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Original Research Article

# Impact of Mobile Phone Addiction on Sleep Quality in Undergraduate Medical Students in a Tertiary Care Teaching Hospital, Srikakulam

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**Conflict of interest: Nil**

**Abstract**

**Background:** Smartphone addiction is an emerging behavioural concern among medical students and may adversely affect sleep quality and academic functioning.

**Objective:** To determine the prevalence of mobile phone addiction and its association with sleep quality among undergraduate medical students.

**Methods:** A cross-sectional study was conducted among 284 undergraduate medical students at Government Medical College, Srikakulam. Data were collected using a socio-demographic questionnaire, Smartphone Addiction Scale–Short Version (SAS-SV), and Pittsburgh Sleep Quality Index (PSQI). Spearman correlation and regression analysis were used to assess associations.

**Results:** The mean age was 19.84 ± 1.04 years. The prevalence of smartphone addiction was 33.8%. Significant positive correlations were observed between addiction and PSQI score ($\rho = 0.335$, $p < 0.001$), self-rated sleep quality ($\rho = 0.341$, $p < 0.001$), and sleep disturbances ($\rho = 0.216$, $p < 0.001$), while sleep duration showed a negative correlation ($\rho = -0.182$, $p = 0.002$). Sleep latency was not significant. Regression analysis confirmed smartphone addiction as an independent predictor of poor sleep quality ($\beta = 1.220$, $p < 0.001$).

**Conclusion:** Smartphone addiction is significantly associated with poor sleep quality among medical students, highlighting the need for targeted interventions.

**Keywords:** Smartphone addiction; Sleep quality; PSQI; Medical students; Behavioural addiction; India.

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## Introduction

The rapid advancement and widespread adoption of smartphones have significantly transformed the academic, clinical, and social environments of students, particularly in medical education. Smartphones serve as versatile tools that facilitate instant communication, provide access to online learning platforms, and enable retrieval of medical information through applications such as PubMed, Medscape.

These resources enhance self-directed learning and support evidence-based clinical practice. However, the increasing dependence on smart phones has also led to concerns regarding excessive and maladaptive usage patterns. Smartphone addiction is increasingly conceptualised as a behavioural addiction characterised by compulsive use, impaired control, tolerance, and withdrawal-like symptoms [1,2]. Individuals with problematic smart phone use often experience interference with daily activities, reduced productivity, and psychosocial disturbances. Among medical students, who are required to maintain high levels of concentration and cognitive efficiency, such dependency may adversely affect academic performance and overall well-being. In India, multiple studies have reported a considerable prevalence of smartphone addiction among medical students, with estimates ranging between 30% and 60% [3,4,5].

The demanding nature of medical education, combined with easy accessibility to digital devices, may predispose students to excessive usage. This trend is concerning, as it may contribute to increased stress, decreased academic engagement, and impaired interpersonal relationships. Sleep is a vital physiological process essential for

maintaining cognitive function, emotional stability, and physical health. Poor sleep quality has been associated with reduced attention, impaired memory, decreased academic performance, and a higher risk of mental health disorders [7]. Medical students are particularly vulnerable to sleep disturbances due to academic workload, irregular schedules, and clinical responsibilities.

The Pittsburgh Sleep Quality Index (PSQI) is a standardised and validated instrument widely used to assess sleep quality over a one-month period. It evaluates multiple domains, including sleep latency, duration, disturbances, efficiency, and daytime dysfunction [8]. A global score greater than 5 indicates poor sleep quality.

Emerging evidence suggests a significant association between excessive smartphone use and disturbed sleep patterns. One of the primary mechanisms involves exposure to blue light emitted from smartphone screens, which suppresses melatonin secretion and disrupts circadian rhythms [9]. Additionally, night time smartphone use increases cognitive and emotional arousal, delaying sleep onset and reducing sleep duration. Engagement with applications such as WhatsApp, Instagram, and YouTube often contributes to prolonged screen exposure and bedtime procrastination.

