

# Social Media Use and Sleep Disturbance among Adolescents: A Cross-Sectional Study

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## Abstract

**Objective:** Recently, social media use has become prevalent in the daily lives of many adolescents. This study was performed to address adolescents' sleep quality and depression in relation to social media use.

**Method:** This cross-sectional cluster-sampling study was directed on 576 high school students in 2019 in Hamadan, Iran. Three standard self-reported questionnaires were used for recording sleep patterns (Pittsburgh Sleep Questionnaire Index (PSQI)), depression (Beck), and Electronic Media Use. Data was analyzed using SPSS. P-values less than 0.05 were considered as being significant.

**Results:** Among the adolescents 290 (50.3%) were female and the age median was 17. The average time of all Smart devices used was 7.5±4.4 hours per day. Among all students 62.3 % (359) said that they had their cell phone on in their bedroom when they sleep. In boys, the amount of social media use was significantly more than girls and poor sleep quality had a statically significant relationship with social media use (P-Value = 0.02). Additionally, there was a reverse correlation between the average use of electronic devices and sleep duration (Spearman's rho = 0.17; P-Value = 0.03), and a direct correlation between the average use in social media and depression (Spearman's rho = 0.171; P-Value < 0.001).

**Conclusion:** In this important age group a high level of electronic devices use and its relationship with sleep quality, daily dysfunction, sleep duration and depression is worthy of issue awareness among health managers, parents and teachers for providing interventional programs, based on standard updated guidelines, in order to reduce the problem and familiarize adolescents and their parents, at home or school, with restrictions on using devices to view and participate in social media.

**Key words:** Adolescent; Sleep Disturbance; Social Media

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**E**lectronic Media Device Use (EMDU) such as computers, smartphones, television, and video games has recently become prevalent in the lives of adolescents all over the world (1). Extensive use of handheld Smart devices is increasing but based on several studies the use has been different; from 50% to more than 90 % (2-5).

This irregular electronic device use has been associated with several harmful outcomes including a higher body mass index (BMI) (6), neck or shoulder pain (7), symptoms of unclear vision and eye strain (6), reduced daytime functioning (8), and parent-child relationship problems (9).

Sleep disturbances are considered among the main ten caution signs of adolescent suicide (10) and improving troubled sleep may be a protective factor in the prevention of mental problems specially, depression (11, 12).

Previous research has demonstrated that sleep disturbance might be an important risk factor in several mental health problems in adolescents (13, 14 15). Limitation in device use, up to two hours a day, was recommended by the American Academy of Pediatrics (16).

Several studies have demonstrated that use of the abovementioned electronic devices causes sleep damage by keeping late bedtimes, limiting the sleep hours, and sleep quality disturbances (8, 17-20).

Jiewen Yang et al., in their study for finding the association between problematic Internet use and sleep in adolescents, found that problematic Internet users were at a higher risk (2.41) of sleep disturbance, and they recommended that improving the sleep patterns of adolescents and Internet use was needed (21).

In another study, Hiu Yan Wong and colleagues suggested that both severities of Internet gaming disorder and social media addiction are associated with more psychological distress and poorer sleep quality (22).

In Iran, Poorolajal and colleagues assessed 4,261 university students and found that one-third of medical students suffered from problematic Internet use which was associated with poor general health (OR=12.1) and risk of suicidal behavior (OR = 2.7) (23). In a study by Azizi performed on 360 university students, it was declared that social networking addiction of the students was at a moderate level and there was a negative correlation between the overall use of social networks and academic performance of the students ( $r = -0.210$ ,  $p < 0.01$ ) (24).

Considering the high prevalence of social media use and the importance of sleep patterns and the effect on the physical and psychological health in adolescents, including insufficient studies on this important age group in Iran, our study was designed to address the adolescent-sleep-quality-relationship with social media use in order to plan interventional programs for reducing the problem, and to familiarize adolescents and their

parents, at home or in school, with restrictions on using devices to enter social media environments based on standard updated guidelines.

## Materials and Methods

### Procedure and Sample

Details about the method was already mentioned in previous article (25) as they were in parallel with each other in a common survey.

