

RESEARCH ARTICLE

Internet addiction and sleep quality among adolescents in a peri-urban setting in Nepal: A cross-sectional school-based survey

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Abstract

Background

Excessive use of the internet among adolescents often led to later bedtimes and poor sleep quality. This study assessed the relationship between internet addiction and sleep quality among adolescents in a peri-urban setting in Nepal.

Method

This cross-sectional study employed a questionnaire survey among 390 adolescent students recruited from two schools in Kirtipur Municipality in Nepal. The Internet Addiction Test and the Pittsburgh Sleep Quality Index were used to assess internet addiction and poor sleep quality respectively. The association between internet addiction and sleep quality was analysed by logistic regression.

Results

One-fifth (21.5%) of the participants were identified with borderline internet addiction and 13.3% with possible internet addiction. Poor sleep quality was found among 31% of the participants. Internet addiction was significantly associated with poor sleep quality (OR = 1.85, $p = 0.022$ for borderline, and OR = 3.98, $p = <0.001$ for possible internet addiction compared to no internet addiction).

Conclusion

Adolescents with internet addiction were more vulnerable to suffer from poor sleep quality. It is recommended that municipalities and schools should aware the adolescent students on the adverse effects of excessive internet use including poor sleep quality. The findings have implications for adolescents, parents, school authorities and researchers.

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Abbreviations: DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, 4th edition; DSM-V, Diagnostic and Statistical Manual of Mental

Disorders, 5th edition; IA, Internet Addiction; IAS, Internet Addiction Scale; IAT, Internet Addiction Test; PSQI, Pittsburgh Sleep Quality Index.

Background

The number of people using the internet has surged in the last few years and the internet has become a fundamental part of daily life for many of us. The proportion of the global population using the internet increased from 17% in 2005 to 53.6% in 2019, with more than half of the internet users living in Asia [1]. While the internet penetration is high in developed countries (86.6%), compared to developing (47.0%) and the least developed countries (19.1%), a steady increase can be observed in low-income countries like Nepal in recent years. A recent survey in Nepal reported 51.1% of the households had access to the internet, with 44.2% of the population using it at least once a week [2]. In Kathmandu valley, about 70% of the households had access to the internet [3].

Adolescents and young adults are more likely to use the internet for a wide range of activities such as information search, social networking, communicating, music playing, emailing, playing games and fulfilling their social needs [4]. Increased internet availability with widespread devices such as mobile phones and tablets provide adolescents access to and use of the internet during daytime as well as bedtime. The accessibility of such facilities in developing countries has put adolescents at risk of internet addiction [5–7]. Internet addiction among adolescents have been reported to be associated with poor outcomes including poor mental [8, 9] and physical [10, 11] health, substance abuse [12], academic difficulties [13], social isolation [14], self-injurious behavior and suicidal tendencies [15–17] and low self-esteem [9, 18].

Internet addiction is also reported to be associated with poor sleep quality and sleep disturbances [19–23]. Adolescents who used the internet go to bed later in the night, needed more time to fall asleep and had an increased number of awakenings in the night [24]. 16.5% of Nepalese undergraduate students [25] and 23.8% of Indian medical students [26] internet users had poor sleep quality which led to depressive symptoms.

Although it is a growing concern, data has been limited in Nepal. Various researches have been conducted on internet addiction, and sleep quality and mental health problems in different countries. However, very less evidence is generated in relation to internet addiction, poor sleep quality and related areas among adolescent students in Nepal. The study will help to explore evidence on sleep quality, internet addiction, and its contributing factors. The purpose of this study was to assess the prevalence of sleep quality on the internet using adolescents in a peri-urban setting of Nepal.

Method

Study design and setting

The study consisted of a cross-sectional school-based survey conducted among adolescents at Kirtipur municipality in Kathmandu, Nepal. The municipality is located 5 km southwest of Kathmandu city and is a peri-urban setting of Nepal. With the increase in internet facilities coupled with access to smartphones, computers, and laptops in recent years, adolescents and youths using the internet have been significantly increased in peri-urban areas [27]. The study followed the STROBE statement for a cross-sectional study [28].

