



A STUDY ON THE PREVALENCE OF SMARTPHONE ADDICTION AND ITS EFFECT ON QUALITY OF SLEEP AMONG MEDICAL UNDER GRADUATES

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ABSTRACT

Background: The modern era is an era of technology. The smartphones, though being useful have hit hardly both our physical and mental health. Both these aspects have impacted our quality of sleep, especially those of students who are totally dependent on these gadgets. Prevalence of smartphone addiction have been found to lie between 40-60% in various previous studies, which have also shown an association between its use and quality of sleep. So, the current study was undertaken among medical undergraduates to evaluate the presence of smartphone addiction and its impact on the quality of sleep and various other aspects. **Objectives:** The aim of the study was to evaluate the prevalence of smartphone addiction in undergraduate students of medical college and its effect as well as relationship to the quality of sleep. **Methods:** A cross-sectional analytical study was done in the Rama Medical College, Hospital and Research Centre. All the medical under graduates who were willing and gave their consent to participate were enrolled in the study, constituting a total of 390 students. The prevalence of smartphone addiction and the quality of sleep was measured using Standard scales and the purpose of its usage was assessed using a self-administered questionnaire. **Results:** Prevalence of smartphone addiction among the undergraduate students of medical college was found to be 51.79%. Among the addicted 53.79% were boys and 46.04% were girls. Sleep quality of 55.38% individuals was poor. A highly significant association ($p < 0.0001$) was found between the smartphone addiction and sleep disturbances. **Conclusion:** The prevalence of smartphone addiction among the undergraduates of medical college is found to be high, and a highly significant association is found between the prevalence of addiction and the deteriorating sleep quality.

KEYWORDS :

INTRODUCTION

Human is an ever-evolving race and has evolved to be a social being. Since antiquity the development of human race has been possible due to the social interactions established in the society. A key reason for us humans to succeed as a species is our social behaviour.

Smartphone has played the role of a catalyst in enhancing this social connectivity multiple times. They have become part and parcel of our everyday life due to its various advanced function and easy availability. We can date back history of smartphone to 1973[1].

As is often said that every coin has two sides and this holds true even with smartphones. In a haste to become progressive, social and tech-savvy, we humans lost the insight that how we became slave to these smartphones. The frequent usage of smartphone has become a hindrance instead of being facilitatory in our progress. Currently the more frequent use of smartphone has taken the form of addiction. We are currently standing at a place where the word smartphone user should be replaced by the term smartphone addicts.

As opposite to the general belief that says addiction to be a sort of dependence on drugs and chemical substances like alcohol etc, behaviour science experts hold a belief that any source which can stimulate an individual, could become addictive. The change of certain behaviours such as computer gaming, chatting, usage of drugs and internet browsing from habits into obligatory behaviour, can be considered as the development of addiction.

The main features involved in behavioural addiction consist of the following: continued and prolonged engagement in a behaviour in spite of knowing its negative effects, unable to

resist oneself from over participation in the behaviour, compulsive participation, and craving urges that lead to engagement in the specific behaviour [2].

Our dependence on smartphones can aptly be classified as a form of behavioural addiction which can be defined using age old criteria. Overall, smartphone addiction consists of four main components: compulsive usage of phone, behaviours which involve repeated checking for notifications; development of tolerance, longer, and more intense duration of use; withdrawal, feelings of anxiety without the phone; and a feeling of functional impairment, interfering other domains of life as well as face-to-face social relationships [3].

India, at present is having more than 600 million smartphone users, which will definitely increase in the near future as more feature phone users will migrate to smartphones.[4] The penetration rate of smartphone in India has reached close to 71% by 2023. It is estimated that by 2040, the number of smartphone users in India will reach 1.55 billion.[5]

Problematic behaviour patterns of usage of smartphone have been reported in various studies around the world almost equivalent to internet addiction [6]. Although addiction to smartphone is not formally recognized as a clinical diagnosis, it has become a subject of active research all round the world. Excess smartphone use can affect the various domains of our physical health including sleep.

Use of smartphone just before the bed time has become rampant among all the individuals. Increased use of smartphones before going to bed directly predisposes individuals to disturbances in sleep pattern and distress on psychological level. Circadian rhythms of an individual get disturbed due to long hours of use of mobile phones at night.

