

The Effects of Electronic Device Use On The Sleep Quality Of Health Science Students In The United Arab Emirates

Chiranthie Hapuarachige¹, Ibukunoluwa Fakunle¹, Hodan Idriss Ahmed¹, Samantha Sparrow^{1*}, Sumya Hasan¹, Latifa Alsaad¹, Shatha Al Sharbatti²

¹MBBS Student, ²Professor, Department of Community Medicine, Gulf Medical University, Ajman, UAE

*Presenting Author

ABSTRACT

Background: The effect of sleep on an individual is a topic that has been studied on a global level for a significant period of time. However, studies in regards to sleep quality and the effect of electronic device use have not been investigated in the United Arab Emirates (UAE).

Objectives: To investigate the frequency of electronic device use amongst health science students, to assess their sleep quality and to determine a possible association between electronic device use and sleep quality.

Materials and Methods: The study was conducted among 301 Gulf Medical University (GMU) students who were selected from the four colleges of GMU. It was used the Validated self-administered questionnaire that encompassed in addition to socio-demography and electronic devices related information, a standardized questionnaire from the University of Pittsburgh which included the Pittsburgh Sleep Quality Index (PSQI); which was used to assess sleep quality. Data was recorded on an excel sheet and analyzed by SPSS version 20. The data was presented as charts and tables and Chi-Square test was used to determine possible association between sleep quality and electronic device use.

Results: All participants are using different forms of electronic devices, mobile was the most common used device (36.2%), 76.4% of participants use electronic devices for >3 hours/day. Long duration of use (>3h) was more common in females ($p=0.006$). No significant association between the duration of use and other socio-demographic factors, 81.7% of students have poor sleep quality. Poor sleep quality was associated with students' missing class attendance and perceived effect on the mood. Putting the electronic device close to bed, or using them just before sleep were associated with perceived effect on sleep and mood (0.01 & 0.006 respectively).

Conclusion: All participants are using different forms of electronic devices A vast majority of students have poor sleep quality. Poor sleep quality is associated with students' class attendance and mood

Keywords: sleep, electronic device, health science students

INTRODUCTION

Sleep is a state of unconsciousness from which a person can be aroused by sensory and/or other stimuli. Sleep is important for the regulation of the internal environment, restoration of normal levels of brain activity and prevention of irritable and psychotic behavior.¹ Both, the quantity and the quality of sleep might have a strong influence on physical and mental well-being². Especially, in the case of young people, a poor sleep quality could have an impact on academic performance as well³, that low GPA has been associated with the lack of sleep⁴.

Technology has become a major part of the average person's life, and regardless of its use, it has its downsides, one of which is its possible effect on sleep⁵. The use of electronic devices such as mobile phone, laptops and PCs is common and on the rise. The UAE doesn't escape this trend. In fact, the sales of personal electronic devices are predicted to rise from US\$ 3.14 billion in 2011 to US \$3.97 billion by 2015, according to the Dubai Chamber analysis. This increase has been driven by the sales of popular electronic devices such as mobile phones, laptops and TVs⁶. The problem does not arise in the amount of devices owned but rather their excessive use especially at night for work or for leisure. In a study done on 20 000 young adults between the ages of 20 and 24, it was found that 13% of the men and 22% of the women indicated that they themselves, or someone close to them, thought that they used the mobile phone too much, and 6 and 14%, respectively, had tried, but failed, to cut down on mobile phone use⁷. In the United Arab Emirates (UAE), a study found about 90% of Emirati students wrote that if they left their cell phones at home, they would return to retrieve them, even if it meant missing an important class.⁸ Previous studies have shown that the overuse of electronic devices and media is associated with sleep disorders^{2,9,10}. Studies have shown that about one in four people said they do not put their phones on silent when they go to bed¹¹ or expect to be reachable by mobile phone around the clock⁷, this results in multiple disturbances during the night. The excitement brought on by communication and the variety of distractions proved by the internet may also play a role. In a study done in Peru it was found that among the 418 undergraduate students interviewed, Facebook dependent participants had about 1.3 times greater prevalence of poor sleep quality than the non-dependent group⁵. Our hypothesis for this study is that the use of electronic devices is associated with sleep quality of students. We chose to focus on this topic in this way because sleep is essential for the body and even more so for students who need to assimilate new information every day. If students are getting little sleep time, this can hamper their potential as far as schoolwork is concerned. Reported data shows that university students, who slept for shorter periods, recorded a lower GPA⁴. Poor sleep quality can also cause irritability, poor immune system function, drowsiness and inability to concentrate, among other things¹². Several researchers in other part of the world¹³ and in the UAE⁶ showed an increase in the use of electronic devices. This has particular relevance for health science students, as the boom in electronic use has led to even greater and more rapid advances in medicine and medical practice, and the students need to rely on access to the internet to stay up to date. Excessive use of electronic devices has been shown by other researcher to have an effect on sleep pattern that can have deleterious effect on new generation achievement⁴. The extent of excessive internet use behavior in the UAE, and on health science students in particular, is not well documented. The objectives of this study were to investigate the frequency of electronic device use

