



Volume 4 Issue 1
(Jul-Dec)
2026

Submission:

17th April, 2026

Acceptance:

19th September,
2026

DOI: 10.5281/
zenodo.2336828

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Available from: [https://
esrfjrjms.co.in/index.php/main/
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Published by: Eureka Sciencetech Research
Foundation, Kolkata.

Online access: <https://esrfjrjms.co.in>

Smartphone Addiction and its Association with Insomnia among Undergraduate Medical Students in a Tertiary Care Teaching Hospital of Eastern India: A Cross-sectional Study

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Abstract

Background: The exponential growth of smartphone technology has significantly impacted medical education and the well-being of students. While serving as an academic resource, excessive use can lead to addiction and disrupted sleep patterns. This study aimed to determine the prevalence of smartphone addiction among undergraduate medical students at North Bengal Medical College and Hospital and evaluate its association with sleep cycle disturbances.

Methods: A descriptive, cross-sectional study was conducted between January and February 2026 among 409 MBBS students selected via stratified random sampling. Smartphone addiction was assessed using the Smartphone Addiction Scale – Short Version (SAS-SV), and sleep quality was measured using the Insomnia Severity Index (ISI). Data were analyzed to identify demographic risk factors and associations between usage patterns and insomnia.

Results: The prevalence of smartphone addiction was 44.5% (n=182), while 65.8% (n=269) of students suffered from insomnia. A strong positive association was found: 56.5% of addicted students experienced clinically significant insomnia compared to 21.4% of non-addicted students. Addiction risk was higher in males (53.1%) than females (30.3%) and highest among students perceiving themselves as having a "poor" socioeconomic status (61.1%). Peak smartphone usage occurred between 6 pm and 12 am for 65% of the cohort.

Conclusion: Smartphone addiction is a significant risk factor for poor sleep hygiene among medical students. These findings highlight an urgent need for institutional interventions, including digital literacy programs and the promotion of strict bedtime routines to mitigate health and academic risks.

INTRODUCTION

The use of smart phones across the globe has grown exponentially in the last few decades, as of 2024 global smartphone penetration exceeds 80%.¹ Unlike traditional mobile phones that were primarily used for calls and sms, smartphones now offer a wide array of functionalities such as email, music, gaming, social networking sites, web browsing and multiple applications, Currently around 6.6 billion people worldwide use mobile phones and this number is projected to reach 7.8 billion by 2028.² In medical education phones serves both as an academic resource and a potential source of distraction.³

Smartphone addiction, also known as Problematic Smartphone Use (PSU) is defined as an individual's excessive use of mobile devices resulting in a loss of self-control, which subsequently impairs social functioning and precipitates psychological or behavioral pathologies. This condition is characterized by core addictive traits, including withdrawal symptoms, tolerance, and loss of control, exhibiting striking similarities to non-chemical addictions such as pathological gambling.⁴

Keywords: Smartphone, addiction, insomnia, medical students



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University students represent the most intensive smartphone user across the globe.⁵ Among this population, medical students in India are particularly susceptible to problematic usage patterns due to the unique pressures of intense academic competition, financial constraints, high familial expectations, and limited access to mental health resources.⁶

A critical consequence of excessive smartphone usage is the disruption of the sleep cycle. While adults are recommended to obtain seven to nine hours of sleep per night, a majority of young adults consistently fail to meet this threshold. Smartphone use occurring close to sleep initiation has been shown to delay the circadian rhythm and is negatively associated with total sleep duration; specifically, prolonged night-time usage is strongly correlated with poor sleep quality.⁷ In the short term, inadequate or disturbed sleep leads to judgment impairment, increased irritability, and a reduced capacity for information processing. Over the long term, chronic sleep deprivation contributes to significant morbidity, including cardiometabolic disorders and increased mortality. Furthermore, poor sleep quality is a known predictor of academic underperformance and psychological distress among medical students.^{8,9}

Given the significant health and academic implications, there is a pressing need to investigate these variables within specialized institutional contexts. Consequently, this research seeks to determine the prevalence of smartphone addiction among undergraduate medical students at North Bengal Medical College and Hospital and to evaluate the specific relationship between smartphone addiction and sleep cycle disturbances within this cohort.