Furthermore, excessive smartphone use may lead to "sleep displacement," wherein time allocated for sleep is replaced by device usage. Studies have demonstrated that smartphone addiction is associated with insomnia, daytime fatigue, and poor academic outcomes [10;11]. The relationship may also be bidirectional, as individuals with poor sleep may increasingly rely on smartphones as a coping mechanism.

Given the growing reliance on smartphones and their potential impact on sleep health, it is important to investigate this relationship among medical students. Understanding the prevalence of smartphone addiction and its association with sleep quality can help in designing targeted interventions, including digital hygiene education and behavioural modification strategies.

Therefore, the present study aims to determine the prevalence of smartphone addiction and evaluate its association with sleep quality among undergraduate medical students in a tertiary care teaching institution

## Materials and Methods

**Study Design and Setting:** Cross-sectional study conducted at Government Medical College, Srikakulam.

**Study Population:** Undergraduate medical students (Phase I & II).

**Inclusion Criteria**

1. Students who provided informed consent
2. Undergraduate medical students of GMC Srikakulam

**Exclusion Criteria**

1. Incomplete questionnaire responses
2. Age less than 18 years

**Sample Size:** The sample size was calculated using the formula based on expected prevalence:

- p = 79.48% (from previous Indian study by Surobhi Chatterjee et al[1].)
- Zα/2 = 1.96 (95% confidence interval)
- d = 5% precision

Calculated sample size = 250.

Adding 10% non-response rate = 25.

Final sample size = 275.

**Study Tools**

1. Semi-structured questionnaire for socio-demographic data
2. Smartphone Addiction Scale – Short Version (SAS-SV)
3. Pittsburgh Sleep Quality Index (PSQI)

The SAS-SV consists of 10 items scored from 10 to 60, with higher scores indicating greater smartphone addiction [1]. The Pittsburgh Sleep Quality Index (PSQI )assesses sleep quality over the past month, with scores ranging from 0 to3.The (PSQI) is a standardised and validated instrument widely used to assess sleep quality over a one-month period. It evaluates multiple domains, including sleep latency, duration, disturbances, efficiency, and daytime dysfunction A global score greater than 5 indicates poor sleep quality [8].

**Data Collection:** Data were collected from Phase I and Phase II under graduate medical students of the Tertiary care Teaching Hospital , Srikakulam after approval of scientific and ethics committee .Simple random sampling was used. After obtaining informed consent, sociodemographic data was collected using a self-administered questionnaire with sociodemographic characteristics.

Then, they were asked to fill Google Forms, which consists of a pre-tested, semi-structured questionnaires in the English language. These questionnaires are smartphone addiction scale - short version was used to evaluate mobile phone addiction and to assess the sleep quality Pitts burg sleep quality index was used.

**Statistical Analysis:** Data were entered in Microsoft Excel and analysed using descriptive statistics.

Chi-square test was used for categorical variables. Independent t-test and ANOVA were used to compare mean sleep quality scores across addiction categories. A p-value < 0.05 was considered statistically significant.

## Results

**Table 1: Demographic Characteristics of Study Participants (n = 284)**

| Variable | Category | Frequency (%) |
|---|---|---|
| Age | Mean ± SD | 19.84 ± 1.04 |
| Gender | Female | 151 (53.2%) |
| | Male | 132 (46.5%) |
| | Prefer not to say | 1 (0.4%) |
| Residence | Hostel | 170 (58.0%) |
| | Day scholar | 84 (28.7%) |
| | With family | 30 (10.2%) |