amongst health science students, to assess their sleep quality and to determine any association between electronic device uses and sleep quality.

MATERIALS & METHODS

A cross sectional study was performed between September 2013 - March 2014, including students at the Gulf Medical University, Ajman, UAE. The inclusion criteria were health science students aged 18 and above, who gave informed consent and were present at the time of data collection. We approached students in the preclinical years of Medicine, Physical Therapy, Dentistry and Pharmacy. Our total study population was 412. We gave out 400 questionnaires, excluding the 10 from our pilot study. 301 were returned. Response rate=75.5%.

Self-administered questionnaire consisting of 35 questions was used as a first tool. The questionnaire included information about demographics, lifestyle factors, variables related to electronic device use and variables related to class activity. The students perception with regard to the effect of sleep quality on their mood was recorded with responses measured on a four point Likert scale (rarely, sometime, most of the times, always). The questionnaire was validated by experts from Community Medicine and Medicine Departments, and pilot tested on 10 students. The second tool was the PSQI (Pittsburg Sleep Quality Index). PSQI is a self-rated questionnaire that assesses sleep quality and disturbances over a 1-month time interval. It has sensitivity of 89.6% and a specificity of 86.5%. Permission for use was acquired from the Pittsburg University. Data collection was started after receiving approval from the selected colleges, which help in setting time and venue for data collection. Participants were informed about the study objectives and the ability to withdraw at any time. The questionnaire was anonymous and confidential and informed consents were obtained from the participants before enrolment in the study. The interviewers remained on site to clarify any doubts. Ethical approval was obtained from the Gulf Medical University (GMU) Ethics Committee before starting data collection. Data was entered into excel sheet and analyzed with SPSS version.20. Data was presented in the form of tables and graphs. Associations were tested by chi-square test or setting a significance level $p < 0.05$.

RESULTS

Data was analyzed by 5 themes, which are; Demographics, Lifestyle, Electronics, Sleep quality, Association between electronic device use and sleep quality. The study included 301 participants, 48.8% of them were < 20 years old and 51.2% of them were older than 20 years. The majority of the participants were either Asian (41.7%) or Arab (36%). 16.7% of the participants are African, Europeans and other ethnicities are a minority in this study (5.7%).

Table 1 shows distribution of participants by the use of electronic devices. The mobile phone is the electronic device of choice for most of the participants, followed closely by the laptop.

We covered 5 themes in our result compilation. They are; Demographics, Lifestyle, Electronic devices, Sleep quality, Association between electronic device use and sleep quality. The significant findings are below;

Table 1: Distribution of participants by type of electronic device

| Types of Electronic Devices | N | Percent |
|-----------------------------|-----|---------|
| Mobile phone | 288 | 36.2 |
| Laptop | 279 | 35.1 |
| Tablet | 151 | 19 |
| PC | 68 | 8.6 |
| Kindle | 9 | 1.1 |

Table 2 shows the association between demographics and duration of electronic device use per day (hours). The frequency of participants who were using the electronic devices >3hours was higher among: females, aged < 20 years, students from African countries, students who were living in single room in Hostel and students from pharmacy program. The association between gender and duration of use per day is significant (P= 0.006). No significant association between the duration of use between different ages, ethnicity, accommodation or college and the duration of electronic device use per day.