MATERIALS AND METHODS

Study type and design: A descriptive, observational study, with cross-sectional design was conducted among undergraduate medical students.

Study Setting: The study was carried out at North Bengal Medical College and Hospital (NBMCH), Sushrutanagar, Darjeeling district, West Bengal, a tertiary care teaching institution.

Study Period: The study was conducted over a period of one month, from 1 January 2026 to 1 February 2026.

Study Population: The study population comprised MBBS students enrolled at North Bengal Medical College and Hospital between the academic years 2021 and 2025.

Inclusion Criteria:

- MBBS students who had been using a smartphone for at least one year prior to the study
- Students present during the period of data collection
- Students who provided informed consent and were willing to participate

Exclusion Criteria:

- Students with a previously diagnosed sleep disorder

- Students currently on medications known to affect sleep patterns
- Students directly involved in the conduct of the study

Sampling:

The sampling frame consisted of approximately 1,000 MBBS students enrolled across all five academic batches (2021–2025).

Sample Size Estimation

The sample size was calculated using the formula for estimating a single proportion: $n = \frac{4pq}{l^2}$

- ◇ p = prevalence of smartphone addiction from previous
- ◇ p = prevalence of smartphone addiction from previous study by Gunasekar et al = 47.8%
- ◇ $q = 100 - p = 52.2\%$
- ◇ l = allowable error = 5%

$$n = \frac{4 \times 47.8 \times 52.2}{(5)^2} \approx 400$$

To account for potential non-response, a 10% non-response rate was added to the calculated sample size. Thus, the final sample size was fixed at 440 students.

Sampling Technique

The sampling frame consisted of approximately 1,000 MBBS students enrolled in the five academic batches (2021–2025). A stratified random sampling technique was used, with each academic batch constituting a separate stratum. Eighty-eight students were selected from each stratum using simple random sampling, resulting in a planned sample of 440 students. The final number of participants included in the analysis was 409 after accounting for non-response.

Data Collection Tools and Techniques

Prior to the main study, a pilot study was conducted to assess the clarity and feasibility of the study questionnaire. The pilot testing was carried out among 22 MBBS students who were involved as data collectors for the study. Based on the feedback obtained, minor modifications were made to refine the questionnaire. Data collected during the pilot study were not included in the final analysis.

Final data were collected using a pre-designed, pre-tested, structured, self-administered online questionnaire. No names or directly identifying information were collected, and the responses were recorded without personal identifiers to ensure anonymity. The questionnaire consisted of four sections:

• Sociodemographic and Academic Profile

⇒ Information on age, gender, academic year, place of residence (hostel/home), and other relevant background characteristics was collected.



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• Smartphone Usage Pattern

⇒ Details regarding duration of smartphone use, average daily screen time, purpose of smartphone use (academic, social media, entertainment), and night-time smartphone usage were recorded.

• Assessment of Smartphone Addiction

⇒ Smartphone addiction was assessed using the **Smartphone Addiction Scale – Short Version (SAS-SV)**, a validated screening instrument.¹⁰

⇒ The SAS-SV consists of **10 items**, each rated on a **6-point Likert scale** (1 = strongly disagree to 6 = strongly agree). **Total scores range from 10 to 60**, with higher scores indicating greater risk of smartphone addiction.

* Cut-off scores used in the study were:

◇ § ≥31 for males

◇ § ≥33 for females

⇒ Participants scoring at or above the respective cut-off values were classified as having smartphone addiction.

• Assessment of Sleep Quality

⇒ Sleep quality was assessed using the **Insomnia Severity Index (ISI)**,¹¹ a widely used validated instrument for evaluating insomnia symptoms over the preceding two weeks.

⇒ The ISI comprises **7 items**, each scored on a **5-point Likert scale** (0–4). Total scores range from **0 to 28**.

