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Original Research Article

The association between smartphone usage patterns, sleep quality, and academic performance among medical students in Punjab: a cross-sectional study

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ABSTRACT

Background: This study aimed to examine the prevalence of smartphone addiction and poor sleep quality among MBBS students in Punjab, Pakistan, and to investigate their associations with academic performance (CGPA%).
Methods: Between December 2024 and May 2025, a cross-sectional online survey was administered to 280 MBBS students at medical colleges in Punjab. Participants completed the Smartphone addiction scale-short version (SAS SV) to assess addictive smartphone behaviours and the Pittsburgh sleep quality index (PSQI) to evaluate sleep quality. Academic performance was self-reported as cumulative grade point average percentage (CGPA%). Associations were tested using chi-square, Mann-Whitney U, and chi-square test for trend as appropriate.
Results: Fifty one percent of students met criteria for smartphone addiction, with mean SAS SV scores of 32.15±12.13 for males and 31.33±12.31 for females (p=0.76), indicating no significant gender difference. Eighty percent of participants exhibited poor sleep quality (mean PSQI 7.43±3.33). There was a significant association between smartphone addiction and poor sleep quality (p=0.027). Smartphone addiction was also modestly associated with lower CGPA% (U=8535.5, p=0.026, r=0.13).
Conclusions: High rates of smartphone addiction and poor sleep quality were observed among MBBS students, and these factors were significantly correlated. Smartphone addiction was also modestly linked to academic performance. These findings underscore the need for institutional interventions to target smartphone overuse and improve sleep hygiene to safeguard students' health and grades.

Keywords: Academic performance, Cross sectional, Medical students, Sleep, Smartphone

INTRODUCTION

University students utilize smartphones for a variety of purposes throughout the day, including social networking, communication, productivity, entertainment, utilities, and gaming.[1] The explosive growth of cell-phones has drastically changed the global communication and information access. The daily lives of young people and adolescents have been profoundly impacted by the easy access to the internet through cell phones, especially in urban areas.[2] The detrimental effects of excessive smartphone use on academic performance have been emphasized in a number of studies.[3]

Poor sleep quality among medical students is consistently associated with smartphone addiction and excessive use.[4] Medical students are more vulnerable than other students or the general population. Excessive academic burden,

rushed schedules, extended study sessions, test stress, peer pressure, high parental expectations, and a competitive environment can all cause stress. Sleep disturbance among medical students can lead to psychiatric diseases and negatively impair cognitive skills, emotional intelligence, and academic performance.[5]

Between 10% and 67% of children, adolescents, and young adults worldwide suffer from smartphone addiction.[6,7] In India, between 24.6% and 44% of teenagers and young adults suffer from SA.[8-10] Among Chinese teenagers, the overall prevalence of Internet addiction was 26.50%.[11] Insomnia affects 10-30% of people globally, according to numerous studies; some even report that the frequency is as high as 50-60%.[12] According to a meta-analysis, 39% of medical students suffer from smartphone addiction.[13] According to a study in India, 63.39% of participants reported poor sleep, and 62.05% had GHQ scores indicating poor health.[14] A study found that 38.9% of students had poor sleep quality, as indicated by their PSQI ratings, hurting their academic performance.[5]

This study therefore aimed to determine the prevalence of smartphone addiction and poor sleep among medical students in Punjab, and whether smartphone addiction and sleep quality are associated with academic performance. By focusing on medical students, a population balancing rigorous academic demands, this study aims to provide insights that could guide institutional policies, promote mindful technology use, and address potential health and educational challenges in this high-pressure demographic.

METHODS

A cross-sectional study was conducted among medical students of Punjab, Pakistan, over a period of 6 months from December 2024 to May 2025. A self-administered questionnaire was used to assess sleep pattern, academic performance and smartphone usage.

The data was collected after the approval from Institutional Review Board (IRB) with reference number IRB/2025/1624/SIMS.