Participants' recruitment and data collection

Two secondary level schools were randomly selected from 37 schools in the study municipality. The number of schools was defined based on the sample size calculated for selecting the students. A total of 390 school students of grades 9 and 10 were selected and all students present at the time of survey completed the questionnaires. The samples were calculated applying the population proportion formula. All students from the selected grades meeting the

eligibility criteria were included in the sample through the enumerative sampling technique. The selected students had access to at least one device with internet. Permission from the respective schools was requested by sending a letter to the principal. The objective, process and confidentiality of the study were explained and a consent form was signed by both the participants and their parents. Students were surveyed using a self-administered questionnaire in the classroom setting. This study was approved by the Ethical Review Board of Nepal Health Research Council (Reg. no. 688/2018). The recruitment and data collection were conducted between May to September 2019.

Measures

Internet addiction. Internet Addiction Test is a validated instrument to measure internet addiction [29]. It consists of 18 items that can be rated in terms of a three-point Likert rating scale (never or rarely, sometimes and often). The scoring ranges from 0 to 36 where 0–14 is considered as no internet addiction, 15–19 as borderline internet addiction, 20–29 as possible internet addiction and ≥ 30 scores as likely internet addiction. Cronbach's alpha coefficient of the Internet Addiction Test in this study was 0.83.

Sleep quality. Pittsburgh Sleep Quality Index is a self-report questionnaire that assesses sleep quality over a month time interval. The measure consists of 19 individual items, creating seven components that produce one global score ranging from 0 to 13. Scores between 0–5 were considered as 'good sleep quality' and ≥ 6 as 'poor sleep quality' [30]. The Cronbach's alpha for sleep quality index was 0.71.

Both the Internet Addiction Test and the Pittsburgh Sleep Quality Index scales were translated into the local (Nepali) language with the help of a bilingual (Nepali and English) social scientist. The two public health researchers had performed the face validity of the translated scales. Then, it was back-translated into English by the independent translator confirming the original meaning of the scales and any discrepancies seen were addressed.

Socio-demographic characteristics. These included age, sex, religion, ethnicity, self-reported family income class, parent's education, list of appliances used to access the internet, and perceived relationship with parents, friends and relatives.

Statistical analysis

Data were entered in EpiData version 3.1, transferred and analyzed using IBM SPSS Statistics for Windows, version 20.0. Descriptive statistics (mean, frequency and percentage) were calculated. The relationship between internet addiction, socio-demographic variables (independent variable) and sleep quality (dependent variable) was assessed using bivariate and multivariable logistic regression analyses. Variables which were significant with sleep quality at $p < 0.05$ in bivariate logistic regression analyses were modeled in multivariable logistic regression estimating the adjusted odds ratio.

Results

Table 1 provides the socio-demographic characteristics of the study sample ($N = 390$). The mean age was 15.0 (SD = 1.0) years and more than half were female (55.4%). In terms of ethnic backgrounds, 47.2% of the participants belonged to the Indigenous ethnicity. Nearly half of the participants (47.4%) identified their family belonging to the upper-middle-income class. It was found that the parents of participants mostly completed bachelor's level education. Majority of the participant's main source of family income was business (43.8%). Most participants had access to at least a smartphone (67.4%) and/or laptop (46.2%). A higher proportion of

Table 1. Socio-demographic characteristics of the adolescent participants.

