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Original Research Article

SMART PHONE USE AND ITS EFFECT ON QUALITY OF SLEEP IN MEDICAL STUDENTS

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Abstract

Background: Life without mobile phone is difficult to imagine. With the advent of "smart phone" it has emerged not only as essential means of communication, but an indispensable part of our lives. This is particularly true for adolescents, as it is primary means of socialization, entertainment, education etc. The present study was conducted to ascertain the impact of excessive use of smart phones on quality of sleep and to correlate scores of Smart phone addiction scale with scores of Sleep quality index. **Materials and Methods:** A cross-sectional study was conducted on 196 male and female medical undergraduate students of age between 17 and 24 years studying in a teaching hospital selected by convenient sampling method. Students who were using mobile phones more than 1 year were included in the study. Students who answered less than 50% of the questionnaires were excluded. The tools of data collection were Smart Phone Addiction Scale - Short Version (SAS-SV), and Pittsburgh Sleep Quality Index (PSQI). Spearman's rank correlation method was used to determine the strength of relationship between smart phone addiction and quality of sleep. **Result:** Out of 196 subjects included in the study, 85 (43.4%) were males and 111 (56.6%) were females. Out of 196 subjects 54 (27.55%) were smart phone excessive users. Prevalence of smart phone addiction was more in males (30.6%) when compared to females (25.2%) which was not statistically significant ($\chi 2 = 0.69$, $p = 0.40$). The mean SAS-SV score of females was slightly higher than that of males (26.69 ± 9.01 versus 25.91±8.98) which was statistically non-significant (U value = 4522, Z score = 0.495d, $p = 0.617$). The mean global PSQI score of all the study subjects was 4.43±2.62. The mean global PSQI score of smart phone excessive users group was slightly higher than that of smart phone non excessive users group which was statistically significant (5.15±2.51 versus 4.15±2.61, U value = 2849.5, Z score = -2.773, $p = 0.005$). **Conclusion:** Excessive use of smart phone, quality of sleep decreases by affecting the subjective sleep quality, sleep latency, sleep duration, sleep disturbance resulting in day time dysfunction and usage of sleep medication.

INTRODUCTION

Mobile phones have become a part of day-to-day life. International studies conducted in 2007 showed that mobile phones are the most essential means of communication for adolescents.[1] Now a days mobile phone use has increased dramatically with falling costs of mobile phones. If any adverse effect is established from mobile phone use it will be a global concern because developing countries are establishing this technology in preference to fixed line systems.[2]

The term "smart phone" is basically used for those phones that provide integrated services of communication, computing, messaging, management of applications and wireless communication competency. Smart phone was invented for the ease and welfare of people but its excess use affected people's mental and social health resulting in a new kind of health disorder among adolescents named as "smart phone's addiction". It involves abuse, misuse, or compulsive use of a smart phone by users.[3] Smart phones lead to problems like being addicted to it. Smart phone overuse leads to frequently checking of dynamic content on mobile devices resulting in

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weakening of self-regulation. Indian adolescents are affected by high smart phone addiction.[4]

Smart phone users had complained of headache, anxiety, irritation, eye strain, and lack of concentration. Researchers also have found close relationship between smart phone overuse and poor mental health like sleep deprivation, and attention deficits.[5,6] Baifeng Chen et al conducted a study on medical undergraduate students to know the gender differences in factors associated with smart phone addiction and observed the prevalence of smart phone addiction was 29.8% and concluded that there is no significant gender difference in prevalence of smart phone addiction (30.3% in males, 29.3% in females).[7] Ruchi Soni, Ritesh Upadhyay et al conducted a study on prevalence of smart phone addiction, sleep quality and associated behaviour problems in adolescents and found the prevalence of smart phone addiction as 33.3% using 33-item smart phone addiction scale. The mean SAS scores were significantly higher in males when compared to females. There was positive correlation between sleep quality global score and SAS score.[8] Demirci et al have studied the relationship of smart phone use severity with sleep quality, depression, and anxiety in university students. They observed that 39.8% of the participants were in high smart phone use group using 33-item smart phone addiction scale. The mean SAS scores were high in females when compared to males. There was positive correlation between smart phone use score and global sleep quality scores. There was also positive correlation between smart phone addiction score and subjective sleep quality, sleep disturbance and day time dysfunction components of PSQI.[9] Concetta De Pasquale, Federica Siacca et al conducted a study on smart phone addiction, dissociative experience and their consequences in Italian adolescents. They observed only boys suffer smart phone addiction when compared to females as SAS score were high in males when compared to females.[10] Tavakolizadeh J et al studied the prevalence of excessive mobile phone use and its relation with mental status and demographic factors among students of Gonabad University of medical sciences in Iran. They observed the prevalence of mobile phone addiction as 36.7% using 17 item Mobile phone addiction scale. They found no significant relation between excessive mobile phone use and gender.[11] So, the present study was conducted to know the impact of excessive use of smart phones on quality of sleep among medical undergraduates.

