A CROSS-SECTIONAL STUDY ON SLEEP QUALITY AND MOBILE PHONE USAGE AMONG MEDICAL COLLEGE STUDENTS IN KANCHIPURAM DISTRICT

Dr. Sagetha J [1]*, K. Subhash [2] and Dinesh Kumar G [3]

[1] Postgraduate, Department of Community Medicine, Saveetha Medical College, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai, India.
*Corresponding Author Email: snowy.emerald@gmail.com
[2] Assistant Professor, Department of Community Medicine, Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Rangareddy, Telangana, India.
[3] Professor, Department of Community Medicine, Saveetha Medical College, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai, India.

Abstract

Introduction: In 2020, the WHO formally recognized addiction to digital technology as a worldwide problem. Excessive online activity and internet use lead to an inability to manage time, energy, and attention during the daytime and produce disturbed sleep patterns or insomnia during nighttime. Prevalence was 26.99% for smartphone addiction, 14.22% for Internet addiction, and 6.04% for game addiction We intended to study the effect of excessive mobile phone usage and gaming on sleep disturbances among medical college students in a Tertiary Care Hospital in Kanchipuram District. **Methodology:** A cross-sectional study was conducted among 288 medical students in a Tertiary Care Hospital in Kanchipuram district, Tamil Nadu. Participants were selected using a simple random sampling technique. A pre-tested semi-structured questionnaire (Pittsburgh Sleep Quality Index) was used and data was collected by interview. The data was entered in MS EXCEL and analyzed using SPSS 25. **Results:** The overall mean age was 20.6 ± 1.81 years with the majority being males. 90 (31%) of participants were third-year students. 260 (90%) of the students used mobile phones for more than 4 hours per day. 219 (76 %) showed signs of sleep disturbances. Among them, 198(90%) students used their mobile for more than 4 hours per day. The majority (44%) of the students were residing in a hostel. **Conclusion:** Medical students who had mobile phone usage for more than 4 hours per day were found to have sleep disturbances which lead to severe sleep loss, emotional distress, depression, and memory dysfunction, suicide. It is important to create awareness among medical college students through health education, alternate strategies for stress management, encourage regular physical activity.

Keywords: Sleep Quality, Addiction, Smartphone, Medical Students, Gaming.

INTRODUCTION

Mobile or cellular phones are now an integral part of modern telecommunications. According to the Ministry of Information and Broadcasting, in 2022 India had over 1.2 billion mobile phone users and 600 million smartphone users[1]. In 2023 it was 66.21% smartphone users and it is estimated to increase by 2039 to 95.46% smartphone users[2]. Although individuals expect several benefits from using smartphones, their interaction via smartphones has increased and, in some cases, has hampered their day-to-day activities. Some studies exploring the prevalence of smartphone addiction among university students have found high percentages[3], **Buctot et al** found that 62.6% of participants had a smartphone addiction[4]. Individuals developing behavioral addiction to smartphones, usually neglect other tasks and duties and have lower quality of life, which points to the importance to investigate the problematic smartphone use among university students. Smartphone addiction can be defined as "the inability to control the smartphone use despite negative effects on users" or "an unstoppable and uncontrollable desire that can lead to use (a drug, a technology),

despite its negative and detrimental effects[5]." In 2020, the World Health Organization formally recognized addiction to digital technology (connected devices) as a worldwide problem, where excessive online activity and internet use lead to inability to manage time, energy, and attention during daytime and produce disturbed sleep patterns or insomnia during nighttime[6].

Prevalence estimates were 26.99%, 14.22%, and 6.04% for Smartphone, Internet, and game addiction respectively[7]. Among medical students, the prevalence of poor sleep quality ranges from 44%- 77%[8]. Excess use of smartphones has huge implications on academic performance, social, occupational, and sleep quality[9].