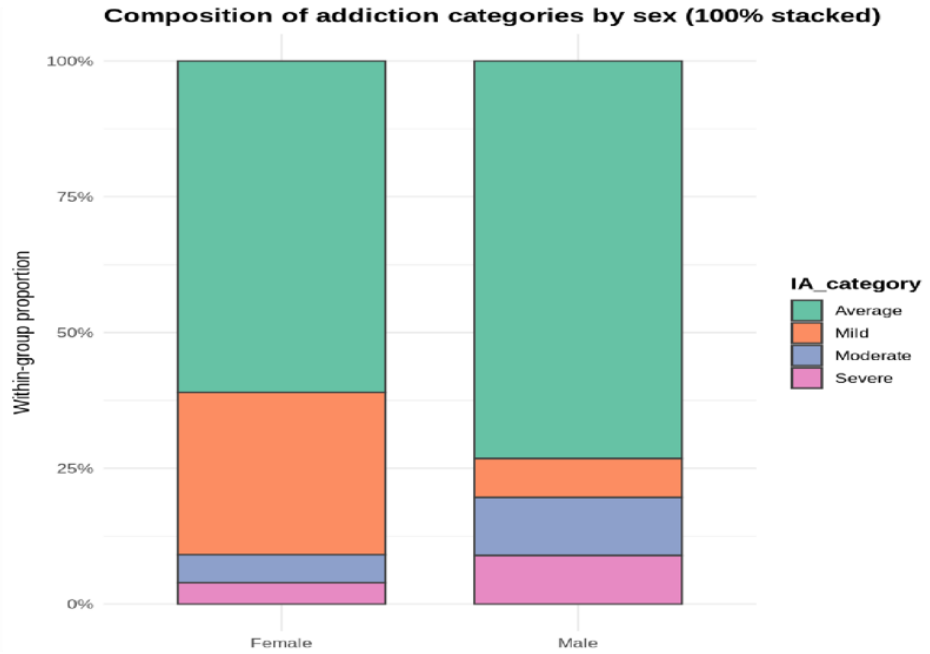


**Figure 1: Composition of addiction categories by sex (110% stacked)**

The average age of the participants is 19.84 years with a standard deviation of 1.04, indicating that most individuals are clustered closely around 20 years old. This suggests a relatively homogeneous age group, likely representing late adolescents or young adults, such as college students.

In terms of gender distribution, the sample is fairly balanced but slightly skewed toward females. Females make up 53.2% (151 participants), while males account for 46.5% (132 participants).

Only one participant (0.4%) preferred not to disclose their gender. This near-equal representation helps reduce gender bias, although females are marginally overrepresented. In the present study, a majority of students were from hostel 58.0%,Day scholars constitute 28.7%,while a smaller proportion, 10.2%, live with their families. This distribution suggests that most participants experience a more independent or semi-independent living environment, which could influence lifestyle, behaviour, or study outcomes and increased smartphone usage and poorer sleep quality. Students living in hostels often experience:

- Reduced parental supervision
- Greater peer influence
- Irregular daily routines

Indian studies suggest that environmental and social factors, such as living arrangements, significantly influence both screen time and sleep habits among students.

**Table 2: Smartphone Addiction Score Distribution**

| Variable | Value |
|---|---|
| Mean ± SD | 40.31 ± 17.73 |
| Median (IQR) | 40.00 (28.33–52.08) |
| Range | 0–83.33 |
| Addiction prevalence | 33.8% |

This table describes how smartphone addiction scores are distributed among the 284 students.

