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Original Article

Impact Of Screen Time on Sleep Quality Among Medical Students in Chakdah, West Bengal: A Cross-Sectional Study

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Abstract

Background: The widespread use of digital devices has transformed the lifestyle of young adults, especially medical students, who rely on smartphones, tablets, and laptops for academic tasks such as accessing e-books, online lectures, and clinical resources. While these tools facilitate learning, excessive screen use has been linked to adverse health effects, particularly poor sleep quality. **Aims and objectives:** To assess the impact of daily screen time and bedtime smartphone use on sleep quality among medical students in JMN Medical College Chakdah, West Bengal. **Materials and methods:** A cross-sectional study was conducted among 265 undergraduate medical students. Data on demographic characteristics, daily screen time, and bedtime smartphone use were collected. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Statistical analyses included Chi-square tests for categorical variables and ANOVA for continuous variables. **Results:** Among 265 medical students, 175 (66.0%) had poor sleep quality, while 90 (34.0%) reported good sleep. Sleep quality did not differ significantly by gender, age, or area of residence ($p > 0.05$). Daily screen time was significantly associated with sleep quality ($p = 0.001$), with 50.0% of students using <2 hours of screens reporting good sleep, compared to 37.5% of those using 2–4 hours and 21.1% of those using >4 hours. Bedtime smartphone use was also strongly associated with poor sleep ($p < 0.001$); 58.3% of non-users reported good sleep versus only 26.8% of users. **Conclusion:** Poor sleep quality is common among medical students and is not significantly influenced by gender, age, or residence. However, higher daily screen time and bedtime smartphone use are strongly linked to poorer sleep, suggesting that reducing screen exposure—especially before bedtime—may help improve sleep quality in this population.

Keywords: Screen time, Sleep quality, Medical students, Pittsburgh Sleep Quality Index, Smartphone use, Digital hygiene.

Introduction:

The widespread use of digital devices has transformed the daily routines and lifestyles of young adults, particularly college and university students. Among medical students, smartphones, tablets, and laptops have become indispensable tools for academic tasks, including accessing e-books, online lectures, clinical resources, and study applications [1, 2]. While these technologies enhance learning efficiency and connectivity, their excessive use has raised concerns regarding potential negative health effects, particularly on sleep quality. Sleep is a vital physiological process essential for cognitive function, memory consolidation, emotional regulation, and overall well-being. Insufficient or poor-quality sleep has been linked to impaired academic performance, increased stress, and heightened risk of mental health issues [3, 4]. Screen time, defined as the duration spent using electronic devices, has emerged as a significant factor influencing sleep patterns among students. Exposure to blue light emitted by screens can suppress melatonin production, delay sleep onset, and reduce sleep duration and efficiency [5, 6]. Moreover, the interactive and stimulating nature of digital content, particularly social media and messaging platforms, contributes to

delayed bedtime, nocturnal awakenings, and fragmented sleep [7]. Previous studies have reported a high prevalence of sleep disturbances among medical students, with excessive screen time identified as an important correlating factor [8, 9]. In India, increasing smartphone penetration and the growing reliance on digital resources for academic purposes have amplified the relevance of understanding how screen use impacts sleep among this population [10].

Given the critical role of sleep in learning, mental health, and overall functioning, it is essential to examine the patterns of screen use and their association with sleep quality among medical students. Assessing this relationship can inform targeted interventions, such as digital hygiene education, time management strategies, and structured guidance on screen use, aimed at promoting healthier sleep habits and enhancing academic performance and well-being in medical students. The study aims to assess the impact of daily screen time and bedtime smartphone use on sleep quality among medical students in JMN Medical College Chakdah, West Bengal.

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MATERIALS AND METHODS

Study design: Cross-sectional observational study

Period of study: 1 year.

Place of Study: JMN Medical College, Chakdah, West Bengal, India

Study Population: Undergraduate medical students who were present during the study period and provided informed consent were included in the study.

Sample size: The sample size for this study was determined based on the prevalence of poor sleep quality (PSQI score >5) reported by Baria et al. among undergraduate medical students in Gujarat, which was 73%. Using a 95% confidence interval and an allowable error of 5%, the sample size was calculated using the formula $4pq / d^2$, yielding a minimum requirement of 303 participants.