The study population comprised all MBBS (bachelor of medicine, bachelor of surgery) medical students studying in around 16 different medical colleges of Punjab from first year to final year and data were collected using a non-probability convenience sampling technique. To minimize biasing validated SAS SV and PSQI instruments were used and kept answers anonymous and data were double-checked to minimize errors. Based on the Cochran formula with a 95% confidence level, 5% margin of error, and an anticipated prevalence of 76%, the sample size was calculated as 280. Informed consent was obtained from all participants prior to commencing the questionnaire. 300 students were approached via Google Forms; 280 completed all items with 93% response and were included in final analysis. Students enrolled in BDS (bachelor of dental surgery), doing house job in hospitals and studying outside Punjab were excluded. The PSQI and SAS-SV are standard questionnaires. The PSQI was designed to evaluate overall sleep quality in the population. Each of the questionnaire's 19 self-reported items belongs to one of seven subcategories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Five additional questions rated by the respondent's roommate or bed partner are included only for clinical purposes and are not scored in the questionnaire. PSQI score cut off >5 indicating poor sleep quality and ≤5 indicating good sleep quality. The questionnaire has an internal reliability of a=0.83, a test-retest reliability of 0.85 for the global scale, a sensitivity of 89.6%, and a specificity of 86.5%.[15] The smartphone addiction scale short version (SAS-SV) was used to assess the smartphone addiction among medical students. It is composed of 10 items along with a Likert scale that results in a total score that ranges between 10 and 60, with a cutoff point of 31 for males and 33 for females, indicative of smartphone addiction. Academic performance was assessed using cumulative grade point average (CGPA) percentage scoring. CGPA was categorized and coded as >85% to 4, 70-85% to 3, 60-69% to 2 and 50-59% as 1.

Statistical software IBM-SPSS version 24 was used for data analysis. The descriptive statistics were presented as percentage and frequency for categorical variables, while the mean and standard deviation were presented for the numerical variables. The chi-squared test was used for comparing the association between the categorical variables. Independent sample t-test was used to compare the mean scores among categorical variables, and logistic regression analysis was used to evaluate the predictive value of several factors on the outcome. The level of significance in this study was set at a p value of less than 0.05. All prevalence estimates, mean differences, and regression coefficients are presented with their 95% confidence intervals.

RESULTS

Data from 280 participants were collected through online survey from undergraduate students enrolled in first year to final year. Of these 60.7% (n=170) were males and 39.3% were females (n=110). Study participants had a mean age of 22.1 years (1.78).

Table 1: Participant characteristics and associations with sleep quality.

Parameters	Poor sleep quality n=224 (80%) (%)	Good sleep quality n=56 (20%) (%)	Total 280 (%)	P value
Age (y)	22.04±1.77	22.4±1.79	22.11±1.78	0.240
Gender				
Male	135 (48.2)	35 (12.5)	170 (60.7)	0.760
Female	89 (31.8)	21 (7.5)	110 (39.3)	
Academic year				
First	21 (7.5)	4 (1.4)	25 (8.9)	0.818
Second	35 (12.5)	6 (2.1)	41 (14.6)	
Third	30 (10.7)	8 (2.9)	38 (13.6)	
Fourth	38 (13.6)	12 (4.3)	50 (17.9)	
Final	100 (35.7)	26 (9.3)	126 (45)	
SAS-SV category				
Addicted	121 (43.2)	21 (7.5)	142 (50.7)	0.027
Non-Addicted	103 (36.8)	35 (12.5)	138 (49.3)	
SAS-SV score	32.86±11.93	27.6±12.3	31.8±12.18	0.296
PSQI score	8.52±2.72	3.01±1.13	7.43±3.32	<0.001
Annual CGPA%				
>85	15 (78.9)	4 (21)	19 (6.79)	0.509
70-85	145 (78.8)	39 (21.1)	184 (65.71)	
60-69	55 (83.3)	11 (16.7)	66 (23.57)	
50-59	9 (81.8)	2 (18.2)	11 (3.93)	

*p values from chi-square test except age (t-test).