Table 2. The association between demographics and duration of electronic device use per day (hours)

| | | Duration of use per day | | | | Total (100) | P value |
|---------------|--------------------|-------------------------|------|-----------|------|----------------|---------|
| | | ≤3 hours | | > 3 hours | | | |
| | | n | % | n | % | | |
| Gender | Male | 27 | 35.1 | 50 | 64.9 | 77 | 0.006 |
| | Female | 43 | 19.6 | 176 | 80.4 | 219 | |
| Age (Years) | < 20 | 34 | 23.9 | 108 | 76.1 | 142 | NS |
| | ≥ 20 | 34 | 22.8 | 115 | 77.2 | 149 | |
| Ethnicity | Arab | 27 | 25.5 | 79 | 74.5 | 106 | NS |
| | Asian | 27 | 22.0 | 96 | 78 | 123 | |
| | African | 9 | 18 | 41 | 82 | 50 | |
| | European/other | 7 | 41.2 | 10 | 58.8 | 17 | |
| Accommodation | Hostel single room | 6 | 14.3 | 36 | 85.7 | 42 | NS |
| | Hostel with others | 5 | 19.2 | 21 | 80.8 | 26 | |
| | With family | 40 | 24.8 | 121 | 75.2 | 161 | |

| | | | | | | | |
|---------|-----------------------|----|-------|----|-------|-----|----|
| College | Private | 13 | 26.5 | 36 | 73.5 | 49 | NS |
| | Private with others | 6 | 33.3 | 12 | 66.7 | 18 | |
| | Medicine | 30 | 24.0 | 95 | 76 | 125 | |
| | Dentistry | 20 | 29.9 | 47 | 70.1 | 67 | |
| | Pharmacy | 5 | 11.6 | 38 | 88.4 | 43 | |
| | Allied Health Science | 15 | 24.2% | 47 | 75.8% | 62 | |

Table 3, shows the association between electronic device use and the perceived effect of sleep on mood. Significant association ($p = 0.006$) is found between the habit of using electronic devices just before sleep and the perceived effect of sleep on mood. Those who were using their devices before bed more often reported that they feel that their sleep quality often affects their mood. The association between habitually silencing one's phone before sleep and the perceived effect of sleep on mood was also found to be significant ($p = 0.006$). Those who habitually silence their phones, less commonly reported perceiving that sleep affects their mood. Analysis of data related to Sleep Quality using the PSQI index showed that 241 students (82.8%) had bad sleep quality, and 50 students (17.2%) had good Sleep Quality.

Table 3: The association between electronic device use and the perceived effect of sleep on mood

| Variables related to the electronic devices usage | Perceived effect of sleep on mood | | | | Total (100) | P value | |
|---|-----------------------------------|-----|-------|-----|-------------|---------|-------|
| | Seldom | | Often | | | | |
| | n | % | n | % | | | |
| Putting the phone beside bed | Seldom | 67 | 65.7 | 35 | 34.3 | 102 | 0.011 |
| | Often | 99 | 50.3 | 98 | 49.7 | | |
| Checking of phone in night | Seldom | 135 | 57.4 | 100 | 42.6 | 235 | NS |
| | Often | 31 | 48.4 | 33 | 51.6 | | |
| Using electronic devices just before bed | Seldom | 70 | 66.0 | 36 | 34.0 | 106 | 0.006 |
| | Often | 95 | 49.5 | 97 | 50.5 | | |
| Putting the phone on silent mood before sleep | Seldom | 105 | 62.5 | 63 | 37.5 | 168 | 0.006 |
| | Often | 61 | 46.6 | 70 | 53.4 | | |

Seldom = sometimes + never ; Often = always + most times

Table 4 shows the association between sleep quality and missing classes, feeling sleepy in class and perceived effect of sleep on mood. Higher percentage of bad sleep quality is seen in students who have missed ≥ 3 hours of classes compared to those who have missed <2 hours (96.4% vs. 81.4%). The results showed a statistically significant association ($p = 0.045$) between the number of classes missed per week and the sleep quality. Higher percentage of bad sleep quality is noticed in students who feel sleepy in class compared to those who don't. (91.3% vs. 82.2%), but was statistically not significant. There was an increased percentage of poor sleep among students who had reported that sleep often affects their mood.

Table 4: The association between sleep quality and missing classes, feeling sleepy in class and perceived effect of sleep on mood

| Variables related to activity | Class | Sleep quality (PSQI*) | | | | Total (%=100) | P value |
|----------------------------------|----------------|-----------------------|------|------------|------|---------------|---------|
| | | Bad sleep | | Good sleep | | | |
| | | n | % | n | % | | |
| Missed Classes | ≤ 2 hours | 215 | 81.4 | 49 | 18.6 | 264 | 0.045 |
| | ≥ 3 hours | 27 | 96.4 | 1 | 3.6 | 28 | |
| Feeling sleepy in class | Seldom | 221 | 82.2 | 48 | 17.8 | 269 | NS |
| | Often | 21 | 91.3 | 2 | 8.7 | 23 | |
| Perceive effect of sleep on mood | Seldom | 127 | 77.9 | 36 | 22.1 | 163 | 0.012 |
| | Often | 114 | 89.1 | 14 | 10.9 | 128 | |