A stratified sampling method was employed to ensure

representation across different streams of study. Six colleges were selected, one each from dental, nursing, engineering, arts, science, and law streams, with each college forming a separate stratum. From each stratum, students were randomly selected and recruited for the study, ensuring proportional representation from each educational background. The final sample consisted of 265 participants who met the inclusion criteria.

Inclusion Criteria:

- Undergraduate medical students enrolled in 18-25 years at the study institution.
- Students who use smartphones, tablets, or other digital devices for academic or personal purposes.
- Students who provide informed consent to participate in the study.
- Students who are available during the data collection period.

Exclusion Criteria:

- Students with diagnosed sleep disorders or on medication affecting sleep.
- Students with chronic medical or psychiatric conditions that may influence sleep patterns.
- Students who decline or do not provide informed consent.
- Students who are Undergoing medical treatment
- Students absent during the study period or unable to complete the questionnaire.

Data Collection: A structured questionnaire was administered through face-to-face interviews conducted by the principal

investigator. It collected information on participants' sociodemographic characteristics, daily screen time habits, and sleep quality, which was evaluated using the Pittsburgh Sleep Quality Index (PSQI).

Study Variable:

- Age (years)
- Gender (male/female)
- Year of study (1st, 2nd, 3rd, final year)
- Good sleep (PSQI $\leq$ 5)
- Poor sleep (PSQI $>$ 5)
- Academic workload
- Use of stimulants (tea, coffee, energy drinks)
- Physical activity
- Stress levels

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spreadsheet and then analyzed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values $\leq$ 0.05 were considered statistically significant.

RESULTS

Table 1: Socio-Demographic Characteristics of Study Participants

Variable	Category	n (%)
Gender	Male	130 (49.1)
	Female	135 (50.9)
Age (years)	18-20	105 (39.6)
	21-23	160 (60.4)
	Mean $\pm$ sd	21.1 $\pm$ 1.4
Residential Area	Rural	126 (47.5)
	Urban	139 (52.5)

Table 2: Screen Time and Bedtime Smartphone Use

Variable	Category	n (%)
Daily screen time	<2 hours	50 (18.9)
	2-4 hours	120 (45.3)
	>4 hours	95 (35.8)
Bedtime smartphone use	No	60 (22.6)
	Yes	205 (77.4)