Aim and Objectives

The main objective of the proposed study was to determine the impact of smart phone use on quality of sleep and to correlate scores of Smart phone addiction scale with scores of Sleep quality index.

MATERIALS AND METHODS

A cross-sectional study was conducted on 196 male and female medical undergraduate students of age between 17 and 24 years studying in a teaching hospital between February to June 2023. Selected by convenient sampling method. Study included students who were using mobile phones more than 1 year were included in the study. Excluded Students who answered less than 50% of the questionnaires, who were unwilling to participate in the study and with history of sleep apnea were excluded from the study. Approval was obtained from the Institutional Ethics Committee. Written informed consent was obtained from the participants after explaining the procedure and ensured that the information pertaining to the subject will not be disclosed to others. After taking their socio-demographic characteristics, they were asked to fill two separate questionnaires. The tools of data collection were Smart Phone Addiction Scale - Short Version (SAS-SV), and Pittsburgh Sleep Quality Index (PSQI).

Smart phone addiction was assessed using Smart Phone Addiction Scale – Short Version developed by Kwon et al [12] which is a 10-item instrument addressing the following 5 content areas: 1. ‘daily life disturbance’, 2. ‘withdrawal’, 3. ‘cyberspace-oriented relationship’, 4. ‘overuse’, and 5. ‘tolerance’.

This scale consisting of 10 statements measures responses on 6 point Likert scale from strongly disagree-1 to strongly agree -6. Score of this scale ranges from 10 to 60. Smart phone addiction scale cut – off values were 31 and 33 for males and females respectively.[12]

The quality of sleep was assessed by the Pittsburgh Sleep Quality Index questionnaire which consisted of 19 self-rated questions and 5 questions rated by the bed partner or roommate (if one is available). Only self-rated questions were included in the scoring.[13]

The 19 self-rated items were combined to form seven “components”, each of which had a range of 0-3 points. A score of “0” indicates no difficulty while a score of “3” indicates severe difficulty.

Those seven components were 1. subjective sleep quality, 2. sleep latency, 3. sleep duration, 4. habitual sleep efficiency, 5. sleep disturbance, 6. use of sleep medication, and 7. day time dysfunction. The global score was obtained by adding the seven component scores with a range of 0-21 points. “0” indicates no difficulty and “21” indicates some difficulties in all areas. PSQI scores above 5 were taken as abnormal.[13]

The data obtained was analyzed by performing descriptive statistics which were represented as mean±standard deviation. Categorical variables were represented as frequency and percentages. Categorical variables were compared between the groups using Chi-square test. Mann-Whitney U test was done to identify statistically significant difference between the groups. Spearman’s rank

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correlation method was used to determine the strength of relationship between smart phone addiction and quality of sleep.

RESULTS

Out of 196 subjects included in the study, 85 (43.4%) were males and 111 (56.6%) were females. Out of 196 subjects 54 (27.55%) were smart phone excessive users and 142 (72.45%) were smart phone non excessive users. The mean global PSQI score of all the study subjects was 4.43±2.62 [Table 1].

Among 85 males, 26 (30.6%) were in smart phone excessive use group whereas 59 (69.4%) were in smart phone non excessive use group. Among 111 females, 28 (25.2%) were in smart phone excessive use group and 83 (74.8%) were in smart phone non excessive use group. Prevalence of smart phone addiction was more in males (30.6%) when compared to females (25.2%) which was not statistically significant ($\chi 2 = 0.69$, p =0.40) [Table 2].