The sample size was calculated at 720 individuals out of 6,830 high school students. Considering that  $p = 0.25$  for prevalence of sleep disturbance (26) ( $d = 0.1$ ,  $z = 1.96$ , cluster effect = 1.5, and attrition rate = 20%) the following sample size formula was used:

$$n = \frac{Z_{1-\alpha} P(1-P)}{d^2}$$

### Measures

We applied a self-reported questionnaire consisting of 4 parts. The first part of the questionnaire was included in the demographic questions. In the second part we applied the Farsi version of the Pittsburgh Sleep Questionnaire Index (PSQI). The standard self-reported valid and reliable ( $\alpha: 0.83$ ) questionnaire for recording sleep quality (27) and the Farsi language version is available. The questionnaire, itself, has optimal psychometric properties for assessment of subjective sleep quality in clinical and research settings. Cronbach's alpha coefficient was shown at 0.77 in previous research (27) and questions could be answered by a 3-level scale (never, sometimes; 2 or 3 times in a week, often; more than 3 times in a week). A standard instruction was used for determining the score of sleep quality in different subscales.

The instrument for recording the amount of an electronic device used in bed before sleep on a regular school night was applied similar to what Lemola and Hysing had used in previous research (2, 8). Cronbach's alpha was 0.70. Media use in bed was checked using four items: how often participants play video games, watch TV, talk on the cell phone, and spend time online or surfing the Internet before going to sleep. Answers were classified ranging from 1 (never), 5 (most of the time) to always (5-7 days per week). A higher sum score represents more electronic media consumption before going to sleep.

For the Electronic Media Use during a day, students were asked to indicate how many minutes and hours they [1] watch TV, [2] play video games, and [3] spend time online during weekdays (2).

Beck Depression's Inventory questionnaire was used in for measuring depression as a valid and reliable questionnaire. The internal consistency was demonstrated at 0.9 and the retest reliability ranged from 0.73 to 0.96 (28). The educational status was defined

based on semester average score:  $\geq 17$  was considered fine, 14-16 moderate, and  $< 14$  was evaluated as poor .

**Ethical Consideration**

All necessary ethical consideration was mentioned in previous article (25).

The study commenced after approval from the institute’s ethical committee (ID: IR.UMSHA.REC.1397.978).

**Statistical Analysis**

The data were entered into SPSS. Analysis strategy was explained formerly (25).

**Results**

The mean age of the 576 assessed students was  $16.53 \pm 0.69$  years (Min- Max: 15-19); 286 (49.7%) were boys where 132 (22.9%) were studying mathematics, 319 (55.4%) were in experimental fields, and the rest were in humanities .

Bedtime was 1a.m. and after in 34.8 % (201) of the students, sleep latency was more than 15 minutes in 36.6% (218), and sleep duration was 6 hours or less in 26.3% (152).

The average of all devices used was  $7.5 \pm 4.4$  hours per day. In boys, the time spent using social media was significantly more than girls, and computer games in girls was statistically more than boys (Table 1).

Results obtained about ‘before bedtime electronic devices use’ showed that watching TV was more frequent in girls (P-Value  $< 0.001$ ) and overindulgence of watching TV was significantly related to severe, and very severe, daily dysfunction (P-Value = 0.002). However, watching TV was less in depressed

adolescents (P-Value = 0.026). Playing computer games was more frequent in girls and adolescents who have been studying in the mathematics field (P-Value  $< 0.001$ ), which could increase moderate and severe daily dysfunction (P-Value = 0.025). Sending SMS text messages or talking on the cell phone, just before bedtime, were more prevalent in girls and students studying in the humanities. Finally, sleep disorder and moderate to severe daily dysfunction were significantly related to more frequent use of the Internet or social media. Details about ‘before bedtime electronic devices use’ and related variables have been shown in (Table 2). Among all students, only 34 persons (5.9%) reported that they did not have a cell phone, and 62.3% (359) said that they did have a cell phone and that it was on in their room while they were sleeping (Figure 1).