⇒ Interpretation of ISI scores:

* **0–7**: No clinically significant insomnia

* **8–14**: Subthreshold insomnia

* **15–21**: Moderate clinical insomnia

* **22–28**: Severe clinical insomnia

⇒ For analytical purpose of the present study, participants with an **ISI score ≥8** were considered to have **clinically significant insomnia**.

Operational Definitions

• **Age (in completed years)**: The age of the participant as self-reported at the time of the study, calculated in completed years.

• **Gender**: The self-identified gender of the participant, recorded as male or female.

• **Perceived Socioeconomic Status (SES)**: The participant's

self-perceived economic position, categorized based on response into:

⇒ Living comfortably

⇒ Just getting by

⇒ Poor

• **Duration of Smartphone Use**: The total number of years the participant has been using a smartphone, categorized as:

⇒ Less than 5 years

⇒ 5–9 years

⇒ 10 years and above

• **Place of Current Residence**: The participant's current living arrangement during the study period, categorized as Home, Hostel, Paying Guest (PG) accommodation

• **Daily Screen Time (Average)**: The average number of hours per day spent using a smartphone, self-reported by the participant and categorized as:

⇒ <3 hours

⇒ 3–6 hours

⇒ 6–9 hours

⇒ >9 hours

• **Purpose of Smartphone Use**: The primary reasons for smartphone use as reported by the participant. Multiple responses were allowed. Categories included:

⇒ Social media

⇒ Academic activities

⇒ Entertainment (videos, music, streaming)

⇒ Gaming

⇒ Others (specified by the participant)

• **Alcohol Use**: Alcohol consumption was assessed by self-report based on the question: *"In the past month, on how many days did you have more than a few sips of beer, wine, or any drink containing alcohol?"*

⇒ Participants reporting alcohol intake on one or more days in the past month were classified as current alcohol users.

• **Tobacco Use**: Tobacco use was assessed by self-report based on the question: *"In the past week, on how many days did you smoke cigarettes or use other tobacco products?"*



⇒ Participants reporting tobacco use on one or more days in the past week were classified as current tobacco users.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using Jamovi version 2.7.14. Categorical variables were summarized using frequencies and percentages. The association between smartphone addiction and insomnia was assessed using the Pearson chi-square test. A two-sided p value of <0.05 was considered statistically significant.

Ethical considerations: The study was conducted in accordance with ethical principles for medical research involving human subjects.

- Permission was taken from the college authorities before data collection
- No personally identifiable information was collected; responses were anonymous.
- Written informed consent was obtained from all participants prior to enrolment.

RESULT

A total of 440 MBBS students were approached for participation in the study. Of these, 409 students provided informed consent and were included in the final analysis, yielding a response rate of 92.9%. The analysis was conducted on data obtained from these 409 participants.

The largest proportion of study participants belonged to the 20–22 years age group (46.5%), 62.1% were male, and the participants were distributed relatively evenly across the five academic batches. Most participants lived in hostels (86.1%), 54.8% reported living comfortably, while smoking and alcohol use were reported by 13.7% and 13.2%, respectively. (Table 1)

Most participants had been using smartphones for 5–9 years (66.3%), while 46.2% reported an average daily screen-time of 3–6 hours and 35.7% reported 6–9 hours. Smartphone use was most commonly reported between 6 pm and 12 midnight (65.0%). (Table 2)

Academic activities (85.6%) and social media (84.8%) were the most commonly reported purposes, followed by entertainment (54.0%) and gaming (33.7%). Other purposes were reported by 2.4% of participants, with multiple responses permitted. (Table 3)

Among students with insomnia, 56.5% had smartphone addiction, compared with 21.4% among students without insomnia. Conversely, 83.5% of participants classified as having smartphone addiction also had insomnia, compared with 51.5% among those without smartphone addiction. The association was found to be statistically significant ($p<0.001$). (Table 4)

Figures 1a and b show that 44.5% of the participants were addicted to smartphones, while 66% reported insomnia.