Socio-demographic characteristics		Frequency	Percentage
Age	≤15 years	287	73.6
	>15 years	103	26.4
Mean±SD (range): 15.0±1.0 (13–20) years			
Sex	Male	216	55.4
	Female	174	44.6
Religion	Hindu	323	82.8
	Other	67	17.2
Ethnicity	Indigenous	184	47.2
	Brahmin	90	23.1
	Chhetri	89	22.8
	Dalit	23	5.9
	Others	4	1.0
Self-reported family income class	Upper middle class	185	47.4
	Middle class	163	41.8
	Upper class	42	10.8
Parent's education (any parent)	Bachelor's and higher	110	28.2
	Secondary	109	27.9
	Primary	76	19.5
	Higher secondary	69	17.7
	Illiterate	26	6.7
Main source of household income	Business	171	43.8
	Service	114	29.2
	Agriculture	69	17.7
	Labour	31	7.9
	Others	5	1.3
Devices for internet use (Multiple responses possible)	Smartphone	263	67.4
	Laptop	180	46.2
	Tablet	90	23.1
	Other	21	5.4
Relation with parents	Good	361	92.6
	Neutral	29	7.4
Relation with friends	Good	307	78.7
	Neutral	74	19
	Bad	9	2.3
Relation with relatives	Good	199	51.1
	Neutral	176	45.1
	Bad	15	3.8

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participants reported better self-perceived relationships with parents and friends compared to relatives.

The mean Internet Addiction Test score was 12.1 (SD = 6.5). Around one-fifth (21.5%) of the participants had borderline internet addiction and 13.3% had possible internet addiction. The mean Pittsburgh Sleep Quality Index score was 4.6 (SD = 2.3), with 31.0% of the participants falling in the poor sleep quality category (Table 2).

In bivariate and multivariable analyses (Table 3), sleep quality was significantly associated with internet addiction, age, and ethnicity. Adolescents with borderline and possible internet addiction were more likely to experience poor sleep quality compared to no internet addiction. Higher age group participants were found to be associated with poor sleep quality. In terms of

Table 2. Prevalence of Internet addictions and sleep quality among adolescent participants.

Variables	Frequency	Percentage
Internet Addiction test, mean±SD	12.1±6.5	
Internet addiction category		
No internet addiction	254	65.2
Borderline internet addiction	84	21.5
Possible internet addiction	52	13.3
Likely internet addiction	0	0.0
Pittsburgh Sleep Quality Index, mean±SD	4.6±2.3	
Sleep quality category		
Good sleep quality	269	69.0
Poor sleep quality	121	31.0

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ethnicity, the participants from Indigenous and Chhetri caste groups were more probable to experience poor sleep quality in comparison to other groups.

Discussions

This study aimed to assess the prevalence of internet addiction and poor sleep quality among adolescents in a peri-urban setting in Nepal. Borderline internet addiction and possible internet addiction were prevalent in 21.5% and 13.3% respectively. Around one-third (31.0%) were found to experience poor sleep quality. These results corroborate with findings of similar other studies conducted in Nepal [25] and elsewhere [9, 31].

Higher age during adolescence depicted poorer sleep quality compared to younger age groups. In contrast to other studies where girls were more likely to have poor sleep quality than boys [32], this study did not find the association between sleep quality and sex. A statistically significant association was found between internet addiction and poor sleep quality in the present study. The current study findings were supported by research conducted among female adolescents in Taiwan [33] and the high school students in Turkey [34] and Japan [35] with the positive relationship between internet addiction and poor sleep quality. Contrary to this study findings, no association was established between poor sleep quality and internet use in a study conducted among university students in Canada. The young population is often found to surf the internet and use other media to cope with sleep problems [36]. Based on our findings, it was found that as the adolescents got older, their sleep quality worsened as well. Of the studies conducted in the UK, one study found that using phones during bedtime reduced sleep duration by 21 minutes [37] and another study associated 45 minutes of reduced sleep duration with the use of phones at bedtime among pre-teens [38, 39]. However, a study in Canada found a negative association between the presence of phones and sleep duration but no association between phone use and sleep duration [40]. The current study showed around 29% of the participants had slept on an average of 7 hours and 23% had slept 8 hours. Whereas, a study conducted in Korea found that participants slept for 6 hours (26%), 7 hours (31.1%), 8 hours (29%) and 9 hours (13.9%). Excessive internet use was presumed to be the cause of sleep deprivation by displacing sleep time [41].