Table 2: Comparison between mean PSQI and SAS-SV scores among gender.

Parameters	Male	Female	Total	P value
PSQI score	7.41 (3.23)	7.445 (3.48)	7.43 (3.33)	0.153
SAS-SV score	32.15 (12.12)	31.32 (12.30)	31.82 (12.18)	0.794
SAS-SV category				0.662
Addict	88 (62%)	54 (38%)	142	
Non addict	82 (59%)	56 (41%)	138	

Table 3: Logistic regression analysis comparing gender, academic year and SAS-SV result on sleep quality.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% CI
Gender (1=male)	-0.071	0.315	0.051	1	0.821	0.931	0.502-1.727
Academic year	-0.095	0.113	0.705	1	0.401	0.910	0.729-1.135
SAS-SV (1=addict)	0.680	0.308	4.892	1	0.027	1.974	1.081-3.607
Annual CGPA category	-0.16	0.242	0.437	1	0.509	0.852	0.531-1.369

B = regression coefficient; S.E. = standard error; Wald = Wald chi-square statistic; df = degrees of freedom; Sig. = significance (p value); Exp(B) = odds ratio; 95% CI=95% confidence interval; CGPA>85%=4, 70-84%=3, 60-69%=2 and 50-59%=1.

Based on SAS-SV, smartphone addiction was present in 51% (n=142) students. There was no significant difference between smartphone addiction and gender. Among males, 51.8% (n=88/170) were classified as addicted to smartphones compared to 49.1% (n=54/110) of females (p=0.76), with the mean addiction score slightly higher in male students (32.15±12.13 versus 31.33±12.31). A significant relationship was detected between academic performance and smartphone addiction, whereas no significant relationships were found for sleep quality or PSQI score. The prevalence of poor sleep quality according to the PSQI score among students was 224 (80%) with a mean score of 7.43±3.32 There was no significant association between gender and poor sleep quality (p=0.76) and there was no significant difference in the mean PSQI score among gender.

There was a significant association between smartphone addiction and sleep quality (p=0.027). No significant association was found between sleep quality and academic performance (p=0.88), gender (p=0.76), Annual CGPA (p=0.883), or academic year (p=0.81) as shown in Table 1. Looking at smartphone addiction, this study showed that 79 (28.2%) students agreed that smartphone

usage had caused them to miss work and 79 (28.2%) stated that they have trouble concentrating in the class, at work, or on assignments. In addition, 86 (30.7%) participants use their smartphones for longer than they anticipated. About (11.8%) participants would never stop using their smartphones.

Regarding sleep habits, around 8.6% of the students reported going to bed by 12 a.m. and 21.4% of the students wake up by 7 a.m. The average time spent in bed before falling asleep was around 30 minutes. The average number of hours of actual sleep was 6.12±1.494 while the average hours in bed was about 8. The minimum hours of sleep were 2 hours, and the maximum was 11 hours.

DISCUSSION

Many individuals, especially young people, spend too much time on their smartphones. Recent research, however, has shown that excessive smartphone use can affect day-to-day activities and even lead to addiction.[16] In this study, 280 medical students were surveyed to investigate smartphone addiction and its effects on medical students' academic performance and sleep quality.

As far as the smartphone addiction is concerned, this study has shown that smartphone addiction was prevalent in 51% of our total study population. This is also supported by different studies in West Bengal, India which is 46% and in Karachi which is 48%.[16,17]

There was no significant difference between smartphone addiction and gender as per recent study in Pakistan.[17] But there is an alternate study by Khalily among students of Pakistan that showed a significant difference.[18]

Male students were more addicted to smartphones as compared to females. This result is same as study in China but different from study in Japan.[19,20] There is statistically significant link between lower academic performance and smartphone addiction. However, the practical significance of this finding is limited, as indicated by a small effect size (r=0.13), which suggests that smartphone addiction explains only about 1.7% of the variance in CGPA rank just like a study from Jordan.[21]