Studies also found that excessive use of smartphones by university students had negative academic performance, psychological issues such as loneliness, depression, isolation and distraction, compulsive behavior, tolerance, withdrawal, anxiety, lack of attention, lack of self-control, hyperactivity, and anger[3]. Excessive smartphone use can also have negative physical impacts like obesity, backaches, migraine headaches, dry eyes, loss of sound sleep, and thumb strain injuries[10].

Negative relationships with family members and peers, parental neglect or negative parental relationship, maladjustment and being unable to cope with social situations are major factors in smartphone addiction or it can cause depression which results in smartphone addiction[11].

These symptoms can appear in all smartphone addicts but can be worse in university students. Recent studies have revealed that the population which is affected by smartphone addiction is mostly young population. Especially, student population has been shown to be affected by smartphone addiction[12].

Medical students are not excluded from mobile phone addiction. Good quality and restorative sleep has been a prime requirement of physical and emotional well-being. Researchers have linked Internet and smartphone addiction to poor sleep quality and sleep disturbances.

In general, people addicted to smartphones have problems structuring their sleep habits also. When it comes to students, sleep disturbance may impair their classroom attention as well as poor concentration at studies and hence poor academic outcome[12].

Sleep restoration has shown a strong relationship with better physical, cognitive, and psychological well-being in adults, adolescents, as well as in children. This makes good quality sleep an extremely essential part of student life with poor sleep quality further increasing the risk of physical and mental disorders[13].

Unfortunately, medical students are exposed to high levels of stress right from the beginning of the course, and this makes them highly vulnerable to sleep deprivation[14]. Limited research has been conducted among medical students with respect to smartphone addiction and its possible physical and mental consequences.

We aimed to determine the pattern of mobile phone usage, and its relation to sleep quality of medical students at a tertiary care hospital in Kanchipuram district, Tamil Nadu. The objectives of this study were to estimate the proportion of mobile phone usage and to estimate the prevalence of poor sleep quality and assess the factors associated with it.

MATERIALS AND METHODS

A cross-sectional analytical study was conducted among the undergraduate students of a Medical College Hospital in Kanchipuram district, Tamil Nadu from March 2022 to August 2022. Students having a pre-existent psychological illness and those facing an upcoming exam during the study period, students who did not give consent or those not possessing a smartphone were also excluded from the study. Using simple random sampling technique (lottery method) and based on the anticipated prevalence of poor sleep quality among the students as 20% with an alpha error of 0.05 and a non-response rate of 10%, the minimum sample size required for the study was 288 by using the formula for cross-sectional study. After taking proper consent from the students, a questionnaire consisting of two sections were distributed to a sample of 288 students from first to final year of MBBS.

The procedures were in accordance and approved by the Institutional Ethics Committee of the Medical College in Kanchipuram District and with the Helsinki Declaration of 1975 as revised in 2000. Written informed consent was obtained from the study participants before getting the information from them. Data collection procedure and instruments used are as follows - The first section consisted of a pre-tested semi-structured questionnaire which was circulated to the participants in google forms and contained questions on socio-demographic factors, transport used for commutation, no.of hours of sleep, type of applications used etc. The second section consisted of the Pittsburgh sleep quality index (PQSI) to assess the sleep quality and quantity in students[15]. 19 individual items generate seven "component" scores including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of scores for these seven components yields one global score as sleep quality score. In each component, the scores varied from 0 to 3 and the total score of questionnaire varied from 0–21 and higher scores indicating the worse sleep quality. Subjects who got Pittsburgh sleep quality inventory (PSQI) global score of 5 or less were classified as "good sleepers," and those who got more than 5 as "poor sleepers." The PSQI has internal consistency and reliability coefficient (Cronbach's alpha) of 0.83.

Since a time-tested, pre-validated proforma was used to measure the study outcomes, quality was ensured. Participant identity was always kept confidential, and the data was used only for research purposes. Data was entered into MS Excel and was analyzed using statistical package for social sciences (SPSS) version 25. The socio-economic status was calculated using the BG Prasad 2023 classification[16]. The final data was tabulated, and percentages were calculated for categorical variables and mean, and standard deviation were calculated for measurable data. The associations were analyzed by crosstabs and Chi-square (χ2) test were used for statistical significance. $p < 0.05$ was considered significant.

