	262 (46.6)	144 (49)	118 (44)	
Moderate	173 (30.8)	120 (40.8)	53 (19.8)	
Severe	10 (1.8)	3 (1)	7 (2.6)	

^a Values are expressed as mean ± SD or No. (%).

Table 2. Sleep Quality Among Participants with Varying Degrees of Internet Addiction^a

Pittsburgh Sleep Quality Index	Internet Addiction Test				P-Value	Tukey's Post Hoc
	Normal (A)	Mild (B)	Moderate (C)	Severe (D)		
Total score Pittsburgh Sleep Quality Index	4.41 ± 2.20	6.60 ± 3.43	8.41 ± 4.58	4.20 ± 2.57	< 0.001	C > B > A; C > D
Subjective sleep quality	0.73 ± 0.62	1.12 ± 0.73	1.35 ± 0.86	0.60 ± 0.51	< 0.001	C > B > A; C > D
Sleep latency	0.98 ± 0.66	1.43 ± 0.91	1.6 ± 1.01	1.00 ± 1.05	< 0.001	C > A; B > A
Sleep duration	0.31 ± 0.60	0.65 ± 0.87	1.07 ± 1.14	0.70 ± 1.05	< 0.001	C > B > A
Habitual sleep efficiency	0.56 ± 0.88	0.82 ± 1.05	1.32 ± 1.24	0.40 ± 0.96	< 0.001	C > B; C > A; C > D
Sleep disturbances	1.02 ± 0.13	1.08 ± 0.27	1.22 ± 0.44	1.10 ± 0.31	< 0.001	C > B; C > A
Use of sleeping medication	0.04 ± 0.20	0.21 ± 0.49	0.32 ± 0.69	0.00 ± 0.00	< 0.001	C > B > A
Daytime dysfunction	0.77 ± 0.74	1.29 ± 0.89	1.49 ± 1.01	0.40 ± 0.69	< 0.001	C > A; B > A; B > D

^a Values are expressed as mean ± SD.

Table 3. Relationship Between Overall Scores of Internet Addiction and Sleep Quality by Logistic Regression

	β	Standard Error	Exp (β)	95% CI for Exp (β)		P-Value
				Lower	Upper	
Internet Addiction Test total score	0.006	0.034	1.035	1.023	1.048	< 0.001

Table 4. Association Between Internet Addiction and Sleep Quality by Logistic Regression

Variables	β	Standard Error	Exp (β)	95% CI for Exp (β)		P-Value
				Lower	Upper	
Saliency	-0.051	0.024	95.0	906.0	997.0	0.038
Excessive use	0.110	0.031	1.028	1.051	1.186	< 0.001
Neglect work	0.028	0.038	1.028	0.095	1.108	0.464
Anticipation	0.317	0.053	1.405	1.237	1.524	< 0.001
Lack of control	-0.016	0.038	0.984	0.914	1.059	0.668
Neglect social life	0.034	0.045	1.034	0.946	1.130	0.460
Age	0.145	0.052	1.156	1.043	1.282	0.006
Gender	0.088	0.202	1.092	0.735	1.624	0.663
Use smartphone before sleep	-1.049	0.389	0.350	0.163	0.751	0.007

found to have the highest rates of internet addiction with 51% and 48%, respectively (33). A systematic study by Kuss et al. in 2021 of 62 studies carried out worldwide (except in Europe) also revealed that internet addiction has a prevalence of between 12.6% to 67.5% (34). In a study by Karki et al. in 2021, 21.5% of participants had an addiction to the Internet, while 13.3% had a lower level of addiction (35). This difference is more justified than ever by attention to different geographical areas. As in Lozano-Blasco et al.'s systematic and meta-analysis study in 2022, internet addiction in countries such as Australia and New Zealand shows a declining trend (36). In comparison with Asian countries (36), there are significant differences. Different measurement expressions have caused this prevalence to vary (37).