The mean SAS-SV score of females was slightly higher than that of males (26.69 ± 9.01 versus 25.91±8.98) which was statistically non-significant (U value = 4522, Z score = 0.495, p = 0.617) [Table 3].

Among 54 excessive users, 27 (50%) had poor sleep quality (PSQI score >5) and another 27 (50%) had good sleep quality (PSQI score ≤ 5). Among 142 smart phone non excessive users 36 (25.35%) had poor sleep quality (PSQI score >5) whereas 106 (74.65%) had good sleep quality (PSQI score ≤ 5). 50% of subjects of smart phone excessive use group had PSQI score >5 when compared to 25.35% of subjects of smart phone non excessive use group who were having poor sleep quality which was statistically significant ($\chi 2 = 10.9$, p =0.001) [Table 4].

The mean global PSQI score of smart phones excessive users group was slightly higher than that of smart phone non excessive users group which was statistically significant (5.15±2.51 versus 4.15±2.61, U value = 2849.5, Z score = -2.773, p = 0.005) [Table 5].

Table 1: Descriptive analysis of baseline parameters

Parameters	Summary
Age (years) (Mean ± SD)	18.55 ± 0.92
Gender	
Males (n%)	85 (43.4%)
Females (n%)	111 (56.6%)
Excessive use (n%)	54 (27.55%)
Non excessive use (n%)	142 (72.45%)
SAS – SV (Mean ± SD)	26.35 ± 8.99
PSQI (Mean ± SD)	4.43 ± 2.62

Table 2: Comparison of prevalence of smart phone addiction among males and females

Gender	Non-Excessive use	Excessive use	Chi-square	P Value
Males (n=85)	59 (69.4%)	26 (30.6%)	0.69	0.40
Females (n=111)	83 (74.8%)	28 (25.2%)		

Table 3: Comparison of smart phone addiction in males and females

Gender	SAS-SV (Mean ± SD)	U value	Z – score	P Value
Males (n=85)	25.91±8.98	4522	0.495	0.617
Females (n=111)	26.69 ± 9.01			

Table 4: Comparison of frequency of sleep quality scores among smart phone excessive and non-excessive use groups

Smart phone usage	Good sleep quality (PSQI ≤ 5)	Poor sleep quality (PSQI > 5)	Chi-square	P Value
Excessive use (54)	27 (50%)	27 (50%)	10.9	0.001
Non-Excessive use (142)	106 (74.65%)	36 (25.35%)		

Table 5: Comparison of sleep quality scores among smart phone excessive and non-excessive use groups

Smart phone usage	Global PSQI (Mean ± SD)	U value	Z-score	P value
Excessive use	5.15 ± 2.51	2849.5	2.773	0.005
Non-Excessive use	4.15 ± 2.61			

Table 6: The correlation between SAS-SV and PSQI global and component scores

	Smart phone Addiction Scale –Short Version	
	r value	p value
Subjective sleep quality	0.24	<0.001
Sleep latency	0.29	<0.001
Sleep duration	0.16	0.03
Habitual sleep efficiency	0.06	0.41
Sleep disturbance	0.15	0.03
Use of sleep medication	0.03	0.65
Day time dysfunction	0.36	<0.001
PSQI global score	0.352	<0.001

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Spearman's rank correlation was applied between smart phone addiction and quality of sleep which showed a statistically significant weak positive correlation (r = 0.352, p = <0.001) between smart phone addiction score and quality of sleep score. There was a statistically significant weak positive correlation between smart phone addiction score and component 1 (subjective sleep quality) of PSQI (r = 0.24, p = 0.001). There was a statistically significant weak positive correlation between smart phone addiction score and component 2 (sleep latency) of PSQI (r = 0.29, p = 0.0000). There was a statistically significant weak positive correlation between smart phone addiction score and component 3 (sleep duration) of PSQI (r = 0.16, p = 0.03). The association between smart phone addiction and component 4 (habitual sleep efficiency) of PSQI was not statistically significant (r = 0.06, p =0.41). There was a statistically significant weak positive correlation between smart phone addiction score and component 5 (sleep disturbance) of PSQI (r = 0.15, p = 0.03). The association between smart phone addiction and component 6 (use of sleep medication) of PSQI was not statistically significant (r = 0.03, p =0.65). There was a statistically significant weak positive correlation between smart phone addiction score and component 7 (day time dysfunction) of PSQI (r = 0.36, p = 0) [Table 6].