In the analysis for determining the relationship between the amount of social media use and sleep quality, and total sleep disorder, results showed that in adolescents with poor sleep quality their average social media use was 36 minutes more than the others. Poor sleep quality had a statistically significant relationship with a high amount of social media use (P-Value = 0.02) (Table 3). In addition, results showed that the higher the average hours use of social media, the greater overall score of sleep disorder was seen (P-Value  $< 0.001$ ) (Table 4). The reverse correlation between average use of electronic devices and sleep duration (Spearman’s rho = -0.17; P-Value = 0.03) (Figure 2) and a direct correlation between average use of social media and depression (Spearman’s rho = 0.171; P-Value  $< 0.001$ ) (Figure 3) was reported.

**Table 1. Average Use of Electronic Devices in High School Students**

	Hours of device use during a day (Mean± SD)		P-Value*
	Male	Female	
TV watch(hours)	2.9±2.1	3.1±2.1	0.12
Computer games(hours)	1.6±2.2	2.5±2.2	<0.001
Social media(hours)	3.4±2.4	3±2.6	0.007
Total device use(hours)	7±4.2	8±4.2	0.1

\*Mann-Whitney test

**Table 2. Before Bedtime Watching TV or Playing Computer Games and Related Variables in High School Students**

Variables	Watching TV			P-Value	Playing with Computer games			P-Value
	Never	1 or 2 nights per week	More than 2 nights per week		Never	1 or 2 nights per week	More than 2 nights per week	
sex								
Male: N (%)	38(13.3)	97(33.9)	151(52.8)		236(82.5)	44(15.4)	6(2.1)	
Female: N (%)	22(7.6)	72(24.8)	196(67.6)	<0.001	144(49.8)	98(33.9)	47(16.3)	0.001

Educational course	Humanities: N (%)					70(56.9)	30(24.4)	23(18.7)	
	Experimental: N (%)					238(74.1)	72(22.4)	11(3.4)	
	Mathematic: N (%)					72(55)	40(30.5)	19(14.5)	<0.001
Daily dysfunction*	Moderate dysfunction: N (%)	18(3.1)	51(8.9)	130(22.6)		131(22.8)	44(7.7)	23(4)	
	Severe and very severe dysfunction: N (%)	30(5.2)	93(16.1)	132(22.9)	0.002	172(20)	61(10.6)	22(3.9)	0.025
depression	normal	16(7.1)	59(26.3)	149(66.5)					
	depress	44(12.5)	110(31.2)	198(56.2)	0.026				

To avoid crowding the table, frequency of variables that didn't have a significant relationship with electronic device use were not shown.

\* Total percentages were reported in parenthesis

**Table 3. Relationship between Amount of Social Media Use and Sleep Quality and Total Sleep Disorder in High School Students**

		Social media(Mean± SD)	P-Value
Sleep quality	Poor	3.57±2.7	0.02*
	Fine	2.9±2.2	
Sleep disorder	Without problem	1.7±1.1	<0.001**
	Mild	3.1±2.4	
	Moderate	4.01±2.8	
	Sever	7.2±2.1	

\*Mann-Whitney  
\*\*Kruskal-Wallis

**Table 4. Before Bedtime Mobile Use and Related Variables in High School Students**

variables	Sending SMS or talking with mobile			P-Value	Being online and internet or social media use			P-Value
	Never	1 or 2 nights per week	More than 2 nights per week		Never	1 or 2 nights per week	More than 2 nights per week	
sex	Male: N (%)	77(26.9)	91(31.8)	118(41.3)	0.001			
	Female: N (%)	42(14.5)	105(36.2)	143(49.3)				

Educational course	Humanities: N (%)	14(11.4)	39(31.7)	70(56.9)	0.012
	Experimental: N (%)	78(24.3)	113(35.2)	130(40.5)	
	Mathematic: N (%)	27(20.5)	44(33.3)	61(46.2)	
Sleep disorder	Mild and moderate: N (%)		74(16.2)	85(18.6)	299(65.3)
	Severe and very severe: N (%)		10(11.5)	18(20.7)	59(67.8)
Daily dysfunction	Moderate dysfunction: N (%)		18(9)	45(22.6)	136(68.3)
	Severe dysfunction: N (%)		31(17.7)	29(16.6)	115(65.7)
	Very severe dysfunction: N (%)		7(8.8)	10(12.5)	63(78.8)
depression	Normal		16(7.1)	59(26.3)	149(66.5)
	Depress		44(12.5)	110(31.2)	198(56.2)

To avoid crowding the table, frequency of variables that didn't have a significant relationship with electronic device use were not shown.