According to the present study, 52.3% of the participants reported poor sleep quality. Among students in Iran in 2016, a systematic and meta-analysis study conducted by Ranjbaran reported a prevalence of poor sleep quality of 56% (38). Or a study by Rezaei et al. in 2018 among medical students in Iran showed that 60% had poor sleep quality (39). According to a similar study conducted by Khosravi et al. in 2021, among 4170 Iranian adults, 42.9% reported poor sleep quality (40). Khayat et al. conducted a study in 2018 among Saudi Arabian students aged 18 to 25, which also indicated that 54.4% of the participants had poor sleep quality (41). In the study Gomez-Chiappe et al. conducted in 2020 among Colombian students, 58.9% reported poor sleep quality (42). Based on a systematic and meta-analysis study by Jahrami et al. in 2021 among 54,231 participants from 13 countries, it was determined that 35.7% of the population suffered from sleep problems (43). According to these studies, students report significantly poorer sleep quality than the general population. Sleep problems are also associated with increased health concerns, irritability, depression, fatigue, attention and concentration prob-

lems, as well as poor academic performance (43).

According to our study, internet addiction adversely affects sleep quality and impairs sleep quality. In addition, this association was shown in studies conducted by Karimy et al. in 2020 among Iranian students (44) and Gupta et al. in India in 2021 (45). Zhang et al. found that 26.7% of Vietnamese youth addicted to the Internet had sleep problems in a study he conducted in 2017 (46). Other studies have shown that internet addiction is inversely related to sleep quality (32, 41, 47, 48). The same relationship was observed among adolescents (35, 47, 48), youth (27, 32, 46), and adults (49).

This study was limited by its cross-sectional nature, which prevented it from clearly demonstrating the causal relationship between variables. Participants' self-reports may also be affected by biases such as reminder bias. A further limitation is that samples were selected from a university in Iran, and no samples were collected from other universities in Iran and abroad, which may affect the study's external validity.

5.1. Conclusions

The study found that 79.2% of participants had mild to severe levels of internet addiction. In addition, 52.3% of the participants reported poor sleep quality. There was a negative association between internet addiction and sleep quality. Also, these results can be a source for universities and all educational institutions to control the adverse effects of using the Internet and improve sleep quality in students.

Acknowledgments

The authors thank Isfahan University of Medical Sciences for supporting the study. We also thank all the students for participating in this study.

Footnotes

Authors' Contribution: Study concept and design: M. J. T., and M. R. K. Z. H.; analysis and interpretation of data: M. J. T., and M. R. K. Z. H.; drafting of the manuscript: M. R. K. Z. H.; critical revision of the manuscript for important intellectual content: M. J. T., and M. R. K. Z. H.; statistical analysis: M. R. K. Z. H.

Conflict of Interests: This research was conducted by Isfahan University of Medical Sciences and had no personal financial interests for the authors.

Data Reproducibility: The dataset presented in the study is available on request from the corresponding author during submission or after publication. The data are not publicly available due to confidentiality of participant information.

Ethical Approval: Ethical approval was obtained from the Ethics Committee of Isfahan University of Medical Sciences (IR.MUI.RESEARCH.REC.1400.139, link: ethics.research.ac.ir/ProposalCertificateEn.php?id=195809).

Funding/Support: This research was supported by Esfahan University of Medical Sciences (code: IR.MUI.RESEARCH.REC.1400.139).

Informed Consent: Informed consent was obtained from all participants in this study.