Most of the recent studies have revealed that the population most affected by smartphone addiction is the young population, major chunk of which is comprised of student population, who suffer from smartphone addiction [7].

A major change in the lifestyle of students who have shifted to online classes, home restricted environment necessitating the use of social media, and loneliness causing excessive use of smartphone for entertainment and time pass, due to the recent COVID-19 pandemic, has made students even more vulnerable for smartphone addiction.

Numerous studies have revealed that the majority of mobile users suffer from sleep deprivation and increased stress, impairing their capacities at cognitive and learning levels [8],[9]. Prevalence of smartphone addiction has severely increased among medical undergraduate [10],[11],[12].

For medical students, good quality sleep is utmost important for academic as well as practical development.

In the literature there is paucity of studies which have tried to find out the association between sleep quality and smartphone addiction among the medical undergraduates in the Northern part of our country. Thus, the current study was planned with the aim to look into the relationship between sleep Quality and smartphone use severity in undergraduates of our medical college.

MATERIAL AND METHODS

The current prevalence study was carried out in the Department of Psychiatry of Rama Medical College, Hospital and Research Centre, Kanpur; among the undergraduate students between June 2023 to July 2023. Permission was taken from the ethical and scientific committee of the institute. Before the study was started, written informed consent was obtained from all the participants.

Total 390 medical students were included in the study. Only those students who were using smartphone from the last one year before the start of study were included in the study. The students were recruited by the method of convenience sampling and only those students who were willing to participate in the study, gave written informed consent and fulfilled the study criteria were included in the current study.

A self-administered semi-structured questionnaire, developed on the basis of the literature, was used to collect information regarding the socio-demographic profile of students, purpose and pattern of smartphone usage etc.

The tools used for the study purpose were Smartphone Addiction Scale- Shorter Version [13] and Pittsburgh Sleep Quality Index Scale [14]. The Smartphone Addiction Scale-Shorter Version is a 10 item self-report scale to evaluate the risk of smartphone addiction among adolescents. Each item is scored on a 6-point Likert scale, with the responses ranging from "I strongly disagree" to "I strongly agree." Score of this scale ranges from 10 to 60. Higher the score respondents get on this scale; more they are dependent on their smartphone and higher they are addicted to smartphone. According to the scale a score of >31 is considered the cutoff for addiction in males and >33 in females. Those falling between 22 and 32 are at risk of addiction in the smartphone addiction scale.

The Pittsburgh Sleep Quality Index Scale is a self-report scale containing 9-item, which measures quality and patterns of sleep in adults. It helps to evaluate overall sleep quality and its following sub-components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The questionnaire consists of 19 self-reported items with a combination of Likert type and open-ended

questions which indicate how frequently they have experienced sleep difficulties over the past month. Responses are later converted to scaled scores ranging from 0 to 3 using the guidelines with higher scores indicating more acute sleep disturbances. The suggested cutoff score for total PSQI distinguishes between good sleepers of 5 for the global scale as it correctly identified 88.5% of the patient group in their validation study.

Participants were made sure that the information given by them would be anonymous and kept confidential to avoid reporting bias.

Numbers and percentages were used to present sociodemographic and individual characteristics. Participant's sociodemographic characteristics and the prevalence of smartphone addiction and sleep quality were analysed using descriptive statistics. The association between smartphone addiction and sleep quality was determined using the Pearson correlation coefficient. This measure was also used to evaluate the associations between sociodemographic characteristics with Internet addiction and sleep quality. Statistical analysis was conducted using IBM Statistical Package for Social Sciences version 29.0.1.0 (SPSS, IBM Corp. NY, USA) for windows.

RESULTS

Out of the 390 medical undergraduates who participated in the study 234 (60%) students were male and 156 (40%) were female. Most of the students, i.e., 210 (53.84%) were older than 21 years of age. The frequency distribution of student's age, gender, religion, family type and place of residence is presented in Table 1. 70% of the students were dependent on Wi-Fi for their data and 30% were using data card. Maximum (86.15%) students were using smartphones during night time and the rest were using it during day.