DISCUSSION

The present study identifies a significant prevalence of both smartphone addiction and sleep disturbances among medical students at North Bengal Medical College and Hospital, with 44.5% meeting the study criteria for smartphone addiction and 65.8% having clinically significant insomnia based on the predefined ISI threshold. The principal finding was a significant association between the two conditions. Among participants with insomnia, 56.5% had smartphone addiction compared with 21.4% among those without insomnia ($\chi^2=45.87$, $df=1$; $p<0.001$). Conversely, 83.5% of students with smartphone addiction had insomnia. These findings indicate substantial overlap between problematic smartphone use and insomnia symptoms in this population.

The prevalence of smartphone addiction in this study (44.5%) is slightly lower than the 47.8% reported in previous research by Gunasekar et al. among Indian medical students, indicating a consistently high burden within the country's medical education system.⁶ Smartphone addiction among Indian medical students is a critical issue with a high prevalence, ranging from 40% to over 60% in various studies, often driven by high academic stress, social media, and gaming.^{12,13} These findings are mirrored in broader adolescent populations globally. For instance, the negative association between excessive screen time and academic performance has been documented in a Chinese cohort.¹⁴

An important feature of the present study was the timing of smartphone use. Sixty-five percent of participants reported predominantly using smartphones between 6 pm and 12 am, while 14.9% reported use between 12 am and 6 am. This pattern is relevant because late-evening and nocturnal smartphone use may overlap temporally with the usual sleep period. Previous studies have also reported an association between problematic smartphone use and poorer sleep outcomes.¹⁵ While this study notes that 85.6% of students use smartphones for academic activities, broader literature suggests that recreational use is the primary driver of negative outcomes. However, the present cross-sectional design does not permit determination of whether excessive smartphone use contributes to insomnia, whether insomnia encourages greater smartphone use, or whether both are influenced by common factors such as academic stress, psychological distress or individual lifestyle patterns.

The high prevalence of insomnia observed in the present study is noteworthy. Almost two-thirds of participants had an ISI score of ≥ 8 according to the analytical criterion used in this study. This finding should, however, be interpreted as the prevalence of clinically significant insomnia symptoms identified using a screening instrument, rather than a diagnosis of insomnia disorder. The high burden of sleep-related symptoms among medical students may have implications for wellbeing and academic functioning, although these outcomes were not directly assessed in the present study.¹⁶

The identified link between addiction and insomnia can be explained by several physiological and behavioral mechanisms. This relationship aligns with systematic reviews demonstrating a consistent positive correlation between smartphone addiction and sleep disturban-



-ces.^{17,18} Existing literature corroborates that medical students with smartphone addiction are at a significantly higher risk for poor sleep quality and reduced sleep duration compared to the general population. Physiologically, blue light emitted from screens suppresses melatonin secretion, disrupting circadian rhythms and delaying rapid eye movement (REM) cycles. Psychologically, late-night usage postpones sleep processes, while constant exposure to digital media and notifications increases cognitive arousal and stress. Additionally, electromagnetic fields emitted by mobile devices may contribute to poor physical recovery and sleep quality.¹⁹

STRENGTHS AND LIMITATIONS

The strengths of the study include the high response rate of 92.9%, inclusion of students from all five academic batches, and use of validated screening instruments, namely the Smartphone Addiction Scale –Short Version and the Insomnia Severity Index. Nevertheless, several limitations should be considered. First, the cross-sectional design prevents assessment of temporality and causality. Reverse causation is possible, whereby students experiencing sleep difficulties may use smartphones more frequently during periods of wakefulness. Second, smartphone use and sleep-related symptoms were self-reported and may therefore be affected by recall and social desirability bias. Third, the study was conducted in a single tertiary care teaching institution, which may limit generalizability to medical students in other settings. Finally, potentially important confounding factors, including psychological stress, anxiety, depression, caffeine consumption and other lifestyle factors, were not comprehensively assessed.

CONCLUSION

Overall, the findings suggest that problematic smartphone use and insomnia represent important co-existing concerns among undergraduate medical students. Further longitudinal and preferably objective studies are required to clarify the temporal relationship between smartphone use and sleep disturbances and to identify modifiable determinants of this association.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this study.

FUNDING

Not declared.