From Table 5 shows the association between variables related to electronic device and sleep quality. Significant association is found between sleep quality and the habit of having phone beside bed ($P=0.043$). Also, significant association is observed between the habit of being woken up by calls/texts/emails and sleep quality ($P=0.021$). Higher percentage of bad sleep quality was found among students whose first preference of electronic device was tablet compared to students with other preferences. Higher percentage of bad sleep quality was found among students who were using electronic devices more than 3 hours compared to those who use it for less than 3 hours (83.6% vs. 79.7%), among students who often check their phone during the night compare to those who seldom do so (95.2% vs. 79.5%); and among students who were using electronic devices just before sleep compared to those who seldom do so (85.1% vs. 78.4%). Almost similar percentage of bad sleep quality was noticed among student who often put their phones on silent mode compared to those who seldom do so (83.2% vs. 82.5%).

Table 5. The Association between variables related to electronic device and sleep quality

| Variables related to the electronic devices usage | Sleep quality PSQI* | | | | | | P value |
|--|---------------------|-----|------------|----|-------------|-----|---------|
| | Bad sleep | | Good sleep | | Total (100) | | |
| | n | % | n | % | | | |
| Preferred type of electronic device | Mobile Phone | 165 | 84.2 | 31 | 15.8 | 196 | NS |
| | Laptop | 53 | 81.5 | 12 | 18.5 | 65 | |
| | PC | 5 | 62.5 | 3 | 37.5 | 8 | |
| | Tablet | 17 | 89.5 | 2 | 10.5 | 19 | |
| Duration of electronic device usage/day (in hours) | <3 hours | 55 | 79.7 | 14 | 20.3 | 69 | NS |
| | ≥3 hours | 183 | 83.6 | 36 | 16.4 | 219 | |
| Duration electronic device usage after dark | <3 hours | 103 | 79.2 | 27 | 20.8 | 130 | NS |
| | ≥3 hours | 136 | 85.5 | 23 | 14.5 | 159 | |
| Having phone beside bed | Seldom | 75 | 76.5 | 23 | 23.5 | 98 | 0.043 |
| | Often | 166 | 86.0 | 27 | 14.0 | 193 | |
| Checking of phone in night | Seldom | 182 | 79.50 | 47 | 20.50 | 229 | NS |
| | Often | 59 | 95.20 | 3 | 4.80 | 62 | |
| Using electronic device (Internet, texting) before bed | Seldom | 80 | 78.40 | 22 | 21.60 | 102 | NS |
| | Often | 160 | 85.10 | 28 | 14.90 | 188 | |
| Silencing oh phone before sleep | Seldom | 132 | 82.50 | 28 | 17.50 | 160 | NS |
| | Often | 109 | 83.20 | 22 | 16.80 | 131 | |
| Woken by calls/texts/mails | Seldom | 194 | 80.50 | 47 | 19.50 | 241 | 0.021 |
| | Often | 47 | 94.00 | 3 | 6.00 | 50 | |

DISCUSSION

This study investigated the use of electronic device in relation to the quality of sleep amongst health science students.

All of the participants in this study regularly use an electronic device. Mobile phones being the most commonly used device regardless of demographics. This is similar to the findings of other studies, for example another study finds that 73% of

Americans use mobile phones the most¹⁴. In terms of duration of use per day, it was seen that participants more frequently used their electronic devices for more than 3 hours per day regardless of demographics.

The association between gender and duration of electronic device use was found to be significant, with women more frequently reporting to use their devices for more than 3 hours per day. A study done on College students in Taiwan¹⁵ found that females generally scored higher than males in the aspect of mobile addiction. However, a study done on Norwegian adolescents¹⁶ found that the duration of use was similar between males and females.

There does not appear to be any relationship between increased device use and the frequency of missed classes. This was also the case with the association between variables related to electronic device and feeling sleepy in class. However, when these variables were compared to the perceived effect of sleep on mood, a significant association was found between frequently putting the phone beside the bed and often feeling that sleep affects mood. This could be due to the feelings of constantly needing to be available that are commonly present among those who sleep with their phones near to their beds.¹⁷

Significant association ($p = 0.006$) was also seen between the habit of using electronic devices just before sleep and the perceived effect of sleep on mood, with those who seldom use their devices before bed reporting that they seldom feel that sleep affects their mood. A study¹⁸ has shown that the majority of adolescents use their electronic devices just before bed and those that do so more than once a month were more likely to be tired during the day than those that did not.