Awareness of poor sleep quality as a result of increased internet use and screen time should be carried out. Parents and school authorities may be at the central focus of the interventions aiming to reduce internet addiction as well as sleep quality.

The results in this study are reliant on self-reported behavior by the participants and it represents their views and perspectives. There might be a discrepancy between self-reported behavior and actual behavior practice. Negligence and underestimation of their own addictive

Table 3. Bivariate and multivariable analysis of socio-demographic characteristics, internet addictions and poor sleep quality among adolescent participants.

Variables	COR (95% CI)	P-value	AOR (95% CI)	P-value
Internet addiction				
No IA	Ref.		Ref.	
Borderline IA	1.85 (1.09–3.13)	0.022*	1.790 (1.034–3.096)	0.037*
Possible IA	3.98 (2.15–7.40)	<0.001*	3.789 (1.984–7.237)	0.000*
Age				
≤15 years	Ref.		Ref.	
>15 years	1.81 (1.13–2.90)	0.013*	1.599 (0.965–2.649)	0.068
Sex				
Male	Ref.		-	
Female	0.87 (0.56–1.33)	0.5		
Religion				
Hindu	Ref.		-	
Other	1.30 (0.75–2.26)	0.352		
Ethnicity				
Brahmin	Ref.		Ref.	
Chhetri	2.73 (1.37–5.44)	0.004*	2.823 (1.378–5.787)	0.005*
Indigenous	2.65 (1.43–4.92)	0.002*	2.204 (1.158–4.196)	0.016*
Dalit	0.69 (0.18–2.62)	0.590	0.800 (0.208–3.075)	0.745
Others	4.63 (0.61–35.32)	0.140	3.119 (0.364–26.762)	0.300
Self-reported family income class				
Upper middle class	Ref.		-	
Middle class	0.878 (0.56–1.38)	0.575		
Upper class	0.930 (0.45–1.93)	0.847		
Parent's education (any parent)				
Bachelor's and higher	Ref.		-	
Secondary	0.905 (0.33–2.49)	0.846		
Primary	1.453 (0.56–3.76)	0.442		
Higher secondary	1.448 (0.53–3.93)	0.468		
Illiterate	1.163 (0.45–3.03)	0.757		
Main source of household income				
Business	Ref.		-	
Service	0.96 (0.51–1.82)	0.902		
Agriculture	0.83 (0.45–1.51)	0.533		
Labour	0.95 (0.39–2.35)	0.916		
Others	0.50 (0.05–4.73)	0.546		
Relation with parents				
Good	Ref.		-	
Neutral	1.00 (0.44–2.27)	0.999		
Relation with friends				
Good	Ref.		-	
Neutral	1.17 (0.29–4.77)	0.828		
Bad	1.27 (0.74–2.16)	0.389		
Relation with relatives				
Good	Ref.		-	
Neutral	1.70 (0.58–5.00)	0.333		
Bad	1.29 (0.83–1.99)	0.260		

(Continued)

Table 3. (Continued)

Variables	COR (95% CI)	P-value	AOR (95% CI)	P-value
Goodness of fit χ^2 (Hosmer-Lemeshow) = df = 7, p = 0.864				

*P<0.05, COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio

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behaviors might be underrepresented based on self-reported behavior. The study has not covered mental health problems associated with internet addictions. Being a cross-sectional study design, the results of this study does not provide causality, instead provide evidence between internet addiction and poor sleep quality.

The study provides background information on internet addiction and the sleep quality to design large scale studies in different age groups, their cognitive and behavioural development as well as overall health impact.

Conclusions

The current cross-sectional study demonstrated the one-third prevalence of internet addiction with poor sleep quality in peri-urban settings of Nepal. Ethnic groups such as Chhetri and Indigenous groups were more prone to problems related to internet addiction and poor sleep quality. These socio-demographic variables depict the complex relationships and influence over the problems of adolescents. The findings also suggest that there are significant associations between internet addiction and sleep quality. The findings that adolescents with internet addiction are more likely to experience poor sleep quality supported the relevancy of this topic in recent times. It would benefit future studies to emphasize and dig deeper into the underlying causes and patterns of these problems. The findings have implications for adolescents, parents, school authorities and researchers.