RESULTS

The overall mean age was 20.6 ± 1.81 years with the majority being males. 90 (31%) of participants were third-year students. 260 (90%) of the students used mobile phones for more than 4 hours per day. 219 (76 %) showed signs of sleep disturbances. Among them, 198 (90%) students used their mobile for more than 4 hours per day. The majority (44%) of the students were residing in a hostel.

Table 1 shows the prevalence of poor sleep and mobile phone usage among medical students in Kanchipuram district. Majority of the students 148 (51.4%) of them had 7-9 hours of intermittent mobile phone usage per day and 129 (44.8%) students spent 4-6 hours averagely on gaming per day. Only 7 (2.4%) of them did not spend time on mobile games. When scored according to PSQI, based on 7 components related to sleep, 192 (66.7%) of the students were found to have poor sleep quality with a minimum score of 0, maximum score of 18 and Mean (SD) of 7.2431 (4.123).

Table 1: Prevalence of poor sleep quality and mobile phone usage among medical students

S. No	Variable	Category	Frequency N = 288	Percentage (%)
1	Intermittent Mobile Phone Usage/day	1 -3 hours	19	6.6
		4 – 6 hours	104	36.1
		7 – 9 hours	148	51.4
		> 9 hours	17	5.9
2	Average hours on Gaming / day	No gaming	7	2.4
		1 – 3 hours	88	30.6
		4 – 6 hours	129	44.8
		> 6 hours	64	22.2
3	PSQI score	< 5 (good)	96	33.3
		>5(poor)	192	66.7

Table 2: Global PSQI scores of the participants

S.No	Variable	Minimum	Maximum	Mean	Standard Deviation
1	Global PSQI score	0	18	7.2431	4.123

Table 3: Factors associated with poor sleep quality among medical students

S.No	Variables	Categories	PSQI ≥5 (poor) N=192	PSQI <5 (good) N=96	Chi-square test	p value
1	Year of study	1st year	52 (71.2)	21 (28.8)	22.351	**0.0001***
		2nd year	44 (81.5)	10 (18.5)		
		3rd year	66 (71.0)	27 (29.0)		
		4th year	30 (44.1)	38 (55.9)		
2	Gender	Male	157(65.4)	83(34.6)	1.013	0.314
		Female	35(72.9)	13(27.1)		
3	Intermittent mobile usage/day	1 -3 hours	11 (57.9)	8 (42.1)	1.724	0.632
		4 – 6 hours	73 (70.2)	31 (29.8)		
		7 – 9 hours	98 (66.2)	50 (33.8)		
		> 9 hours	10 (58.8)	7 (41.2)		
4	Average hours spent on gaming/day	No gaming	3 (42.9)	4 (57.1)	25.452	**0.0001***
		1 – 3 hours	55 (62.5)	33 (37.5)		
		4 – 6 hours	75(58.1)	54 (41.9)		
		>6 hours	59 (92.2)	5 (7.8)		
5	Mode of transport	College bus	138 (70.4)	58 (29.6)	7.932	**0.019***
		Public transport	20 (74.1)	7 (25.9)		
		Self-driven	34 (52.3)	31 (47.7)		
6	Place of stay	Hostel	124 (66.3)	63 (33.7)	0.03	0.861
		Day scholar	68 (67.3)	33 (32.7)		
7	Time spent on physical activity	No physical activity	71 (74.0)	25 (26.0)	3.466	0.177
		1-30 mins	118 (63.1)	69 36.9)		
		>30 mins	3 (60.0)	2 (40.0)		

*p value ≤0.05 is statistically significant

Results in Table 3 shows the factors associated with poor sleep quality among medical students. Majority of them were third year students among whom 71% had poor sleep quality compared to other students and students of other years of study and this was found to be statistically significant (p=0.0001). Gender and mobile phone usage intermittently per day were not found to be associated with poor sleep quality. Among students who has poor sleep quality, 75 (58.1%) spent 4-6 hours per day averagely on gaming compared to other students who spent less or more time on gaming and this was found to be statistically significant (p=0.0001). Mode of transportation of the students to commute to college was found to be positively associated with poor sleep quality (p=0.019) with the majority of them 138 (70.4%) using college bus. Place of stay and time spent on physical activity was not found to be positively associated with poor sleep quality among medical students.