Table-1: Frequency Distribution Of Demographic Characteristics

DEMOGRAPHIC CHARACTERISTICS	Categories	N	%
Age	≤ 21	180	46.15
	>21	210	53.84
Sex	Male	234	60.0
	Female	156	40.0
Religion	Hindu	338	86.66
	Muslim	41	10.51
	Sikh	8	2.05
	Christian	3	0.77
Type of family	Nuclear family	278	71.28
	Joint family	60	15.38
	Three generation family	52	13.33
Place of residence	Hostel	367	94.10
	Home	23	5.88
Source of Data	Wi-Fi	273	70.0
	Data card	117	30.0
Time of use	Day	54	13.85
	Night	336	86.15

Out of 390 students, 202 (51.79%) reported smartphone addiction among which 109 (53.97%) were males with smart phone addiction score of >31 and 93(46.04%) were females with smart phone addiction score of >33. 188(48.20%) students were not addicted to smart phones. Quality of sleep was poor in 216(55.38%) students whereas 174(44.61%) were having good quality sleep. [Table 2]

Among the students having smartphone addiction poor quality sleep was present in 216 (55.38%) students. Association between the smartphone addiction and the quality of sleep was highly significant (p value < 0.0001). As the internet addiction is increasing the quality of sleep is

deteriorating. [Table 3]

Table-2: Comparing Smart Phone Addiction And Quality Of Sleep Among Males And Females

	Male	Female	Total (N=390)	χ^2	P value
SMART PHONE ADDICTION				5.	0.0155
Present (n=202)	109 (53.97%)	93 (46.04%)	202 (51.79%)	858	
Absent (n=188)	125 (66.49%)	63 (33.51%)	188 (48.20%)		
QUALITY OF SLEEP				25.	<0.
Good (n=174)	65 (37.35%)	109 (62.64%)	174 (44.62%)	198	0001
Poor (n=216)	137 (63.43%)	79 (36.57%)	216 (55.38%)		

Table-3: Relationship Between Smart Phone Addiction And Quality Of Sleep

QUALITY OF SLEEP	SMARTPHONE ADDICTION		χ^2	P value
	Present (n=202)	Absent (n=188)		
Good (PSQI <5)	14 (6.93%)	160 (85.11%)	237.	<0.0001
Poor (PSQI >5)	188 (93.06%)	28 (14.89%)	68	

The mean of SAS-SV score came out to be 37.69 ± 9.88 and the average global PSQI score was 7.53 ± 3.08 . Based on the PSQI, the highest scores in sleep quality components were observed in component 7 (daytime dysfunction; $M = 1.89$, $SD = 1.07$) and component 4 (sleep efficiency; $M = 1.65$, $SD = 1.02$), followed by component 5 (sleep disturbance; $M = 1.23$, $SD = 0.59$) and component 2 (sleep latency; $M = 1.12$, $SD = 1.09$). The lowest scores were achieved by component 1 (subjective sleep quality; $M = 0.34$, $SD = 0.64$) and component 6 (use of sleep medication; $M = 0.29$, $SD = 0.16$) [Table-4]. Among the various 7 components of sleep, all the components except sleep disturbances and the use of sleep medication were significantly associated with the level of smartphone addiction (p value < 0.05). [Table- 4]

Table-4: Effect Of Smart Phone Addiction On Sleep Components

SLEEP COMPONENTS (Mean score $\pm$ S.D)	SMART PHONE ADDICTION		χ^2 Value	P value
	PRESENT (n=202)	ABSENT (n=188)		
SLEEP QUALITY (0.34 ± 0.64)			83.05	< 0.0001
Very good	20 (9.9%)	81 (43.08%)		
Fairly good	46 (22.77%)	56 (29.79%)		
Fairly bad	111 (54.95%)	31 (16.49%)		
Very bad	25 (12.37%)	20 (10.64%)		
SLEEP LATENCY (1.12 ± 1.09)			52.226	< 0.0001
≤ 5 min	46 (22.77%)	86 (45.74%)		
16-30 min	56 (27.72%)	71 (37.77%)		
31-60 min	90 (44.55%)	31 (16.49%)		
> 60 min	10 (4.95%)	0 (0%)		
SLEEP DURATION (1.01 ± 0.67)			30.837	< 0.0001
> 7 hours	35 (17.33%)	70 (37.23%)		
6-7 hours	56 (27.72%)	62 (32.98%)		
5-6 hours	90 (44.55%)	41 (21.81%)		
< 5 hours	21 (10.39%)	15 (7.98%)		
SLEEP EFFICIENCY (1.65 ± 1.02)			34.084	< 0.0001
> 85%	29 (14.36%)	66 (35.11%)		
75-84 %	32 (15.84%)	42 (22.34%)		
65-74%	65 (32.18%)	45 (23.94%)		
< 65%	76 (37.62%)	35 (18.62%)		