AI USE DECLARATION

Artificial intelligence tools, including language assistance from ChatGPT (OpenAI), were used to support the drafting and editing of this manuscript. All content was reviewed and verified by the authors to ensure accuracy and integrity. No AI tools were used for data analysis or interpretation.

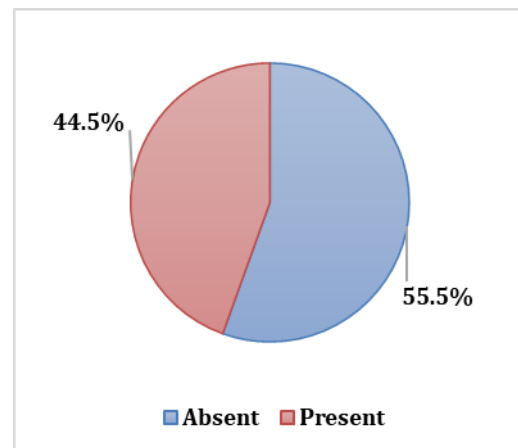


Figure 1a: Smartphone addiction

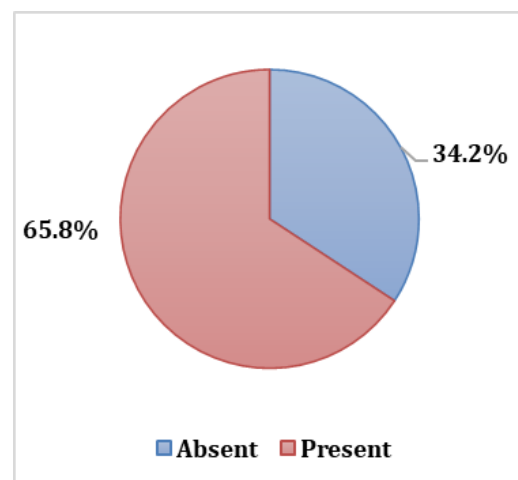


Figure 1b: Insomnia

Table 1: Distribution of study participants based on sociodemographic characters (n=409)

Sociodemographic characteristics	Levels	Frequency	Percent
Age group	Less than 20 years	33	8.1
	20-22 years	190	46.5
	23-24 years	130	31.8
	25 years and above	56	13.7
Gender	Male	254	62.1
	Female	155	37.9
Academic Batch	2021-2026	79	19.3
	2022-2027	80	19.6
	2023-2028	81	19.8
	2024-2029	87	21.3
	2025-2030	82	20
Perceived SE status	Just getting by	149	36.4
	Living Comfortably	224	54.8
	Poor	36	8.8
Residence	Home	17	4.2
	Hostel	352	86.1
	PG	40	9.8
Addictions (n=)*	Smoking	56	13.7
	Alcohol	54	13.2
Total		409	100

*multiple responses possible

Table 2: Distribution of study participants by duration of smartphone usage and daily screentime (n=409)

Characteristics	Levels	Frequency	Percent
Duration of Smartphone usage	Less than 5 years	86	21
	5-9 years	271	66.3
	10 years and above	52	12.7
Average daily screen-time	<3 hrs	30	7.3
	> 9 hrs	44	10.8
	3-6 hrs	189	46.2
	6-9 hrs	146	35.7
Time of using smartphone	6am-12pm	21	5.1
	12pm-6pm	61	14.9
	6pm-12am	266	65
	12am-6am	61	14.9
Total		409	100

Table 3: Distribution of study participants by purpose of smartphone usage. (n= 409)

Purpose of using smartphone*	Frequency	Percent
Social media	347	84.8
Academics	350	85.6
Entertainment	221	54
Gaming	138	33.7
Others	10	2.4

* multiple responses possible

Table 4: Distribution of smartphone addiction status categorised by insomnia status (n=409)

Insomnia	Smartphone Addiction		Total	Statistical test of significance
	Absent	Present		
Absent	110 (78.6%)	30 (21.4%)	140	$\chi^2 = 45.87$
Present	117 (43.5%)	152 (56.5%)	269	df = 1
Total	227 (55.5%)	182 (44.5%)	409	p < 0.001



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