Table 3: Sleep Quality (PSQI) Among Medical Students

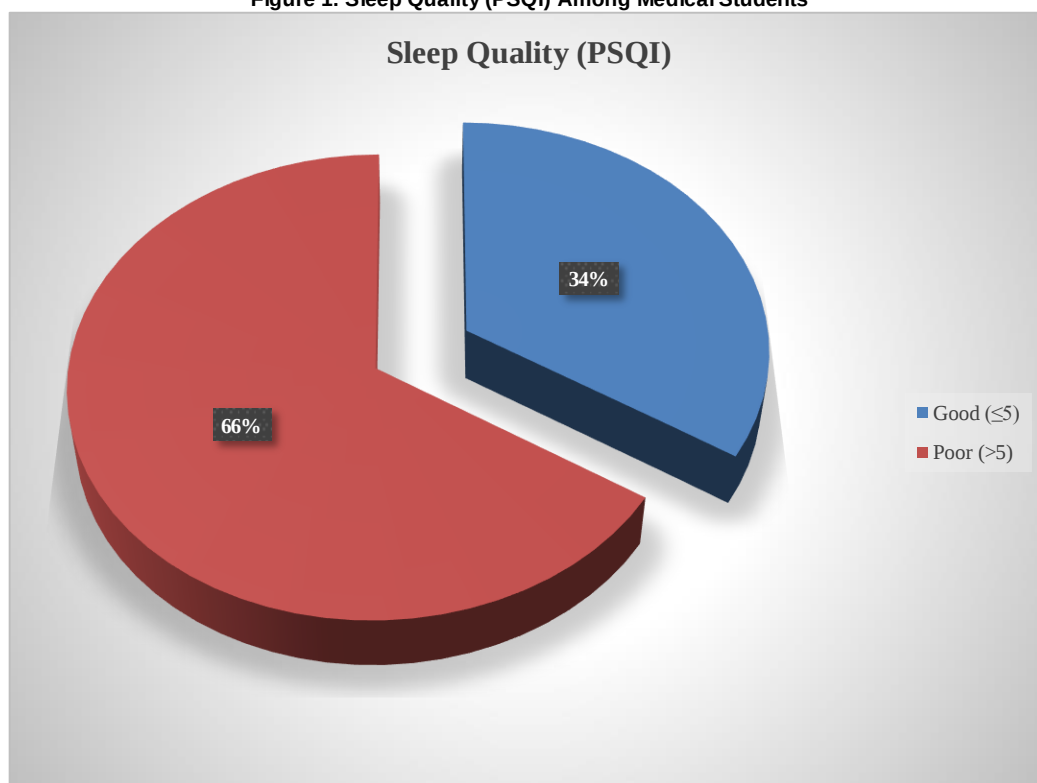
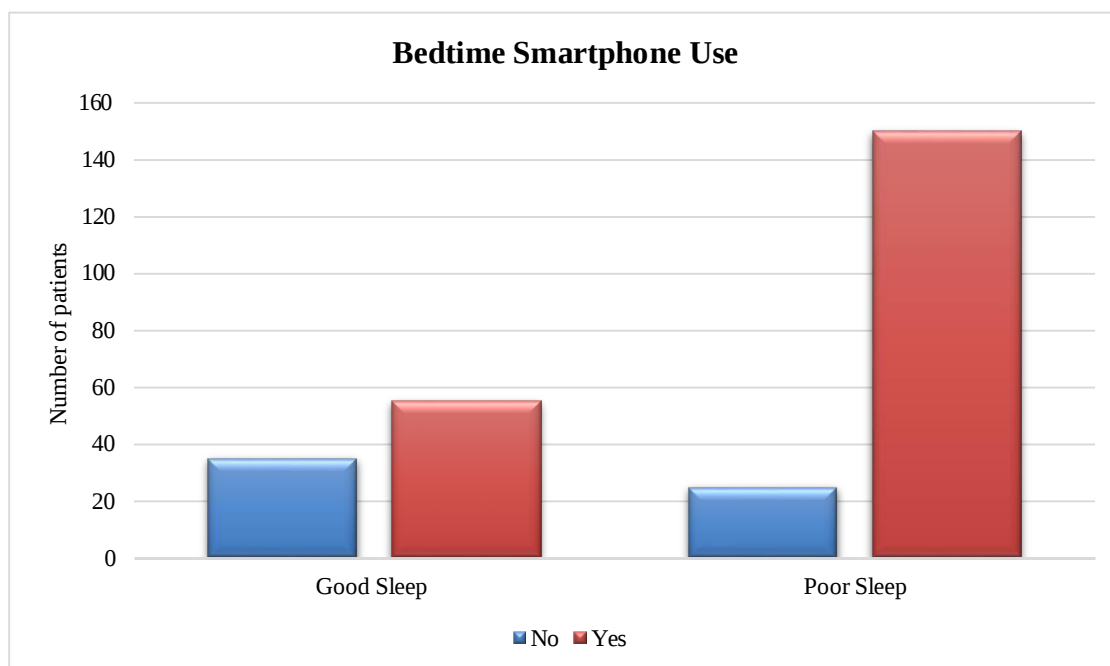
Sleep quality (PSQI)	n (%)
Good ($\leq$ 5)	90 (34.0)
Poor ($>$ 5)	175 (66.0)

Table 4: Association between Sleep Quality with Demographic Factors, Screen Time, and Bedtime Smartphone Use.