SLEEP DISTURBANCES (1.23 ± 0.59)			0.2831	0.5947
Present	43 (21.29%)	35 (18.62%)		
Absent	159 (78.71%)	153 (81.38%)		
USE OF SLEEP MEDICATION (0.29 ± 0.16)			1.314	0.2516
Present	197 (97.52%)	187 (99.47%)		
Absent	5 (2.48%)	1 (0.53%)		
DAY TIME DYSFUNCTION (1.89 ± 1.07)			62.466	< 0.0001
Present	66 (32.67%)	3 (1.59%)		
Absent	136 (67.32%)	185 (98.40%)		

While assessing the various factors showing the academic performance of medical undergraduates, factors which were found to be statistically associated were difficulty in waking up (p value < 0.0001), drowsiness in morning (p value < 0.0001) and decreased daytime concentration (p value < 0.0001). [Table- 5]

Table-5 Academic Performance According To Smart Phone Addiction

FACTORS SHOWING ACADEMIC PERFORMANCE	SMART PHONE ADDICTION		χ^2 Value	P value
	PRESENT	ABSENT		
DIFFICULTY IN WAKING UP			200.82	<0.0001
Yes	175 (86.63%)	27 (14.36%)		
No	27 (13.36%)	161 (85.64%)		
DROWSINESS IN MORNING			100.81	<0.0001
Yes	150 (74.26%)	43 (22.87%)		
No	52 (25.74%)	145 (77.13%)		
DECREASED DAYTIME CONCENTRATION			41.241	<0.0001
Yes	154 (76.24%)	102 (54.26%)		
No	34 (16.83%)	100 (53.19%)		
DECREASE IN GRADES			0.6875	0.407
Yes	103 (50.99%)	87 (46.27%)		
No	99 (49.01%)	101 (53.72%)		
SHORT ACADEMIC ATTENDANCE			0.3259	0.5681
Yes	24 (11.88%)	18 (9.57%)		
No	178 (88.11%)	178 (94.68%)		

Purpose of the smartphone use was maximum for communication followed by social media use. Almost all the students were using smartphone for communication. 98.97% students used smartphones for social medias. Only 90% students used smartphones for academic purposes like subscribing for online coaching etc. 72.31% students indulged themselves in online shopping. [Figure-1]

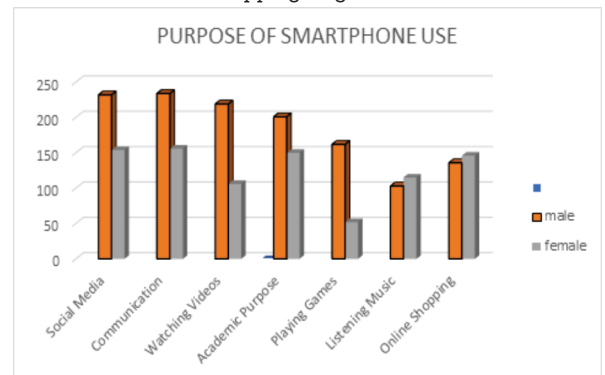


Fig-1: Bar Graph Showing Purpose Of Smartphone Use

DISCUSSION

As the human has entered a smartphone era, it has intruded every domain of his life. The most serious is the effect on his addictive behaviour towards smartphones and the effect on his quality of sleep. Smartphone addiction has affected the lives of students most severely as they are more dependent on smartphones.

As found in our study among the medical undergraduates prevalence of smartphone addiction was 51.79%. This is almost consistent with the studies of Dhamija S et al[11] , Mahesh D. Kurugodiyavar et al[15] and Liu H et al[16] who found out the smartphone addiction's prevalence among medical students to be 52% , 48.75% and 52.8% respectively.