The results show that nearly 83% of the students have bad quality sleep. A study done on University students in Ethiopia¹⁹ found that 55.8% of students had poor quality sleep according to the PSQI result. Another study done on older Chinese adults²⁰ found that 77.7% of the participants had poor quality sleep according to the PSQI score.

The results show a statistically significant association between the number of classes missed per week and the sleep quality, with those who missed more than 3 hours of classes per week more frequently having poor quality sleep. Prior study by Onyper et al have also shown that college students who sleep longer are less likely to miss classes.²¹ The current data showed that students who reported feeling sleepy in class show a higher frequency of poor quality sleep than those who didn't, but not to a statistically significant degree. Studies have found that sleep deprivation leads to increased feelings of sleepiness during the day and thus decreased ability to pay attention in class.²² There was also an increased frequency of poor sleep among those who reported that sleep often affects their mood, although the association was not significant. Pilcher et al²² reported that sleep deprivation decreases positive mood states and increases negative mood states.

Association of the preferred electronic device and sleep quality showed that the frequency of bad sleep was highest among those who preferentially use tablets as opposed to any other electronic device, while the frequency of good quality sleep was highest among PC users, this association was, however not found to be significant. The frequency of poor sleep was higher among those who reportedly used their mobile devices for 3 or more hours per day. Prior study has indicated that frequent mobile phone use was associated with sleep disturbance⁷. The association between the duration of electronic device use after dark and sleep quality was not found to be significant in this study, which support findings from the National Sleep

Foundation's 2011 Sleep in America Poll, indicating that the amount of technology used before bed did not predict variation in sleep time²³.

Frequently checking the phone during the night, often using electronic devices before bed and seldom silencing the phone before sleep were all associated with a higher frequency of poor sleep, but not to a significant degree. Previous study has, however, shown a correlation between these variables⁷.

Often sleeping with the phone beside the bed and often being woken by calls, texts or emails both showed a significant association with poor quality sleep. Pilcher et al²¹ have shown that there is a connection between being woken during the night and sleep disturbance. Sleeping with the phone beside the bed is commonly associated with feeling the need to constantly 'be available' this feeling may be what causes the decrease in the quality of sleep⁷.

LIMITATIONS

This study has some limitation because we surveyed only one medical university in the United Arab Emirates which subsequently decreased our potential sample size and could have affected the significance of our results. Some students did not answer some of the questions. This caused information to be missing for some of the variables. Also, we used a convenient sampling method which limits the generalizability of the findings.

CONCLUSION

All participants are using different forms of electronic devices A vast majority of students have poor sleep quality. Poor sleep quality is significantly associated with the frequently sleeping with the phone beside the bed, and Woken up by calls/texts/mails. Poor sleep quality is also associated with students' class attendance and perceived effect on mood,

RECOMMENDATIONS

We recommend that there should be a national study which includes a larger sample size, representative of UAE college students which would provide more generalizable data; Increase awareness of the college student about the importance of good sleep to improve their class attendance and mood ; Increase awareness of the college student about the proper use of electronic devices that will not have negative effect on their sleep quality; Further research on the psychosocial impact of excessive electronic device usage on youth.

REFERENCES

1. Guyton AC, Hall JE. States of brain activity-sleep, brain waves, epilepsy, psychosis. In: Schmitt W, Grulioiw R. (eds). Textbook of Medical Physiology. 11th edition. Jackson, Mississippi: Elsevier Saunders. 2006. p. 739, 741.
2. Adams SK, Daly JF, Williford DN. Adolescent sleep and cellular phone use: recent trends and implications for research. *Health Serv Insights*. 2013;6:99-103. doi: 10.4137/HSI.S11083. eCollection 2013.
3. Gomes AA, Tavares J, de Azevedo MH. Sleep and academic performance in undergraduates: a multi-measure, multi-predictor approach. *Chronobiol Int*. 2011 Nov;28(9):786-801. doi: 10.3109/07420528.2011.606518.