Variable	Category	Good Sleep n (%)	Poor Sleep n (%)	Total	χ^2 value	p-value
Gender	Male	40 (30.8)	90 (69.2)	130	1.9	0.15
	Female	50 (37.0)	85 (63.0)	135		
Age (years)	18-20	35 (33.3)	70 (66.7)	105	0.03	0.78
	21-23	55 (34.4)	105 (65.6)	160		
Area of Residence	Urban	45 (35.7)	81 (64.3)	126	0.27	0.85
	Rural	45 (32.6)	93 (67.4)	138		
Screen Time	<2 hours	25 (50.0)	25 (50.0)	50	17.3	0.001
	2-4 hours	45 (37.5)	75 (62.5)	120		
	>4 hours	20 (21.1)	75 (78.9)	95		
Bedtime Smartphone Use	No	35 (58.3)	25 (41.7)	60	21.6	<0.001
	Yes	55 (26.8)	150 (73.2)	205		

Table 5: Sleep quality assessment of study participant based on Pittsburgh sleep quality index

Sleep quality assessment	Category	n (%)
Component 1- subjective sleep quality score	Good	220 (83.0)
	Bad	45 (17.0)
Component 2- sleep latency score	<15 min	108 (40.8)
	16-30 min	101 (38.1)
	30-60 min	42 (15.8)
	>60 min	14 (5.3)
Component 3- sleep duration	<5 hours	14 (5.3)
	5-7 hours	158 (59.6)
	>7 hours	93 (35.1)
Component 4- sleep efficiency	>85%	168 (63.4)
	65-84%	86 (32.5)
	<65%	11 (4.1)
Component 5- sleep disturbance	Yes	193 (72.8)
	No	72 (27.2)
Component 6- use of sleep medication	Yes	25 (9.4)
	No	240 (90.6)
Component 7- daytime dysfunction	Yes	140 (52.8)
	No	125 (47.2)

Figure 1: Sleep Quality (PSQI) Among Medical Students**Figure 2: Association between Bedtime Smartphone Use and Sleep Quality**

A total of 265 medical students participated in the study. The gender distribution was nearly equal, with 130 males (49.1%) and 135 females (50.9%). Most participants were aged 21-23 years (160, 60.4%), while 105 (39.6%) were aged 18-20 years. In terms of area of residence, 139 students (52.5%) lived in urban areas, whereas 126 (47.5%) were from rural areas. This indicates a relatively balanced representation in terms of gender and residence, with a slightly higher proportion of older students and urban residents.

Daily screen time varied among participants. Fifty students (18.9%) reported using screens for less than 2 hours per day, 120 students (45.3%) reported 2-4 hours, and 95 students (35.8%) reported more than 4 hours. A substantial majority (205, 77.4%) reported using smartphones at bedtime, while only 60 students (22.6%) did not. This suggests that prolonged screen exposure and bedtime smartphone use are common among these medical students.

Overall, sleep quality assessed using the Pittsburgh Sleep Quality Index (PSQI) revealed that a majority of students had poor sleep. Specifically, 175 students (66.0%) had poor sleep quality (PSQI >5), while only 90 students (34.0%) reported good sleep quality (PSQI ≤5). This indicates that poor sleep is prevalent among medical students in this sample.

Sleep quality did not show significant differences based on gender, age, or area of residence. Among males, 40 (30.8%) reported good sleep, while 90 (69.2%) had poor sleep, compared to 50 females (37.0%) with good sleep and 85 (63.0%) with poor sleep ($p=0.15$). Regarding age, 33.3% of students aged 18-20 years and 34.4% of students aged 21-23 years reported good sleep ($p=0.78$). Similarly, 35.7% of urban and 32.6% of rural students reported good sleep quality ($p=0.85$). These findings suggest that demographic factors were not significantly associated with sleep quality in this sample.

A significant association was observed between daily screen time and sleep quality ($p=0.001$). Among students with less than 2 hours of screen time, 25 (50.0%) had good sleep, whereas 25 (50.0%) had poor sleep. In contrast, students with 2-4 hours of screen time had 37.5% good sleep, and those with more than 4 hours had only 21.1% good sleep. This indicates that increased screen time is associated with poorer sleep quality.

Bedtime smartphone use was strongly associated with poor sleep quality ($p<0.001$). Among students who did not use smartphones at bedtime, 35 (58.3%) reported good sleep and 25 (41.7%) reported poor sleep. In contrast, only 55 students (26.8%) who used smartphones at bedtime reported good sleep, while 150 (73.2%) had poor sleep. This suggests that bedtime smartphone use may significantly contribute to poor sleep quality among medical students.