DISCUSSION

This study shows that smartphone addiction was associated with poor sleep quality. This is one of the few studies conducted among medical students relating to smart phone addiction and sleep quality. According to the results, the mean age of participants was 20.6 ± 1.81 years which was found to be similar, 21.8 ±3.2 years in a study by **Abolfazl Mohammadbeigi** et al [17], 69.5% were females which was contrary to our study. The mean (± SD) of the age was 21.60± 2 years, **Nahla Khamis Ibrahim** et al [18], **Vivek Arun Kumar** et al [19], Among the participants, 62 (41.3%) were males and 88 (58.7%) were females in a study done in Melmaruvathur, South India. In a study done in Karnataka by **Mahesh D. Kurugodiyavar et al** [20], The mean age of subjects was 19.9 years, and there were 142 (59.2%) males similar to our study. 49.6% were residents in university dormitories, and the same results were acquired in the current study. The majority (44%) of the students were residing in a hostel and deprived of family or relatives and entertainment with their friends such as picnics or parties. Therefore, the student spends his/her time online on his smartphone instead of having useful social activity, useful entertainment, and educational activity. In a study by **Nahla Khamis Ibrahim et al** [18], the mean mobile phone dependency score was significantly higher among females compared to males (*P*<0.001). Male students studying in the third year of MBBS, those who travel by college bus and use mobile games averagely for 4-6 hours per day are at risk of higher usage of mobile cell phones and more addiction to cell phones due to more contribution in social networks which was comparable to a study by **Abolfazl Mohammadbeigi et al** [17]**,** Multivariate analysis showed that affected to cell-phone addiction, male gender and studying in general practitioner (GP) level are the most important predictors of poor sleep quality in medical students. Therefore, cell phone addiction due to higher usage of social networks is effective on sleep quality and quantity in medical students.

Nearly half of the students (51.4%) used intermittent mobile phones (7-9 hours per day) – to check messages/SMS/browsing the internet. Similar to our study by **Mahesh D. Kurugodiyavar et al** [20]**,** smartphone was primarily used for social networking by 74.2% of the subjects or playing games by 9.2 %, which was comparatively very less than our study where nearly 97.6% of students agree to play some or other form of mobile game and academic, scientific, and educational-related apps/functions were preferred by 7.1% of the subjects. The mean for the global PSQI score was 4.80, the standard deviation was 2.49 with a minimum score of 0 and a maximum score of 14

in a study done by **Mahesh D. Kurugodiyavar et al** [20]**,** in Karnataka, which was lesser than our study with a mean and standard deviation of 7.2431 (4.1231)