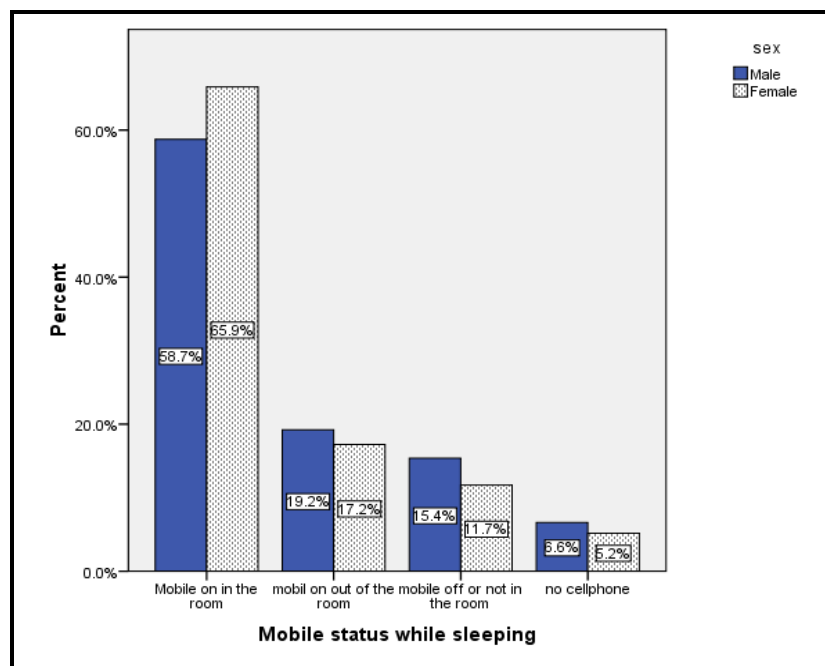


Figure 1. Mobile Status while Sleeping in High School Students

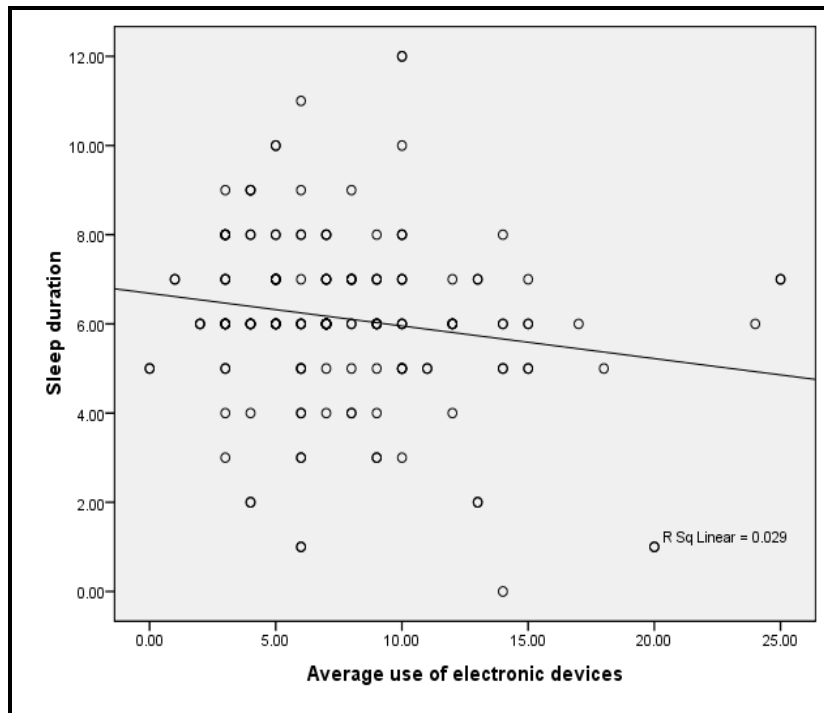


Figure 2. Reverse Correlation between Average Use of Electronic Devices (TV, Mobile and Computer Games) and Sleep Duration in High School Students