References

- Poznyak V. *Public health implications of excessive use of the Internet and other communication and gaming platforms*. Geneva, Switzerland: World Health Organization; 2018, [updated 13 September 2018; cited 2022]. Available from: <https://www.who.int/news/item/13-09-2018-public-health-implications-of-excessive-use-of-the-internet-and-other-communication-and-gaming-platforms>.
- Shek DT, Sun RC, Yu L. Internet Addiction. In: Pfaff DW, editor. *Neuroscience in the 21st Century*. New York, USA: Springer; 2013. p. 2775–811. doi: [10.1007/978-1-4614-1997-6_108](https://doi.org/10.1007/978-1-4614-1997-6_108).
- Weinstein A, Curtiss Feder L, Rosenberg KP, Dannon P. Internet Addiction Disorder. In: Rosenberg KP, Feder LC, editors. *Behavioral Addictions*. Massachusetts, USA: Academic Press; 2014. p. 99–117. doi: [10.1016/b978-0-12-407724-9.00005-7](https://doi.org/10.1016/b978-0-12-407724-9.00005-7).
- Wang Y, Zhao Y, Liu L, Chen Y, Ai D, Yao Y, et al. The Current Situation of Internet Addiction and Its Impact on Sleep Quality and Self-Injury Behavior in Chinese Medical Students. *Psychiatry Investig*. 2020;**17**(3):237–42. doi: [10.30773/pi.2019.0131](https://doi.org/10.30773/pi.2019.0131). [PubMed: [32151129](https://pubmed.ncbi.nlm.nih.gov/32151129/)]. [PubMed Central: [PMC7113173](https://pubmed.ncbi.nlm.nih.gov/PMC7113173/)].
- Modara F, Rezaee-Nour J, Sayehmiri N, Maleki F, Aghakhani N, Sayehmiri K, et al. Prevalence of Internet Addiction in Iran: A Systematic Review and Meta-analysis. *Addict Health*. 2017;**9**(4):243–52. [PubMed: [30574288](https://pubmed.ncbi.nlm.nih.gov/30574288/)]. [PubMed Central: [PMC6294487](https://pubmed.ncbi.nlm.nih.gov/PMC6294487/)].
- Abolghasem P, Eftekhari M, Rezaei Z, Jafarizadeh M, Soleimani R, Khalafi A. Studying the Relationship between Quality of Sleep and Addiction to Internet among Students. *Nova Journal of Medical and Biological Sciences*. 2016;**5**(3). doi: [10.20286/jmbs-050303](https://doi.org/10.20286/jmbs-050303).
- Ansari H, Ansari-Moghaddam A, Mohammadi M, Peyvand M, Amani Z, Arbabisarjou A. Internet Addiction and Happiness Among Medical Sciences Students in Southeastern Iran. *Health Scope*. 2016;**5**(2). doi: [10.5812/jhealthscope.20166](https://doi.org/10.5812/jhealthscope.20166).
- Doosti IA, Bagheri AF, Khajehkazemi R, Mostafavi E. [Prevalence of internet addiction among students and graduates of epidemiology, clinical sciences, and basic sciences in Iran: A cross-sectional study]. *Iran J Epidemiology*. 2017;**13**(1):14–21. Persian.
- The Global Economy. Iran: *Internet users*. Georgia, USA: The Global Economy; 2020, [cited 2022]. Available from: https://www.theglobaleconomy.com/Iran/Internet_users/.
- Lemola S, Perkinson-Gloor N, Brand S, Dewald-Kaufmann JF, Grob A. Adolescents' electronic media use at night, sleep disturbance, and depressive symptoms in the smartphone age. *J Youth Adolesc*. 2015;**44**(2):405–18. doi: [10.1007/s10964-014-0176-x](https://doi.org/10.1007/s10964-014-0176-x). [PubMed: [25204836](https://pubmed.ncbi.nlm.nih.gov/25204836/)].
- Yang SY, Lin CY, Huang YC, Chang JH. Gender differences in the association of smartphone use with the vitality and mental health of adolescent students. *J Am Coll Health*. 2018;**66**(7):693–701. doi: [10.1080/07448481.2018.1454930](https://doi.org/10.1080/07448481.2018.1454930). [PubMed: [29565784](https://pubmed.ncbi.nlm.nih.gov/29565784/)].
- Kline C. Sleep Quality. In: Gellman MD, Turner JR, editors. *Encyclopedia of Behavioral Medicine*. New York, USA: Springer; 2013. p. 1811–3. doi: [10.1007/978-1-4419-1005-9_849](https://doi.org/10.1007/978-1-4419-1005-9_849).