Poor sleep quality was noted among 66.7% of the medical students which was similar to a study by **Abolfazl Mohammadbeigi et al** [17] **,** where the prevalence of poor sleep quality was 61.7% (CI 0.95; 57.1%, 66.3%). 48.75 % were poor sleepers according to PSQI global sleep score in a study by **Mahesh D. Kurugodiyavar et** al [20], which is lesser than the prevalence found in our study. Half of the participants 77 (51.3%) reported poor quality of sleep. Smartphone addiction was statistically significantly associated with poor sleep quality in the participants (OR: 2.34 with $P <$ 0.046) **Vivek Arun Kumar et al** [19]. **Nahla Khamis Ibrahim et al** [18]**,** according to PSQI, 68.4% of the students had poor sleep quality, and the actual sleeping hours per day was 6.0 ± 1.84 h which is similar to our study. **Diogo von Gaevernitz Lima et al** [21]**,** quoted that poor quality of sleep was a frequent complaint among medicine and dentistry students, with a prevalence of 61.4% and 60.1%, respectively. The average score of subjective sleep quality in the study was 5.62 ± 2.59 ranging from 2 to 12, with 95% confidence interval of 4.44–6.8. The total of 12 participants (57%) had score higher than 5, putting them into bad sleepers category, **Pavle Randjelović et al** [22]**,** which is less than our study. The full spectrum of behavioral symptoms in digital addicts includes eating disorders and withdrawal from outdoor and social life. Evidence pointing towards dysfunctional melatonin and vitamin D metabolism in digital addicts should be taken into account for carving out perspectives for treatment. The conclusions offer a holistic account for digital addiction, where sleep deficit is one of the key factors. This article offers a narrative overview of some of the most recent literature on this topic. The analysis provided offers a conceptual basis for understanding digital addiction as one of the major reasons why people, and adolescents in particular, sleep less and less well in the digital age.

Year of study, average. gaming hours spent and mode of transport were statistically associated with poor quality of sleep. There was no statistically significant association between age group, year of study with sleep quality [20]**.** Longer average screen times and younger age have been found to be associated with poor sleep quality, which is in line with the current findings, 148 (51.4%) of them had 7-9 hours of intermittent mobile phone usage per day and 129 (44.8%) students spent 4-6 hours averagely on gaming per day. In a study done in Southern Brazil, there was a difference between the mean times of use of computers during the night (p=0.04) and computer (p<0.001) and cell phone use (p<0.001) immediately before sleep, which were greater among students with poor sleep quality. In San Francisco, California, the longer average spent on the screen-times through the time on bed was associated with poor quality of sleep, diminished sleep efficiency, and increased in the sleep onset latency. There was statistically significant (p < 0.01) and strong positive (r = 0.65) correlation between subjective quality of sleep and smartphone usage time during 24 h in a study done in Serbia by **Pavle Randjelović et al** [22]**,** Similarly, it is reported that using smartphones may affect physiological factors on brain activity such as sleep quality and the melatonin rhythm, particularly that of the pineal gland; it may also result in altered cerebral blood flow and brain electrical activity through electromagnetic field exposure in the evenings. Moreover, it is reported that long-term use of mobile devices may lead to physical discomfort, such as muscle pain and headaches, which can have adverse effects on sleep quality. There was a relation between gender and sleep quality in smartphone users. In this regard, it was reported that number of male

users with poor sleep quality was more than good sleep quality. Exposure to electronic devices had adverse effects on sleep duration, sleep onset and sleep efficiency. Checking the smartphone is informative and a sign of addiction that can be done repeatedly and is affected by sleep quality because this habit activates reward centers. Medical students use smartphone because of its apps and this affects their sleep quality by increasing depletion in the next morning and this had adverse effects on daily work quality.

The strength of the study was the evaluation of smartphone addiction among medical students, an upcoming behavioral addiction in the current global scenario. Inclusion of the PSQI has enabled the evaluation of the subjective component of sleep in the participants. Limitations of the study can be stated as the absence of a measure of the daytime sleepiness scale which could have provided more insights into the dysfunction due to poor sleep. Assessment of the academic performance could have provided inputs regarding the varying effects of sleep on the functioning of medical students.

CONCLUSION

Information and communication electronic devices interfere with the circadian clock by emitting bright light delaying this endogenous clock and causing sleep disturbance. It is clear that cheap and easy access to cell phone entertainment helps to increase the chance of sleep disorders in students. Today the researchers are focusing on sleep disorder which is one of the internet addiction complications via smartphones. Sleep disorders as one of the most important internet addiction complications related to headaches, learning disability, memory diagnosis, aggressive behavior, mental disorders, and higher risk is cause of heart disease and diabetes. However, future studies with a multicenter design are suggested with a higher sample size to assess the cultural and economic differences.

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