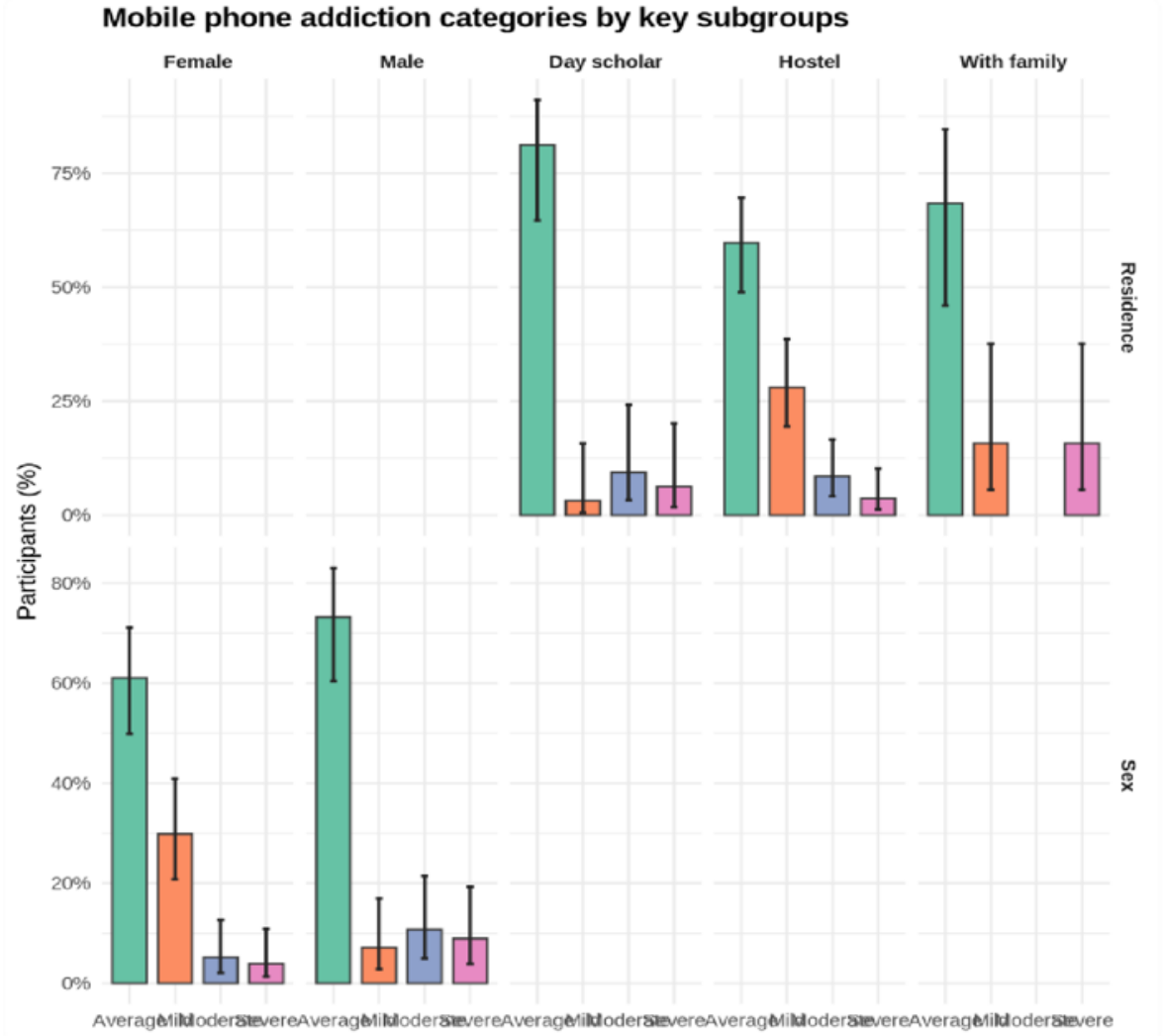


**Figure 2 : Mobile phone addiction categories by key subgroups**

Faceted bar charts reveal differences in addiction category distribution across sex and place of residence. The "Average" category remains dominant across all subgroups, but proportional differences in Mild and Moderate categories

The mean score is 40.31 with a standard deviation of 17.73, indicating a moderate average level of smartphone addiction The median score is 40.00, with an interquartile range (IQR) of 28.33 to 52.08. This shows that half of the participants scored between about 28 and 52, reinforcing that most individuals fall within a moderate range of smartphone use behavior. The prevalence of smartphone addiction is 33.8%, meaning roughly one-third of the students meet the criteria for addiction.

This is a substantial proportion and suggests that smartphone addiction is a notable concern within this group. Overall, while the average level of smartphone addiction is moderate, the wide variation and relatively high prevalence indicate that a significant subset of participants may be at risk and could benefit from awareness or intervention strategies.