DISCUSSION

Very few studies have been conducted in India on smart phone addiction and its effect on quality of sleep and this study was done in medical college in Andhra Pradesh to know the prevalence of smart phone addiction and its impact on quality of sleep. The prevalence of smart phone addiction in this study was 27.55%. (Table) as measured with the same SAS-SV was slightly lower than the study conducted in China by Baifeng Chen et al (29.8%),[7] and was lower than the study conducted by Ruchi soni et al (33.3%) which was done by using 33-item Smart phone addiction scale.[8] This was also lower than the study conducted by Tavakolizadeh J et al (37.6%) which was done by using 17-item Mobile phone addiction scale.[11]

Gender difference in prevalence of smart phone addiction was not statistically significant ($\chi 2 = 0.69$, p =0.40). This is in correlation with the study done by Baifeng Chen et al.[7]

The mean SAS-SV score of females was slightly higher than that of males (26.69 ± 9.01 versus 25.91±8.98) which was statistically non significant (U value = 4522, Z score = 0.49547, p = 0.617). This is not in correlation with studies of Ruchi Soni et al,[8] Demirci et al,[9] and Concetta De Pasquale et al.[10]

There were statistically significant more number of subjects with smart phone excessive use and poor quality sleep (50%) when compared to subjects with smart phone non excessive use and poor sleep quality (25.35%) ($\chi 2 = 10.9$, p =0.001). This is in correlation with study done by Ruchi Soni et al.[8]

There was a statistically significant positive correlation between smart phone addiction score and quality of sleep score (r = 0.352, p=0). So, with increase in smart phone use, quality of sleep decreases as higher scores of PSQI indicate poor quality of sleep. These findings are in correlation with the studies done by Ruchi Soni et al,[8] and Demirci et al.[9]

There was statistically significant positive correlation between smart phone addiction and subjective sleep quality component (r = 0.24, p = 0.001), sleep latency component (r = 0.29, p = 0.0000), sleep duration component (r = 0.16, p = 0.03), sleep disturbance component (r = 0.15, p = 0.03) and daytime dysfunction component (r = 0.36, p = 0). This is in correlation with the study done by Demirci et al in which there was positive correlation between the smart phone usage and subjective sleep quality component, sleep disturbance component and daytime dysfunction component.[9]

The probable mechanisms of association between the sleep and electronic device as suggested by Cain et al,[14] were electronic media use may displace sleep, may be associated with cognitive, emotional, psychophysiological arousal. Light emission of the screen may affect sleep. Mobile phone use in bedroom may disturb sleep in the form that received messages may awake adolescents at night.[9,14] Mobile phone usage prior to sleep affects the sleep electroencephalogram.[9,15] There were associations between electronic media use and sleep parameters like sleep onset latency, sleep deficit and sleep duration. Long sleep onset latency in adolescents may be due to biologically based delay in circadian rhythm during puberty.[16] Mobile phone emissions at night time could have an effect on melatonin onset time but not on total night time melatonin output.[9,17] High mobile phone use was associated with sleep disturbances in men and symptoms of depression in both men and women at 1 – year follow up.[18]

CONCLUSION

Study on effect of smart phone use on quality of sleep in medical students revealed that with excessive use of smart phone, quality of sleep decreases by affecting the subjective sleep quality, sleep latency, sleep duration, sleep disturbance resulting in day time dysfunction and usage of sleep medication. This study was done only in medical undergraduates and findings couldn't be generalized. As this was a cross sectional study design it was unable to evaluate the strong causal association between smart phone addiction and quality of sleep which might limit the results. The factors contributing to their excessive use of smart phone were not studied. Effect of poor quality of sleep produced by smart phone excessive use on academic performance was not studied.

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