The sleep quality assessment of the study participants based on the Pittsburgh Sleep Quality Index (PSQI) revealed varied patterns across the different components. Most participants reported good subjective sleep quality (83.0%), although 17.0% rated their sleep as bad. Regarding sleep latency, 40.8% fell asleep within 15 minutes, while 5.3% required more than an hour. Over half of the participants (59.6%) slept between 5-7 hours per night, and 35.1% reported sleeping more than 7 hours. Sleep efficiency was high in the majority, with 63.4% achieving more than 85% efficiency. Sleep disturbances were common, affecting 72.8% of participants. Only 9.4% reported using sleep medication. Daytime dysfunction was noted in 52.8% of participants.

DISCUSSION

In the present study of 265 medical students, we found a high prevalence of poor sleep quality (66.0%) — especially among those with greater daily screen time and those who used smartphones at bedtime. The strong association between longer screen time and poor sleep, and between bedtime smartphone use and poor sleep, suggests that screen-based behaviours may be an important contributor to sleep disturbances in this population.

These findings are consistent with several prior studies among medical and university students. For instance, in a study by Joseph et al., MBBS students showed a significant association between increased smartphone screen time and poor sleep quality as measured by the Pittsburgh Sleep Quality Index (PSQI). [11] Similarly, a cross-sectional study among medical students by Kurugodiyavar and colleagues found that smartphone addiction (as assessed by a standardized scale) was positively correlated with PSQI scores ($r = 0.343$, $p<0.001$) — indicating that heavier smartphone users tended to have poorer sleep. [12]

The role of bedtime smartphone use appears particularly detrimental. In a cross-sectional study at a medical college in Thailand, prolonged smartphone use during bedtime was associated with poor sleep quality, longer sleep latency, and daytime sleepiness. [13] An international cohort study also reported that nighttime screen use was common among medical students and significantly associated with increased sleep latency and disruptions in sleep continuity — regardless of socio-demographic factors. [14]

Mechanistically, these associations may be mediated by a combination of factors. First, prolonged screen time — especially before bed — likely delays sleep onset by displacing time that would otherwise be spent resting, thereby reducing total sleep duration and quality. This is supported by arguments that evening screen use, especially from smartphones, can suppress melatonin secretion and disrupt circadian rhythms, thus impairing sleep-wake regulation. [15] Second, smartphones often deliver stimulating content (social media, videos, messages), which may increase cognitive or emotional arousal at bedtime — making it harder to relax and fall asleep. Prior studies have noted that bedtime smartphone use is associated with increased sleep latency, more frequent awakenings, and shorter overall sleep duration. [16]

However — while our findings align with many — there is not universal agreement in the literature. For example, a recent study published in 2025 on nomophobia among university students reported no significant association between the number of hours of daily smartphone use and sleep quality. [17] This suggests that the effect of screen time may depend not only on quantity but also on context (e.g., time of use, purpose of use, individual differences) — a nuance that our study broadly supports, given the stronger effect for bedtime use than for screen time alone.

Additionally, methodological differences may account for some of the variation: some studies focus on total daily use, others on pre-sleep use; some use smartphone addiction scales rather than simple hours-of-use; and sleep quality is often self-reported.

Given the high prevalence of poor sleep and the significant associations found in the present study, it is prudent to consider interventions. Encouraging reduced screen use before bedtime — perhaps via “smartphone free hour(s)” before sleep — could be a low-cost, low risk approach to improve sleep quality. Universities and colleges might integrate sleep hygiene education, specifically addressing smartphone use.

Conclusion

The study highlights a high prevalence of poor sleep quality among medical students, with two-thirds of participants reporting poor sleep. While demographic factors such as gender, age, and area of residence were not significantly associated with sleep quality, lifestyle factors, particularly screen time and bedtime smartphone use, showed strong associations. Increased daily screen time and habitual smartphone use at bedtime were linked to poorer sleep quality, suggesting that these modifiable behaviors may play a key role in sleep disturbances among medical students. Interventions aimed at reducing screen exposure, especially before bedtime, could potentially improve sleep health in this population.

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