Contrary to the above findings smartphone addiction was found to be as high as 65.8% in the study carried out by Telegote SA et al[12]. However in few other studies conducted in India among medical students in the past, smartphone addiction's prevalence was found to be 46.15%[17] and 34.4%[18].

The findings of our study show an increasing trend of smartphone use and its addiction. This trend may also be due to a large number of online study and shopping platforms available for the students.

While assessing the sleep quality of the medical undergraduates it was found that 55.38% student's sleep quality was poor. This finding can be corroborated with the findings of a study conducted by Chatterjee S et al[10]. Other studies on correlation between the smartphone addiction and the quality of sleep, found out prevalence of sleep disturbances due to smartphone addiction to be 71% [8] 69.23% [11], 58.7%[6], 52% [12] and 28.5%[16] respectively, almost consistent to our finding.

When a comparative analysis of students addicted to smartphone versus student not addicted was done, we found that students addicted to smartphones had significantly more sleep disturbances as measured by PSQI assessment scale. The association between smartphone addiction and quality of sleep was found out to be highly significant (p value < 0.0001) in our study. Such sleep disturbances are obvious as the blue light coming from the smart phones effects the quality of sleep. Many studies have shown the same correlation in their studies [19] in the past.

70% of students in our study relied on Wi-Fi as the source of data. This number is significantly high due to the Wi-Fi facility provided by the college. Also, maximum students i.e. 86.15% used smartphones during the night hours.

When compared for gender wise difference of usage of smartphone, smartphone addiction was found to be significantly higher in boys as compared to girls. This is well corroborated by the findings of other studies that have similar findings for gender-based disparity in smartphone addiction [20],[21],[22]. The reason for such a gender disparity may be the presence of more usage of smartphone for gaming in boys as compared to girls which consumes more time as well as concentration to stay stuck to the screen for a longer time duration.

In the present study, communication (100%) was the most prevalent usage purpose, followed by social media (98.97%), while only 90% students used smartphones for academic purpose. In accordance, Haque et al. [23] found in their study that the preferred purposes of smartphone usage were social media apps (99.53%), educational apps (83.26%), video apps (74.42%), and gaming apps (31.63%). In addition, Gladius et al. [24] found that 100% of their students used mobiles as a mode of communication, followed by social media (66.5%)

and only 31.5% for academic purposes. Moreover, Meng et al. [25] mentioned that 91% of college students used mobile phones for entertainment and 61% to obtain information.

The time of usage was significantly different in both genders. Most of the girls used their phones during daytime and boys used during nighttime. The mode of Internet access for smartphone was not significantly different between Wi-Fi or data card usage; however, smartphone was used significantly more in hostels than at home [11].

The factors of academic performance which were found to be statistically associated with smartphone addiction were difficulty in waking up (p value < 0.0001), drowsiness in morning (p value < 0.0001) and decreased daytime concentration (p value < 0.0001). Corroborating with our study, the study by Telegote SA et al[12] revealed that most poor sleeper students faced difficulty in waking up, had morning fatigue, suffered from a decrease in concentration, and reported decline in exam grades. In our study there was a decrease in grade in 50.99% smartphone addicted students as compared to 46.27% of the non-addicted students and this difference was not statistically significant. It may be due to other factors which may affect the studies of the students. Overall smartphone addiction played a significant role in affecting the quality of sleep of medical undergraduates.

CONCLUSION

In this study, Smart phone addiction was found to be significantly associated with the worsened sleep quality of medical undergraduates. A further study involving students of various medical colleges is suggested to investigate the underlying risk factors and mechanisms behind these problems.

Recommendation: The usage of smartphones should be decreased among medical undergraduates so that the quality of sleep is not affected and their performance may improve.

Strengths of Our Study: To investigate the relationship between smartphone addiction and sleep disturbance, we used the PSQI and SAS-SV, which have been frequently used as standard indices.

Limitations of our Study: The sample size was not adequate as 110 students didn't give consent to participate in study. Also, temporal relationship cannot be established between the two factors as this is a cross-sectional study. Data collection was done through self-report questionnaires, which may have affected the accuracy of data. Finally, study group consisted of students of only one medical college, so the result cannot be generalised.

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