4. Lowry M, Dean K, Manders K. The Link between Sleep Quantity and Academic Performance for the College Student. *Sentience-The University of Minnesota Undergraduate Journal of Psychology*. [Online]. 2010;3(1):16-19. Available from: URL: http://www.psych.umn.edu/sentience/files/Lowry_2010.pdf [Accessed 16th July 2013].
5. Wolniczak I, Cáceres-DelAguila JA, Palma-Ardiles G, et al. Association between Facebook dependence and poor sleep quality: a study in a sample of undergraduate students in Peru. *PLoS One*. 2013;8(3):e59087. doi: 10.1371/journal.pone.0059087. Epub 2013 Mar 12.
6. Kapur. V. UAE retail sector to grow by 33% (2011). *Emirates 24/7 business* [online]. Available from: URL: <http://www.emirates247.com/business/economy-finance/uae-retail-sector-to-grow-by-33-2011-07-19-1.408619> [Accessed 17th July 2013]
7. Thomee S, Harenstam A, Hagberg M. Mobile phone use and stress, sleep disturbance and symptoms of depression among young adults – a prospective cohort study. *BMC public Health*. [Online].2011; 11:66 Available from:URL: <http://www.biomedcentral.com/1471-2458/11/66> [Accessed 17th July 2013].
8. Hashem ME, Smith S. Emirati youth's level of addiction to New Information Technology: Opportunities, challenges/dangers, and solutions. *Global Media Journal, Arabian Edition* 2011;1(2):28-48.
9. Van den Bulck J. Television viewing, computer game playing, and Internet use and self-reported time to bed and time out of bed in secondary-school children. *Sleep*. 2004;27(1):101-4.
10. Choi K, Son H, Park M, et al. Internet overuse and excessive daytime sleepiness in adolescents. *Psychiatry Clin Neurosci*. 2009 Aug;63(4):455-62. doi: 10.1111/j.1440-1819.2009.01925.x. Epub 2009 Mar 25.
11. Doheny K. Sleep and Technology don't Mix: Sleep Poll [Internet] 2011 [cited 2013 July 17]. Available from:URL: <http://www.webmd.com/sleep-disorders/news/20110306/sleep-and-technology-dont-mix-sleep-poll> [Accessed 17th July 2013].
12. National Institute of Neurological Disorders And Stroke. Brain Basics: Understanding Sleep. [Online]. Available from: URL: http://www.ninds.nih.gov/disorders/brain_basics/understanding_sleep.htm [Accessed 16th July 2013].
13. Bergmark KH, Bergmark A, Findahl O. Extensive internet involvement--addiction or emerging lifestyle? *Int J Environ Res Public Health*. 2011 Dec;8(12):4488-501. doi: 10.3390/ijerph8124488. Epub 2011 Dec 2.
14. Tsurulnik . G. Mobile phone ranked most used electronic device: Forrester. *Mobile marketer* 2010. Available from: URL: <http://www.mobilemarketer.com/cms/news/research/7473.html> [Accessed 10. 03. 2014]
15. Chiu. SI, Hong FY and Chiu. SL. An Analysis on the Correlation and Gender Difference between College Students' Internet Addiction and Mobile Phone Addiction in Taiwan, *ISRN Addiction*, 2013, Article ID 360607, 10 pages, doi:10.1155/2013/360607.
16. Watten RG, Kleiven J, Fostervold KI, et al. Gender Profiles of Internet and Mobile Phone Use among Norwegian Adolescents. *International journal of media, technology and lifelong learning*. 2008;4(3): 1504-4831.
17. Malone SK. Early to bed, early to rise?: An exploration of adolescent sleep hygiene practices. *The Journal of School Nursing*, 211;27(5), 348-54.
18. Van den Bulck, J. Adolescent use of mobile phones for calling and sending text messages after lights out: Results from a prospective cohort study with a one year follow up. *Sleep*. 2007;30(9):1220-1223.
19. Lemma S, Gelaye B, Berhane Y, et al. Sleep quality and its psychological correlates among university students in ethiopia: A cross-sectional study. *BMC Psychiatry*. 2012;12:237.
20. Lo CMH & Lee, PH. Prevalence and impacts of poor sleep on quality of life and associated factors of good sleepers in a sample of older chinese adults. *Health and Quality of Life Outcomes*, 2012;10:72.
21. Onyper SV, Thacher PV, Gilbert JW, et al. Class start times, sleep, and academic performance in college: a path analysis. 2012;29(3):318-35.
22. Pilcher JJ & Walters AS How sleep deprivation affects psychological variables related to college students' cognitive performance. *Journal of American College Health*. 1997;46(3):121-126.
23. Gradisar M, Wolfson AR, Harvey AG, et al. The sleep and technology use of Americans: findings from the National Sleep Foundation's 2011 Sleep in America poll. *J Clin Sleep Med*. 2013;9(12):1291-9.