Medical students were surveyed for poor sleep quality by PSQI scale. The study showed that 80% of medical students had poor sleep quality. This may be attributable to irregular sleep schedules common among medical students. The results are in accordance with many previous studies, which also showed poor sleep quality among medical students. This result is almost equal to the study among medical students of Pakistan.[22]

Using the PSQI to quantify sleep quality in medical students, the raw prevalence estimates of poor sleep quality ranged from 12.6 to 92%.[23] This study showed prevalence of poor sleep quality to be 80%. No significant association was found between CGPA and a binary sleep quality variable, a finding reinforced by a negligible effect size (φ=0.04). Similarly, academic performance did not differ significantly across the full range of PSQI sleep quality scores. These results suggest that within this student population, CGPA operates independently of the sleep quality metrics used. For instance, a study among Saudi medical students found no correlation between academic performance and sleep quality[24]. Academic scores and PSQI did not significantly correlate in another study of 810 King Edward Medical University Pakistani medical students.[25]

Another study on medical students discovered a link between poor academic performance and midday drowsiness and late bedtime.[26]

This cross-sectional study looked at the relationship between sleep and smartphone addiction among medical students. The research found a strong link between sleep scores and smartphone addiction scores. According to a prior study, the general population with problematic smartphone usage had a 2.19 odds ratio (estimated correlation coefficient =0.211) of poor sleep quality compared to those without.[27] This study demonstrated a stronger link between smartphone addiction and sleep in medical students than in the general population.

The mean PSQI in this study was 7.43 (3.33), which was comparable to a systematic review study that found a PSQI score of 6.1 in medical students.[28] Poor sleep seems to be common among medical students. It can be due to stress, a heavy study load, prolonged study durations, studying before bedtime, unpredictable work/rest routines, and anxiety about their studies and results.[29] Medical students were more worried about their studies and spent less time on leisure activities than students of law and economics.[30] A lack of sleep knowledge can also contribute to poor sleep.[31]

This study showed that gender had no effect on either sleep quality or academic achievement. However, in contrast to several prior research that found that female medical students had lower sleep quality than male students.[32] A study on Umm Al-Qura University medical students found that female students had inferior sleep quality than male students. Furthermore, another study of Nepali medical students found that female students had poorer sleep quality.[33]

In accordance with smartphone addiction, this study reveals that smartphones cause students to miss their work and attention also distracted them from their studies. 79 (28.2%) students said they had difficulty concentrating in class, at work, or on homework. In previous studies more than half of participants agreed that reducing cell phone usage can improve academic achievement.[34]

Students were reluctant to reduce smartphone use to improve concentration. According to them, it increases

their study skill and speedy access to the latest information as per shown by previous study in Pakistan.[35]

In terms of sleep habits, around 8.6% of students go to bed by 12 a.m., whereas 21.4% wake up by 7 a.m. The average time spent in bed before falling asleep was approximately 30 minutes. The average number of hours of actual sleep was 6.12±1.494, and the average number of hours in bed was around 8. The lowest amount of sleep was two hours, while the highest was eleven hours.

Some participants are aware of their addiction to smartphones. Efforts to reduce phone usage are often unsuccessful due to addiction. Similar findings have been reported in previous studies. This is the same problem discussed by different participants during different previous studies.[34]

As a cross-sectional study, causal relationships cannot be established and convenience sampling that limits generalizability. The self-reported measures in the study are susceptible to recall bias and the lack of control for potential confounders such as mental health and caffeine use may also alter the result statistically and significantly.

CONCLUSION

This study showed that smartphone addiction among medical students is associated with poor sleep quality. We recommend that medical schools implement health education programs and enhance counselling services focused on promoting healthy sleep hygiene and mindful smartphone use among students. Promoting such changes has the potential to positively impact students' lifestyles, thereby enhancing their productivity and quality of life.

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