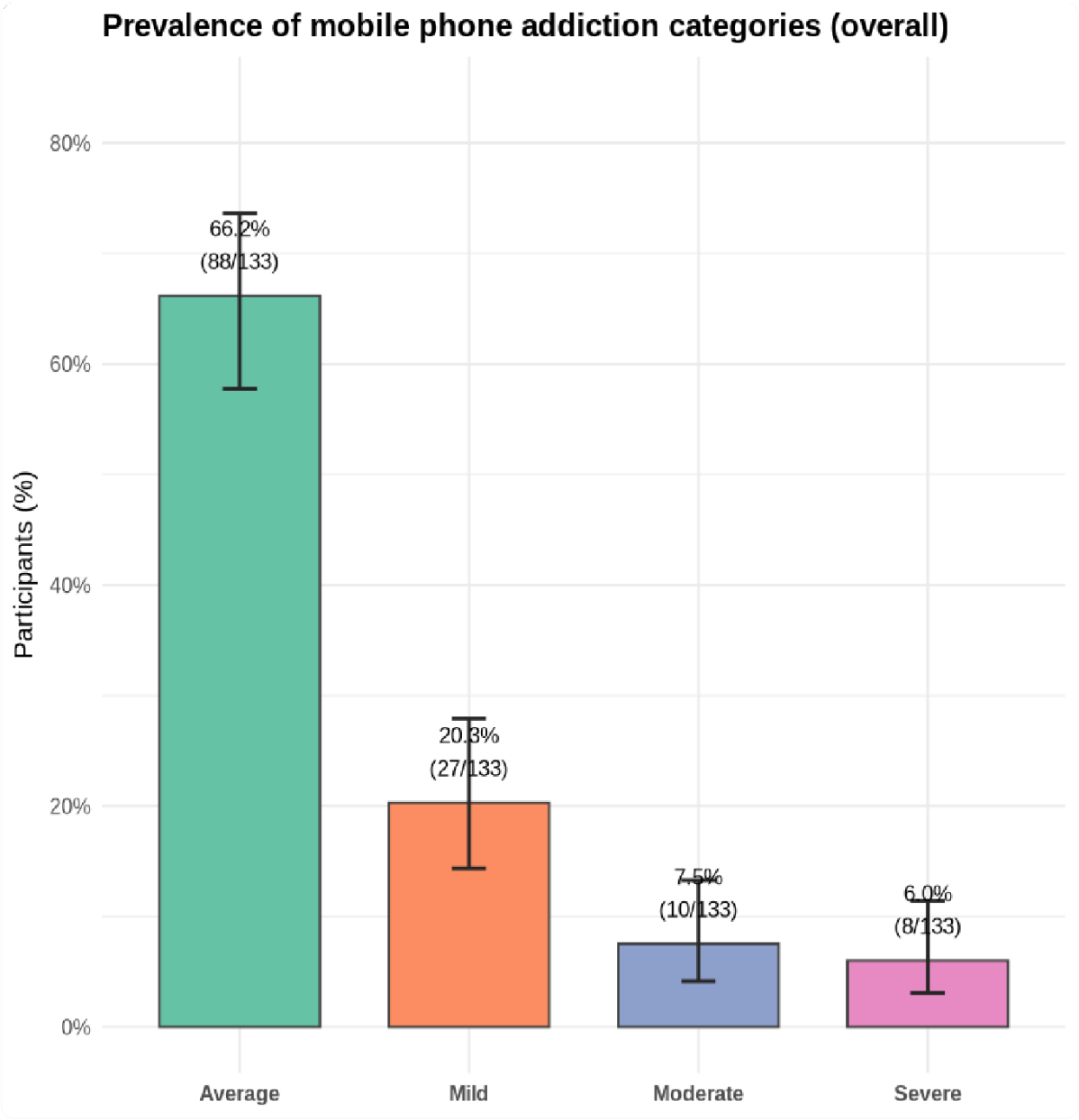


**Figure 3: Prevalence of mobile phone addiction categories (overall)**

This bar chart shows that while the majority of students fall within the "Average" category, a meaningful proportion demonstrates mild to severe addiction patterns.