- Izadi M, Bashardost S. [Predicting sleep quality based on Internet addiction and students' quality of life]. *The 6th Congress of the Iranian Psychological Association*. Tehran, Iran. 2017. Persian.
- Otsuka Y, Kaneita Y, Itani O, Matsumoto Y, Jike M, Higuchi S, et al. The association between Internet usage and sleep problems among Japanese adolescents: three repeated cross-sectional studies. *Sleep*. 2021;**44**(12). doi: [10.1093/sleep/zsab175](https://doi.org/10.1093/sleep/zsab175). [PubMed: [34252182](https://pubmed.ncbi.nlm.nih.gov/34252182/)].
- Nayak A, Saranya K, Fredrick J, Madumathy R, Subramanian SK. Assessment of burden of internet addiction and its association with quality of sleep and cardiovascular autonomic function in undergraduate medical students. *Clin Epidemiology Glob Health*. 2021;**11**. doi: [10.1016/j.cegh.2021.100773](https://doi.org/10.1016/j.cegh.2021.100773).
- Arzani-Birgani A, Zarei J, Favaregh L, Ghanaatiyan E. Internet addiction, mental health, and sleep quality in students of medical sciences, Iran: A cross-sectional study. *J Educ Health Promot*. 2021;**10**:409. doi: [10.4103/jehp.jehp_1506_20](https://doi.org/10.4103/jehp.jehp_1506_20). [PubMed: [35071615](https://pubmed.ncbi.nlm.nih.gov/35071615/)]. [PubMed Central: [PMC8719569](https://pubmed.ncbi.nlm.nih.gov/PMC8719569/)].
- Clement-Carbonell V, Portilla-Tamarit I, Rubio-Aparicio M, Madrid-Valero JJ. Sleep Quality, Mental and Physical Health: A Differential Relationship. *Int J Environ Res Public Health*. 2021;**18**(2). doi: [10.3390/ijerph18020460](https://doi.org/10.3390/ijerph18020460). [PubMed: [33435528](https://pubmed.ncbi.nlm.nih.gov/33435528/)]. [PubMed Central: [PMC7826982](https://pubmed.ncbi.nlm.nih.gov/PMC7826982/)].
- Curcio G, Ferrara M, De Gennaro L. Sleep loss, learning capacity and academic performance. *Sleep Med Rev*. 2006;**10**(5):323–37. doi: [10.1016/j.smrv.2005.11.001](https://doi.org/10.1016/j.smrv.2005.11.001). [PubMed: [16564189](https://pubmed.ncbi.nlm.nih.gov/16564189/)].
- Awasthi AA, Taneja N, Maheshwari S, Gupta T, Bhavika. Prevalence of Internet Addiction, Poor Sleep Quality, and Depressive Symptoms Among Medical Students: A Cross-Sectional Study. *Osong Public Health Res Perspect*. 2020;**11**(5):303–8. doi: [10.24171/j.phrp.2020.11.5.06](https://doi.org/10.24171/j.phrp.2020.11.5.06). [PubMed: [33117635](https://pubmed.ncbi.nlm.nih.gov/33117635/)]. [PubMed Central: [PMC7577382](https://pubmed.ncbi.nlm.nih.gov/PMC7577382/)].
- Buysse DJ, Reynolds C3, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;**28**(2):193–213. doi: [10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4). [PubMed: [2748771](https://pubmed.ncbi.nlm.nih.gov/2748771/)].
- Farrahi Moghaddam J, Nakhaee N, Sheibani B, Garrusi B, Amirakafi A. Reliability and validity of the Persian version of the Pittsburgh Sleep Quality Index (PSQI-P). *Sleep Breath*. 2012;**16**(1):79–82. doi: [10.1007/s11325-010-0478-5](https://doi.org/10.1007/s11325-010-0478-5). [PubMed: [21614577](https://pubmed.ncbi.nlm.nih.gov/21614577/)].
- Widyanto L, McMurrin M. The psychometric properties of the internet addiction test. *Cyberpsychol Behav*. 2004;**7**(4):443–50. doi: [10.1089/cpb.2004.7.443](https://doi.org/10.1089/cpb.2004.7.443). [PubMed: [15331031](https://pubmed.ncbi.nlm.nih.gov/15331031/)].
- Faraci P, Craparo G, Messina R, Severino S. Internet Addiction Test (IAT): which is the best factorial solution? *J Med Internet Res*. 2013;**15**(10). e225. doi: [10.2196/jmir.2935](https://doi.org/10.2196/jmir.2935). [PubMed: [24184961](https://pubmed.ncbi.nlm.nih.gov/24184961/)]. [PubMed Central: [PMC3806548](https://pubmed.ncbi.nlm.nih.gov/PMC3806548/)].