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References

1. ITU. Measuring digital development Facts and Figures 2019. Geneva, Switzerland; 2019. Available: <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2019.pdf>
2. Central Bureau of Statistics. Multiple Indicator Cluster Survey 2019, Key Findings. Kathmandu; 2020. Available: https://www.unicef.org/nepal/media/9076/file/NMICS_2019_-_Key_findings.pdf
3. Regmi N, Nepal MC. Expectations versus Reality: A Case of Interest in Nepal. *Electron J Inf Syst Dev Ctries*. 2017. Available: www.ejisdc.org
4. Prashanthi B. Internet Usage Pattern of Adolescents. *IOSR J Humanit Soc Sci*. 2017; 22: 01–05. Available: <http://www.iosrjournals.org/iosr-jhss/papers/Vol.22Issue2/Version-5/A2202050105.pdf>
5. Lam LT. Internet gaming addiction, problematic use of the Internet, and sleep problems: A systematic review. *Current Psychiatry Reports*. Current Medicine Group LLC; 2014. p. 444. <https://doi.org/10.1007/s11920-014-0444-1> PMID: 24619594
6. Anusha Prabhakaran M, Patel VR, Ganjiwale DJ, Nimbalkar MS. Factors associated with internet addiction among school-going adolescents in Vadodara. *J Fam Med Prim Care*. 2016; 5: 765. <https://doi.org/10.4103/2249-4863.201149> PMID: 28348987
7. Kuss DJ, Lopez-Fernandez O. Internet addiction and problematic Internet use: A systematic review of clinical research. *World J Psychiatry*. 2016; 6: 143. <https://doi.org/10.5498/wjp.v6.i1.143> PMID: 27014605
8. Ostovar S, Allahyar N, Aminpoor H, Moafian F, Nor MBM, Griffiths MD. Internet Addiction and its Psychosocial Risks (Depression, Anxiety, Stress and Loneliness) among Iranian Adolescents and Young Adults: A Structural Equation Model in a Cross-Sectional Study. *Int J Ment Health Addict*. 2016; 14: 257–267. <https://doi.org/10.1007/s11469-015-9628-0>
9. Younes F, Halawi G, Jabbour H, El Osta N, Karam L, Hajj A, et al. Internet Addiction and Relationships with Insomnia, Anxiety, Depression, Stress and Self-Esteem in University Students: A Cross-Sectional Designed Study. 2016. <https://doi.org/10.1371/journal.pone.0161126> PMID: 27618306
10. Eliacik K, Bolat N, Koçyiğit C, Kanik A, Selkie E, Yilmaz H, et al. Internet addiction, sleep and health-related life quality among obese individuals: a comparison study of the growing problems in adolescent health. *Eat Weight Disord*. 2016; 21: 709–717. <https://doi.org/10.1007/s40519-016-0327-z> PMID: 27757931
11. Ustinavičienė R, Škėmienė L, Lukšienė D, Radišauskas R, Kalinienė G, Vasilavičius P. Problematic computer game use as expression of Internet addiction and its association with self-rated health in the Lithuanian adolescent population. *Med*. 2016; 52: 199–204. <https://doi.org/10.1016/j.medic.2016.04.002> PMID: 27496191
12. Evren C, Dalbudak E, Evren B, Demirci AC. High Risk of Internet Addiction and its Relationship with Lifetime Substance Use, Psychological and Behavioral Problems among 10th Grade Adolescents. *Psychiatr Danub*. 2014.
13. Mohamed G, Bernouss R. A cross-sectional study on Internet addiction among Moroccan high school students, its prevalence and association with poor scholastic performance. *Int J Adolesc Youth*. 2020; 25: 479–490. <https://doi.org/10.1080/02673843.2019.1674165>
14. Tateno M, Teo AR, Ukai W, Kanazawa J, Katsuki R, Kubo H, et al. Internet Addiction, Smartphone Addiction, and Hikikomori Trait in Japanese Young Adult: Social Isolation and Social Network. *Front Psychiatry*. 2019; 10: 455. <https://doi.org/10.3389/fpsy.2019.00455> PMID: 31354537
15. Lam LT, Peng Z, Mai J, Jing J. The association between internet addiction and self-injurious behaviour among adolescents. *Inj Prev*. 2009; 15: 403–408. <https://doi.org/10.1136/ip.2009.021949> PMID: 19959733
16. Pan PY, Yeh C Bin. Internet Addiction among Adolescents May Predict Self-Harm/Suicidal Behavior: A Prospective Study. *J Pediatr*. 2018; 197: 262–267. <https://doi.org/10.1016/j.jpeds.2018.01.046> PMID: 29550226
17. Sami H, Danielle L, Lih D, Elena S. The effect of sleep disturbances and internet addiction on suicidal ideation among adolescents in the presence of depressive symptoms. *Psychiatry Res*. 2018; 267: 327–332. <https://doi.org/10.1016/j.psychres.2018.03.067> PMID: 29957549