**Table 3: Relationship between Mobile Addiction and Sleep Quality**

| Outcome | n | Spearman ρ | p-value |
|---|---|---|---|
| PSQI proxy (higher = worse sleep) | 274 | 0.335 | $1.32 \times 10^{-8}$ |
| Self-rated sleep quality | 284 | 0.341 | $3.69 \times 10^{-9}$ |
| Trouble sleeping frequency | 284 | 0.216 | $2.52 \times 10^{-4}$ |
| Sleep hours | 279 | −0.182 | 0.002 |
| Sleep latency (minutes) | 275 | 0.057 | 0.342 |

This table shows the relationship between smartphone addiction and different sleep outcomes using Spearman's correlation. Overall, smartphone addiction is significantly associated with poorer sleep across several parameters. The PSQI score has a moderate positive correlation ($\rho = 0.335$, $p < 0.001$), indicating that higher smartphone addiction is linked with worse overall sleep quality. Similarly, self-rated sleep quality ($\rho = 0.341$, $p < 0.001$) also shows a moderate positive relationship, participants with higher addiction levels tend to perceive their sleep as poorer. Sleep disturbances show a weaker but still significant positive correlation ($\rho = 0.216$, $p < 0.001$). This suggests

that increased smartphone use is associated with more frequent disruptions during sleep, although the relationship is not as strong as with overall sleep quality. In contrast, sleep duration has a negative correlation ($\rho = -0.182$, $p = 0.002$). This indicates that higher smartphone addiction is associated with shorter sleep duration, though the strength of this relationship is relatively weak. Finally, sleep latency ($\rho = 0.057$, $p = 0.3$) is not statistically significant, meaning there is no clear evidence that smartphone addiction affects the time it takes to fall asleep in this sample. Higher smartphone addiction is linked to poorer sleep quality, more disturbances, and shorter sleep duration, but it does not appear to significantly influence how quickly individuals fall asleep.

**Table 4: Regression Analysis for Sleep Quality**

| Variable | β (95% CI) | p-value |
|---|---|---|
| Smartphone addiction score | 1.220 (0.805–1.634) | <0.001 |
| Age | −0.184 (−0.455–0.086) | 0.180 |
| Gender (Male vs Female) | 0.800 (0.246–1.354) | 0.005 |

This regression analysis examines how different factors predict sleep quality, likely measured using a score where higher values indicate poorer sleep. The smartphone addiction score shows a strong and statistically significant positive association with sleep quality ($\beta = 1.220$, 95% CI: 0.805–1.634, $p < 0.001$). This means that for every one-unit increase in smartphone addiction score, the sleep quality score increases by about 1.22 units, indicating worsening sleep. Since the confidence interval does not include zero and the p-value is highly significant, this is a reliable predictor. It suggests that smartphone addiction is an important factor contributing to poor sleep. Age has a negative coefficient ($\beta = -0.184$, 95% CI: −0.455–0.086, $p = 0.180$), indicating a slight tendency for older participants to have better sleep (lower scores). However, this result is not statistically significant, as the p-value is greater than 0.05 and the confidence interval includes zero. Therefore, age does not appear to have a meaningful impact on sleep quality in this study. For gender (Male vs Female), the β value is 0.800 (95% CI: 0.246–1.354) with a statistically significant p-value (~0.004). This indicates that being male is associated with a higher sleep quality score (worse sleep) compared to females. Since the result is significant and the confidence interval does not cross zero, gender appears to be an independent predictor of sleep quality in this model. In summary, smartphone addiction is the strongest predictor of poor sleep quality, followed by gender (males having worse sleep than females), while age does not significantly influence sleep quality in this analysis.