24. Cernja I, Vejmelka L, Rajter M. Internet addiction test: Croatian preliminary study. *BMC Psychiatry*. 2019;**19**(1):388. doi: [10.1186/s12888-019-2366-2](https://doi.org/10.1186/s12888-019-2366-2). [PubMed: [31805882](https://pubmed.ncbi.nlm.nih.gov/31805882/)]. [PubMed Central: [PMC6896280](https://pubmed.ncbi.nlm.nih.gov/PMC6896280/)].
25. Mohammadsalehi N, Mohammadbeigi A, Jadidi R, Anbari Z, Ghaderi E, Akbari M. Psychometric Properties of the Persian Language Version of Yang Internet Addiction Questionnaire: An Explanatory Factor Analysis. *Int J High Risk Behav Addict*. 2015;**4**(3): e21560. doi: [10.5812/ijhrba.21560](https://doi.org/10.5812/ijhrba.21560). [PubMed: [26495253](https://pubmed.ncbi.nlm.nih.gov/26495253/)]. [PubMed Central: [PMC4609498](https://pubmed.ncbi.nlm.nih.gov/PMC4609498/)].
26. Yarahmadi S, Zarei F, Sadooghiasl A, Jeong S. The Prevalence of Internet Addiction and Its Associated Factors Among Iranian Adults. *Iran Rehabilitation J*. 2020;**18**(2):163–70. doi: [10.32598/irj.18.2.934.1](https://doi.org/10.32598/irj.18.2.934.1).
27. Salarvand S, N. Albatineh A, Dalvand S, Baghban Karimi E, Ghanei Gheshlagh R. Prevalence of Internet Addiction Among Iranian University Students: A Systematic Review and Meta-analysis. *Cyberpsychol Behav Soc Netw*. 2022;**25**(4):213–22. doi: [10.1089/cyber.2021.0120](https://doi.org/10.1089/cyber.2021.0120). [PubMed: [35085012](https://pubmed.ncbi.nlm.nih.gov/35085012/)].
28. Amiri M, Dowran B. Smartphone Overuse from Iranian University Students' Perspective: A Qualitative Study. *Addict Health*. 2020;**12**(3):205–15. doi: [10.22122/ahj.v12i3.271](https://doi.org/10.22122/ahj.v12i3.271). [PubMed: [33244397](https://pubmed.ncbi.nlm.nih.gov/33244397/)]. [PubMed Central: [PMC7679485](https://pubmed.ncbi.nlm.nih.gov/PMC7679485/)].
29. Ayatollahi A, Ayatollahi J, Ayatollahi F, Ayatollahi R, Shahcheragh SH. Computer and Internet use among Undergraduate Medical Students in Iran. *Pak J Med Sci*. 2014;**30**(5):1054–8. doi: [10.12669/pjms.305.5355](https://doi.org/10.12669/pjms.305.5355). [PubMed: [25225525](https://pubmed.ncbi.nlm.nih.gov/25225525/)]. [PubMed Central: [PMC4163231](https://pubmed.ncbi.nlm.nih.gov/PMC4163231/)].
30. Amidi Mazaheri M, Jadidi H, Zhaleh M, Kaviani Tehrani A, Ghasemi M, Khoshgoftar M. Prevalence of internet addiction and its association with general health status among high school students in Isfahan, Iran. *Int J Pediatr*. 2020;**8**(1):10799–806.
31. De R, Pandey N, Pal A. Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice. *Int J Inf Manage*. 2020;**55**:102171. doi: [10.1016/j.ijinfomgt.2020.102171](https://doi.org/10.1016/j.ijinfomgt.2020.102171). [PubMed: [32836633](https://pubmed.ncbi.nlm.nih.gov/32836633/)]. [PubMed Central: [PMC7280123](https://pubmed.ncbi.nlm.nih.gov/PMC7280123/)].
32. Tahir MJ, Malik NI, Ullah I, Khan HR, Perveen S, Ramalho R, et al. Internet addiction and sleep quality among medical students during the COVID-19 pandemic: A multinational cross-sectional survey. *PLoS One*. 2021;**16**(11): e0259594. doi: [10.1371/journal.pone.0259594](https://doi.org/10.1371/journal.pone.0259594). [PubMed: [34739502](https://pubmed.ncbi.nlm.nih.gov/34739502/)]. [PubMed Central: [PMC8570473](https://pubmed.ncbi.nlm.nih.gov/PMC8570473/)].