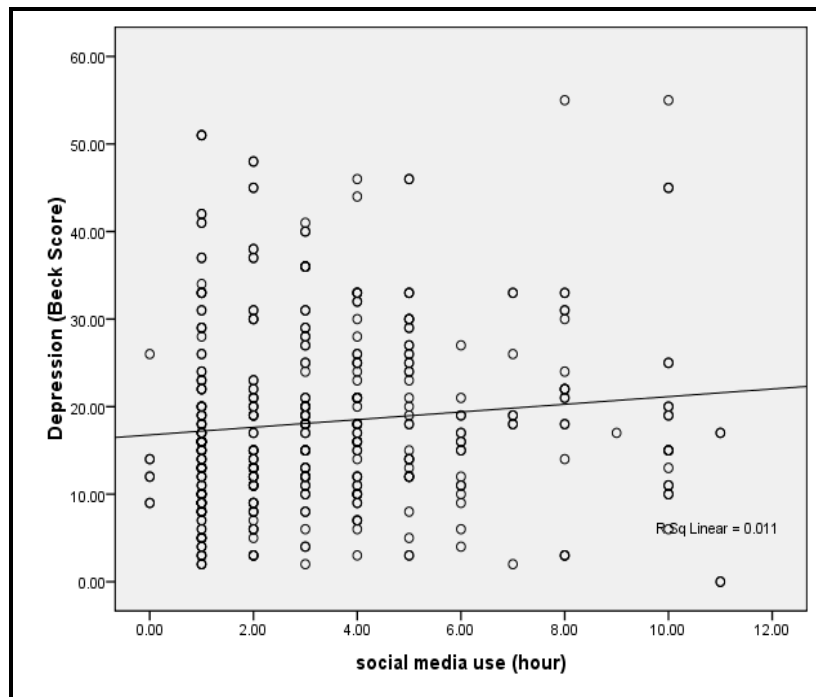


Figure 3. Direct Correlation between Average Use of Social Media Use and Depression in High School Students

## Discussion

This study on 576 high school students in 10<sup>th</sup> to 12<sup>th</sup> grades, assessed the relationship between electronic devices use and sleep pattern in adolescents.

The average use of devices (TV, cell phone, and computer games) was more than 7 hours a day and especially, for social media use, was more than 2 hours per day; longer than recommended by the American Academy of Pediatrics, and which has been accepted internationally (16).

Nearly a third of the adolescents' sleep duration was 6 hours or less and it was correlated with the amount of time Smart devices were used. There is strong evidence linking poor sleep, including shorter sleep duration (29), daily dysfunction (30), and longer sleep latency (31), with general Smart devices and Internet use. Therefore, in this important age group high levels of electronic devices use is worthy of assessment among health managers, parents and teachers.

Several studies have investigated the effect of Internet use and computer games in adolescents. For instance, in a research, 10.8% of the adolescents were moderate or severely addicted to the Internet and the risk of Internet overuse and addiction was higher in boys including adolescents who experienced recent stressful events (32). Mikiko Tokiya et al. indicated that sleep disturbance in more than half of the students in their research and a significant relationship between insufficient sleep and Internet addiction was shown in Japanese adolescents. That study found a higher percentage of sleep disturbances in private high school students and adolescents with depressed moods among other related variables (33).

Durkee et al. in another study, for finding the relationship between Pathological Internet Use (PIU) and Risk-Behaviors among European adolescents, showed that adolescents with poor sleep pattern and risky behaviors showed the strongest associations with pathological Internet use, tobacco use, poor nutrition and physical inactivity. In the study, poor sleeping habits were considered as the strongest factors related to PIU. Moreover, the prevalence of maladaptive Internet users (MIU) was significantly higher among females, whereas PIU was significantly higher in males (34).