## Discussion

The present study examined the prevalence of smartphone addiction and its association with sleep quality among undergraduate medical students. The findings indicate that while the majority of students fall within the non-addicted or “average use” category, a substantial proportion (33.8%) demonstrate varying degrees of problematic smartphone use. This highlights that smartphone addiction is a significant behavioural concern even within academically demanding populations. The observed prevalence aligns with previous studies conducted in India, which report smartphone addiction rates ranging between 30% and 60% among medical students [3,4,5 6]. Variations in prevalence across studies may be attributed to differences in assessment tools, cutoff criteria, and sociocultural contexts. Nevertheless, the presence of mild to severe addiction in approximately one-third of participants underscores the growing dependence on digital devices in medical education. The internal consistency of the 10-item addiction scale used in this study was high (Cronbach’s alpha = 0.882), indicating that the instrument reliably captured smartphone-related behavioural patterns. Item-level analysis revealed that the most frequently endorsed behaviours were related to impaired academic functioning, including missing planned work due to smartphone use (40.1%) and difficulty concentrating in class (32.7%). These findings are consistent with earlier research suggesting that excessive smartphone use interferes with attention, productivity, and academic engagement [12]. Frequent checking behavior, particularly driven by social media engagement, further reflects compulsive usage patterns that are characteristic of behavioural addiction. Subgroup analysis suggested that males exhibited a slightly higher proportion of mild addiction compared to females. This observation is supported by some prior studies that report higher risk-taking and technology engagement behaviours among males [13], although gender differences in smartphone addiction remain inconsistent across the literature. Importantly, the persistence of addiction patterns across different residential settings indicates that smartphone overuse is a pervasive issue not confined to specific living environments. A key objective of this study was to examine the relationship between smartphone addiction and sleep quality. The results demonstrate a statistically significant positive correlation between addiction scores and poor sleep outcomes. Higher addiction scores were associated

with worse self-rated sleep quality (ρ = 0.341), higher PSQI proxy scores (ρ = 0.335), and more frequent sleep disturbances (ρ = 0.216). Additionally, a weak but significant negative correlation was observed with sleep duration (ρ = −0.182), indicating that increased smartphone use is associated with reduced sleep time. These findings are consistent with prior research demonstrating that excessive smartphone use adversely affects sleep quality [10,11]. One of the primary mechanisms underlying this relationship is exposure to blue light emitted by smartphone screens, which suppresses melatonin secretion and disrupts circadian rhythms [9]. Increased cognitive and emotional arousal due to nighttime engagement with stimulating content—such as messaging on WhatsApp, browsing Instagram, or watching videos on YouTube—may further delay sleep onset and impair sleep continuity. Interestingly, sleep latency did not show a significant association with smartphone addiction in this study. This contrasts with some previous findings [10], suggesting that while smartphone use may not directly prolong the time taken to fall asleep, it may still impair overall sleep quality through fragmentation and reduced duration. This discrepancy may also be due to self-reported measurement limitations or variability in individual sleep habits. The regression analysis provides further insight into the relationship between smartphone addiction and sleep quality. After adjusting for age and gender, addiction score remained a strong independent predictor of poor sleep, with each one-point increase in addiction score associated with a 1.22-point worsening in sleep quality. This reinforces the notion of a dose-response relationship between smartphone use and sleep impairment. Gender differences were also observed in sleep outcomes, with males reporting significantly poorer sleep quality compared to females, independent of addiction levels. This finding is supported by some studies suggesting that males may engage more frequently in late-night device usage or gaming behaviours, which can negatively impact sleep [14]. Age, however, was not a significant predictor, likely due to the narrow age range of the study population. A majority of participants (58.0%) resided in hostels, followed by day scholars (28.7%) and those living with family (10.2%). This distribution is typical of medical institutions where students often relocate for education. Residential status is an important contextual factor influencing both smartphone usage and sleep patterns. Hostel environments may promote increased smartphone use due to greater autonomy, peer influence, and lack of parental supervision. Studies have shown that students residing in hostels are more likely to engage in prolonged night time smartphone use, social media interaction, and irregular sleep schedules [16]. Peer group dynamics and shared living spaces may also contribute to delayed sleep timing and increased screen exposure. In contrast, students living with family may benefit from more structured routines and external regulation of behavior, which can positively influence sleep hygiene and limit excessive smartphone use. Day scholars represent an intermediate group, balancing institutional demands with home environments. Although the present study did not find stark differences across residence categories in overall addiction prevalence, subtle variations in behavioural patterns may still exist and warrant further exploration. The majority of participants belonged to the 2025 (46.4%) and 2024 (44.0%) academic cohorts, with a smaller proportion from 2023 (5.5%). This indicates that the study primarily captured students in phase 1 and phase 2,the early to mid-stages of their medical education. Academic year can influence both smartphone usage and sleep patterns due to varying academic pressures and clinical responsibilities. Early-year (phase1 and phase 2) students may rely more heavily on smartphones for social adjustment and academic support, including accessing digital learning resources and communicating with peers. Applications such as WhatsApp and YouTube are frequently used for collaborative learning and concept clarification. However, this increased reliance may also predispose them to excessive usage. The relationship between smartphone addiction and sleep disturbance is likely bidirectional. While excessive smartphone use can disrupt sleep, poor sleep may also lead to increased smartphone use as a coping mechanism for fatigue, stress, or boredom. This cyclical pattern may further exacerbate both conditions over time. Overall, the findings of this study have important implications for student health and academic performance. Given the critical role of sleep in cognitive functioning, memory consolidation, and emotional regulation, impaired sleep quality may adversely affect learning outcomes and clinical performance in medical students [15]. Therefore, addressing smartphone addiction should be considered an important component of student wellness programs. Interventions such as digital hygiene education, promoting screen-time limits, encouraging device-free periods before bedtime, and raising awareness about the impact of blue light exposure may help mitigate the adverse effects of excessive smartphone use. Institutions may also consider integrating behavioural counselling and stress management strategies into medical curricula.