33. Mak KK, Lai CM, Watanabe H, Kim DI, Bahar N, Ramos M, et al. Epidemiology of internet behaviors and addiction among adolescents in six Asian countries. *Cyberpsychol Behav Soc Netw*. 2014;**17**(11):720–8. doi: [10.1089/cyber.2014.0139](https://doi.org/10.1089/cyber.2014.0139). [PubMed: [25405785](https://pubmed.ncbi.nlm.nih.gov/25405785/)].
34. Kuss DJ, Kristensen AM, Lopez-Fernandez O. Internet addictions outside of Europe: A systematic literature review. *Comput Hum Behav*. 2021;**115**. doi: [10.1016/j.chb.2020.106621](https://doi.org/10.1016/j.chb.2020.106621).
35. Karki K, Singh DR, Maharjan D, K CS, Shrestha S, Thapa DK. Internet addiction and sleep quality among adolescents in a peri-urban setting in Nepal: A cross-sectional school-based survey. *PLoS One*. 2021;**16**(2): e0246940. doi: [10.1371/journal.pone.0246940](https://doi.org/10.1371/journal.pone.0246940). [PubMed: [33600410](https://pubmed.ncbi.nlm.nih.gov/33600410/)]. [PubMed Central: [PMC7891762](https://pubmed.ncbi.nlm.nih.gov/PMC7891762/)].
36. Lozano-Blasco R, Robres AQ, Sánchez AS. Internet addiction in young adults: A meta-analysis and systematic review. *Comput Hum Behav*. 2022;**130**. doi: [10.1016/j.chb.2022.107201](https://doi.org/10.1016/j.chb.2022.107201).
37. Lei H, Cheong CM, Li S, Lu M. The relationship between coping style and Internet addiction among mainland Chinese students: A meta-analysis. *Psychiatry Res*. 2018;**270**:831–41. doi: [10.1016/j.psychres.2018.10.079](https://doi.org/10.1016/j.psychres.2018.10.079). [PubMed: [30551332](https://pubmed.ncbi.nlm.nih.gov/30551332/)].
38. Ranjbaran M. [Prevalence of poor sleep quality in college students of Iran: Systematic review and Meta-analysis]. *Razi Journal of Medical Sciences*. 2016;**23**(143):1–7. Persian.
39. Rezaei M, Khormali M, Akbarpour S, Sadeghniai-Hagighi K, Shamsipour M. Sleep quality and its association with psychological distress and sleep hygiene: a cross-sectional study among pre-clinical medical students. *Sleep Sci*. 2018;**11**(4):274–80. doi: [10.5935/1984-0063.20180043](https://doi.org/10.5935/1984-0063.20180043). [PubMed: [30746046](https://pubmed.ncbi.nlm.nih.gov/30746046/)]. [PubMed Central: [PMC6361305](https://pubmed.ncbi.nlm.nih.gov/PMC6361305/)].
40. Khosravi A, Emamian MH, Hashemi H, Fotouhi A. Components of Pittsburgh Sleep Quality Index in Iranian adult population: an item response theory model. *Sleep Med X*. 2021;**3**:100038. doi: [10.1016/j.sleepx.2021.100038](https://doi.org/10.1016/j.sleepx.2021.100038). [PubMed: [34471869](https://pubmed.ncbi.nlm.nih.gov/34471869/)]. [PubMed Central: [PMC8319517](https://pubmed.ncbi.nlm.nih.gov/PMC8319517/)].
41. Khayat MA, Qari MH, Almutairi BS, Shuaib BH, Rambo MZ, Alrogi MJ, et al. Sleep Quality and Internet Addiction Level among University Students. *Egypt J Hosp Med*. 2018;**73**(7):7042–7. doi: [10.21608/ejhm.2018.17224](https://doi.org/10.21608/ejhm.2018.17224).