In a study performed by Gholamian et al. it was reported that nearly one third of high school students are mild to severely addicted to the Internet in Iran and anxiety, depression, and stress among the Internet addicted was significantly higher than among the normal Internet users (15).

The results of these studies in different cultures can confirm the effect of EMDU on sleep patterns similar to the present research. Whereas, there were some differences in instruments for measuring the dependency of students to EMDU, different grades of the students, and various assessed variables.

Among all students involved in the present study more than 60% reported that they have a cell phone and it is

on, in their room, while they are sleeping. The other studies have shown different results based on location and grade of students. In Lenhart et al. findings show 86% of the adolescents fell asleep with their phones, under their pillows, or in their hands (35). In a survey conducted by Haug et al. over 85% of the adolescents used at least one Smart device every day, and more than half of them used them more than 2 h per day (36), and its use for leisure was higher in use than studying. Although the reasons for use (studying or leisure) was not specified in our study, using for leisure can be considered a negative side effect of device use which should attract the specific attention for behavior control by adolescents' health officials.

In a recent study, there was particular attention paid to the consequences of excessive social media use on depression besides sleep disturbance (25). The significant relationship between excessive social media use and poor sleep quality, daily dysfunction, sleep disorder and depression was shown in the findings. One study indicated that social media use at night and emotional interests in social media are two important elements in relation to adolescent sleep and wellbeing (37). Hallmarks in social media use such as sleep interruptions from incoming text messages (30), the pressure of being available, and feeling stressed and guilty in missing a new message, content or call (38), has been mentioned as reasons for depression referred to in previous studies. Age vulnerability of adolescents for anxiety and depression (39, 40), besides the interfering digital screen exposure at bedtime with melatonin production (41), and the stress of availability (42) in social media use can be considered as the most important reasons for increasing risk of depression by excessive use of social media.

The average use of electronic devices (TV, cell phone and computer games) was more than 7, and especially for social media, was more than 2 hours per day. This high level of social media use was positively associated with sleep quality, daily dysfunction, sleep duration and depression. Additionally, more than 60% of students said that they have a cell phone and it is on, in their room, while they are sleeping. In boys, the amount of using social media was significantly more than girls and watching TV was more frequent in girls and was significantly related with severe, and very severe, daily dysfunction. Computer games were more frequent in girls, and it could increase moderate and severe daily dysfunction. Sending SMS text messages or talking on the cell phone just before bedtime was more prevalent in girls.

## Limitation

There were, however, some limitations in the study. The importance of sleep health and electronic devices, especially social media use, in adolescents as an important age group and the high number of the sample size were advantages of our study. The limitations will

need to be considered in future research. First, this is a cross-sectional study and lower sleep quality is not necessarily the consequence of using social media, so we cannot demonstrate causality in our interpretation. Second, our sample was limited to adolescents in specific grades (10<sup>th</sup> to 12<sup>th</sup> grade high school students), so results may not be generalized to all adolescents. Third, for determining the consequence of excessive electronic devices and social media use we cannot rely on such a weak correlation despite statistical significance. As a result, more empowered studies are recommended in the future. The next recall bias might be considered in the study because the students, who had sleep problems, probably remembered their excessive use of electronic devices and social media use, more than others. Finally, identifying reasons for using social media such as leisure time or learning are needed in future studies, and interventional programs for reducing the social media use and modifying sleep problems must be considered in adolescents health care packages.

### Conclusion

The present study investigated associations between electronic devices and social media use and two important health outcomes (i.e. sleep quality and depression) among Iranian students in Hamedan, Iran. The results showed a high level of social media use which was positively associated with sleep quality, daily dysfunction, sleep duration and depression. Additionally, more than half of the students said that they have cell phones and it is on in their room while they are sleeping. Hence, in this important age group it is worthy of concern for health officials, parents and teachers to provide interventional programs in order to reduce the problem and familiarize adolescents and their parents, at home or school, with restrictions when using devices to view social media sites based on present standard updated guidelines.

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### Conflict of Interest

None.

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