## Conclusion

This study demonstrates that smartphone addiction is prevalent among undergraduate medical students, with approximately one-third of participants exhibiting mild to severe levels of dependency.

Although the majority fall within the average usage category, the presence of problematic usage patterns is clinically and academically significant. A key finding of this study is the strong and consistent association between smartphone addiction and poor sleep quality. Higher addiction scores were linked to worse overall sleep, increased disturbances, and reduced sleep duration. These findings highlight the negative impact of excessive smartphone use on sleep health, which is critical for cognitive functioning, emotional regulation, and academic performance. The regression analysis further establishes smartphone addiction as an independent predictor of poor sleep, even after adjusting for demographic variables. The observed gender differences in sleep quality suggest the need for tailored interventions, although further research is required to explore underlying behavioural factors. Given the demanding nature of medical education, poor sleep quality may have far-reaching consequences, including impaired learning, reduced clinical performance, and increased risk of mental health-issues such as stress and burnout. Therefore, addressing smartphone addiction should be considered an essential component of student wellness strategies.

Interventions such as promoting digital hygiene, limiting screen exposure before bedtime, and increasing awareness about the effects of blue light and nighttime device use may help mitigate these risks. Institutional policies and counselling programs can further support students in adopting healthier behavioural patterns. Future studies should consider longitudinal designs to better understand causal relationships and explore additional factors such as mental health status, academic stress, and lifestyle behaviours.

## Limitations

This study has certain limitations that should be considered while interpreting the findings. First, the cross-sectional design limits the ability to establish causal relationships between smartphone addiction and sleep quality; only associations can be inferred. Second, the study relied on self-reported questionnaires (SAS-SV and PSQI), which may be subject to recall bias and social desirability bias, potentially affecting the accuracy of responses.

Third, the study was conducted in a single tertiary care teaching hospital, which may limit the generalisability of the findings to other medical colleges or non-medical student populations. Fourth, objective sleep measures such as actigraphy or polysomnography were not used, which could have provided more precise assessment of sleep patterns. Finally, potential confounding factors such as stress levels, academic workload, caffeine intake, and mental health status were not fully controlled, which may also influence sleep quality.

## Recommendations

Based on the findings of this study, several recommendations can be made. Early identification of students with high smartphone usage should be encouraged through routine screening in academic institutions. Awareness programs focusing on the harmful effects of excessive smartphone use on sleep and academic performance should be implemented. Students should be educated on digital well-being practices, including limiting screen time before bedtime and maintaining sleep hygiene. Institutional interventions such as “no-phone zones” or “digital detox hours” in hostels may help reduce excessive nighttime usage. Counselling services should be made accessible for students exhibiting signs of behavioural addiction. Future studies should consider longitudinal designs to establish causality and include objective sleep measurement tools for more accurate assessment. Expanding research to multiple institutions and diverse populations would improve generalisability of findings.

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