42. Gomez-Chiappe N, Lara-Monsalve PA, Gomez AM, Gomez DC, Gonzalez JC, Gonzalez L, et al. Poor sleep quality and associated factors in university students in Bogota D.C., Colombia. *Sleep Sci*. 2020;**13**(2):125–30. doi: [10.5935/1984-0063.20190141](https://doi.org/10.5935/1984-0063.20190141). [PubMed: [32742583](https://pubmed.ncbi.nlm.nih.gov/32742583/)]. [PubMed Central: [PMC7384535](https://pubmed.ncbi.nlm.nih.gov/PMC7384535/)].
43. Jahrami H, BaHammam AS, Bragazzi NL, Saif Z, Faris M, Vitiello MV. Sleep problems during the COVID-19 pandemic by population: a systematic review and meta-analysis. *J Clin Sleep Med*. 2021;**17**(2):299–313. doi: [10.5664/jcs.m.8930](https://doi.org/10.5664/jcs.m.8930). [PubMed: [33108269](https://pubmed.ncbi.nlm.nih.gov/33108269/)]. [PubMed Central: [PMC7853219](https://pubmed.ncbi.nlm.nih.gov/PMC7853219/)].
44. Karimy M, Parvizi F, Rouhani MR, Griffiths MD, Armoon B, Fattah Moghaddam L. The association between internet addiction, sleep quality, and health-related quality of life among Iranian medical students. *J Addict Dis*. 2020;**38**(3):317–25. doi: [10.1080/10550887.2020.1762826](https://doi.org/10.1080/10550887.2020.1762826). [PubMed: [32431237](https://pubmed.ncbi.nlm.nih.gov/32431237/)].
45. Gupta R, Taneja N, Anand T, Gupta A, Gupta R, Jha D, et al. Internet Addiction, Sleep Quality and Depressive Symptoms Amongst Medical Students in Delhi, India. *Community Ment Health J*. 2021;**57**(4):771–6. doi: [10.1007/s10597-020-00697-2](https://doi.org/10.1007/s10597-020-00697-2). [PubMed: [32852657](https://pubmed.ncbi.nlm.nih.gov/32852657/)].
46. Zhang MWB, Tran BX, Huong LT, Hinh ND, Nguyen HLT, Tho TD, et al. Internet addiction and sleep quality among Vietnamese youths. *Asian J Psychiatr*. 2017;**28**:15–20. doi: [10.1016/j.ajp.2017.03.025](https://doi.org/10.1016/j.ajp.2017.03.025). [PubMed: [28784371](https://pubmed.ncbi.nlm.nih.gov/28784371/)].
47. Celebioglu A, Aytakin Ozdemir A, Kucukoglu S, Ayran G. The effect of Internet addiction on sleep quality in adolescents. *J Child Adolesc Psychiatr Nurs*. 2020;**33**(4):221–8. doi: [10.1111/jcap.12287](https://doi.org/10.1111/jcap.12287). [PubMed: [32657485](https://pubmed.ncbi.nlm.nih.gov/32657485/)].
48. Nguyen CTT, Yang HJ, Lee GT, Nguyen LTK, Kuo SY. Relationships of excessive internet use with depression, anxiety, and sleep quality among high school students in northern Vietnam. *J Pediatr Nurs*. 2022;**62**:e91–7. doi: [10.1016/j.pedn.2021.07.019](https://doi.org/10.1016/j.pedn.2021.07.019). [PubMed: [34334256](https://pubmed.ncbi.nlm.nih.gov/34334256/)].
49. Mahamid FA, Berte DZ, Bdier D. Problematic internet use and its association with sleep disturbance and life satisfaction among Palestinians during the COVID-19 pandemic. *Curr Psychol*. 2021:1–8. doi: [10.1007/s12144-021-02124-5](https://doi.org/10.1007/s12144-021-02124-5). [PubMed: [34334988](https://pubmed.ncbi.nlm.nih.gov/34334988/)]. [PubMed Central: [PMC8310401](https://pubmed.ncbi.nlm.nih.gov/PMC8310401/)].