18. Woods HC, Scott H. Social media use in adolescence is associated with poor sleep quality, anxiety, depression and low self-esteem. *J Adolesc.* 2016; 51: 41–49. <https://doi.org/10.1016/j.adolescence.2016.05.008> PMID: 27294324
19. Abdurhman Khayat M, Hasan Qari M, Salman Almutairi B, hassan Shuaib B, Ziyad Rambo M, Jobran Alrogi M, et al. Sleep Quality and Internet Addiction Level among University Students. *Egypt J Hosp Med.* 2018.
20. Cheung L m, Wong WS. The effects of insomnia and internet addiction on depression in Hong Kong Chinese adolescents: an exploratory cross-sectional analysis. *J Sleep Res.* 2011; 20: 311–317. <https://doi.org/10.1111/j.1365-2869.2010.00883.x> PMID: 20819144
21. Koças F, Şaşmaz T, Yazar S, Tayyar Şaşmaz P. Internet addiction increases poor sleep quality among high school students. *Turk J Public Heal.* 2018. Available: <http://dergipark.gov.tr/tjph/>
22. Shin M-K. The Relation of Internet Addiction and Excessive Daytime Sleepiness in Korean College Students. *Science & Engineering Research Support soCiety*; 2015. pp. 248–252. <https://doi.org/10.14257/astl.2015.103.53>
23. Wolniczak I, Cáceres-DelAguila JA, Palma-Ardiles G, Arroyo KJ, Solís-Visscher R, Paredes-Yauri S, et al. Association between Facebook Dependence and Poor Sleep Quality: A Study in a Sample of Undergraduate Students in Peru. Schuelke M, editor. *PLoS One.* 2013; 8: e59087. <https://doi.org/10.1371/journal.pone.0059087> PMID: 23554978
24. Singh A, Soniya. Ever-Increasing Trend of Internet Usage and Its Impact on School Aged Children and Adolescents. *Int J Educ Manag Stud.* 2018; 8.
25. Bhandari PM, Neupane D, Rijal S, Thapa K, Mishra SR, Poudyal AK. Sleep quality, internet addiction and depressive symptoms among undergraduate students in Nepal. *BMC Psychiatry.* 2017; 17: 106. <https://doi.org/10.1186/s12888-017-1275-5> PMID: 28327098
26. Nagori N, Kinjal Vasava, Ashok U. Vala U. Vala, Imran J. Ratnani. Association of sleep quality and internet addiction among the medical students. *Int J Res Med Sci Int J Res Med Sci [Online].* 2019; 7: 2703–2707. <http://dx.doi.org/10.18203/2320-6012.ijrms20192903>
27. Nepal Telecommunication Authority. 12th Annual Report 2019. Kathmandu, Nepal; 2019. Available: <https://cms.ntc.net.np/storage/media/Pykk9gZC20D1bPRrF8VQXEDU9T8bdqUlo59vTtkS.pdf>
28. Cuschieri S. The STROBE guidelines. *Saudi Journal of Anaesthesia.* Wolters Kluwer Medknow Publications; 2019. pp. S31–S34. https://doi.org/10.4103/sja.SJA_543_18 PMID: 30930717
29. Grohol JM. Are You Addicted to the Internet? In: Quiz. *Psych Central [Internet].* 2019 [cited 14 Mar 2020]. Available: <https://psychcentral.com/quizzes/internet-addiction-quiz/>
30. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Res.* 1989; 28: 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4) PMID: 2748771
31. 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: 237–242. <https://doi.org/10.30773/pi.2019.0131> PMID: 32151129
32. Hysing M, Pallesen S, Stormark KM, Lundervold AJ, Sivertsen B. Sleep patterns and insomnia among adolescents: A population-based study. *J Sleep Res.* 2013; 22: 549–556. <https://doi.org/10.1111/jsr.12055> PMID: 23611716
33. Lin P-H, Lee Y-C, Chen K-L, Hsieh P-L, Yang S-Y, Lin Y-L. The Relationship Between Sleep Quality and Internet Addiction Among Female College Students. *Front Neurosci.* 2019; 13: 599. <https://doi.org/10.3389/fnins.2019.00599> PMID: 31249504
34. Çelebioğlu A, Aytekin Özdemir A, Küçüköğlü S, Ayran G. The effect of Internet addiction on sleep quality in adolescents. *J Child Adolesc Psychiatr Nurs.* 2020; 33: 221–228. <https://doi.org/10.1111/jcap.12287> PMID: 32657485
35. Tokiya M, Itani O, Otsuka Y, Kaneita Y. Relationship between internet addiction and sleep disturbance in high school students: A cross-sectional study. *BMC Pediatr.* 2020; 20: 379. <https://doi.org/10.1186/s12887-020-02275-7> PMID: 32782022
36. Tavernier R, Willoughby T. Sleep problems: predictor or outcome of media use among emerging adults at university? *J Sleep Res.* 2014; 23: 389–396. <https://doi.org/10.1111/jsr.12132> PMID: 24552437
37. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: A systematic literature review. *Sleep Med Rev.* 2015; 21: 50–58. <https://doi.org/10.1016/j.smrv.2014.07.007> PMID: 25193149
38. Arora T, Broglia E, Thomas GN, Taheri S. Associations between specific technologies and adolescent sleep quantity, sleep quality, and parasomnias. *Sleep Med.* 2014; 15: 240–247. <https://doi.org/10.1016/j.sleep.2013.08.799> PMID: 24394730

39. Arora T, Hussain S, Hubert Lam K-B, Lily Yao G, Neil Thomas G, Taheri S. Exploring the complex pathways among specific types of technology, self-reported sleep duration and body mass index in UK adolescents. *Int J Obes (Lond)*. 2013; 37: 1254–1260. <https://doi.org/10.1038/ijo.2012.209> PMID: [23295500](https://pubmed.ncbi.nlm.nih.gov/23295500/)
40. Chahal H, Fung C, Kuhle S, Veugelers PJ. Availability and night-time use of electronic entertainment and communication devices are associated with short sleep duration and obesity among Canadian children. *Pediatr Obes*. 2013; 8: 42–51. <https://doi.org/10.1111/j.2047-6310.2012.00085.x> PMID: [22962067](https://pubmed.ncbi.nlm.nih.gov/22962067/)
41. Kim SY, Kim M-S, Park B, Kim J-H, Choi HG. Lack of sleep is associated with internet use for leisure. *PLoS One*. 2018; 13: 1–11. <https://doi.org/10.1371/journal.pone.0191713> PMID: [29360882](https://pubmed.ncbi.nlm.nih.gov/29360882/)