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# Smartphone Addiction, Sleep Quality & Anxiety Levels Among College Students in Danapur

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**Abstract**

Smartphone use has become deeply embedded in the daily lives of college students, raising concerns about its psychological and behavioural consequences. The present study examined the relationship between smartphone addiction, sleep quality and anxiety among undergraduate students in Danapur, a rapidly urbanising peri-urban region of Patna. A cross-sectional survey was conducted among 80 students aged 18–24 years, using the Smartphone Addiction Scale–Short Version (SAS-SV), the Pittsburgh Sleep Quality Index (PSQI) and the Generalized Anxiety Disorder-7 (GAD-7). Descriptive findings indicated high levels of smartphone addiction and widespread poor sleep quality, with nearly half of the sample reporting clinically meaningful anxiety. Correlation analyses showed that smartphone addiction was significantly associated with poorer sleep quality and higher anxiety. Regression analysis demonstrated that sleep quality was a stronger predictor of anxiety than smartphone addiction. Mediation testing further revealed that sleep quality partially mediated the association between smartphone addiction and anxiety, indicating that excessive smartphone use contributes to anxiety both directly and indirectly through its negative impact on sleep. These findings highlight the growing relevance of digital-behavioural health concerns among students in smaller urban Indian settings and underscore the need for institutional interventions promoting healthy smartphone use, sleep hygiene and mental-health support.

**Keywords:** *Smartphone Addiction, Sleep Quality, Anxiety, College Students, Danapur, SAS-SV, PSQI, GAD-7*

## 1. Introduction

Smartphones have become ubiquitous among young adults, especially college students, who rely on them for communication, learning and entertainment. While the benefits are extensive, research has increasingly demonstrated that excessive smartphone use may develop into problematic smartphone use or smartphone addiction, characterised by preoccupation, loss of control, withdrawal-like symptoms and functional impairment (Kwon et al., 2013; Matar Boumosleh & Jaalouk, 2017). Systematic reviews show that 40–60% of university students worldwide exhibit problematic smartphone use, making this population particularly vulnerable (Candussi et al., 2023).

In India, similar patterns have been reported across medical, engineering and general-degree students, with high smartphone-usage hours associated with stress, sleep disturbance and impaired academic performance (Devi et al., 2025; Singh et al., 2025). The rise in digital dependency coincides with increasing concerns about sleep quality and anxiety, two psychological domains that appear strongly linked to smartphone overuse. Studies consistently show that late-night screen exposure, bedtime scrolling and prolonged digital engagement impair sleep patterns and overall sleep quality (Buysse et al., 1989; Uniyal & Kaur, 2020). Poor sleep, in turn, is a well-documented predictor of anxiety and psychological distress among young adults (Nikolic et al., 2023; Wu et al., 2024).

A growing body of evidence indicates that smartphone addiction is positively correlated with both poor sleep quality and higher anxiety among students (Pradeep et al., 2025; Nikolic et al., 2023). Moreover, emerging studies suggest that sleep may serve as a mediator, explaining how excessive smartphone use contributes to elevated anxiety (Wu et al., 2024; Zhu et al., 2024).

Despite strong global and Indian evidence, very limited research has focused on non-metropolitan, peri-urban educational environments. The Danapur region, part of the Patna urban fringe, has rapidly expanded in digital access, coaching institutes and student hostels. These socio-environmental features make Danapur an important yet understudied context for examining digital behaviour and mental-health outcomes.

This study therefore aims to:

(a) assess levels of smartphone addiction, sleep quality and anxiety among college students in Danapur;

(b) examine the correlations among these variables; and

(c) test whether sleep quality mediates the relationship between smartphone addiction and anxiety.

## 2. Review of Literature

### 2.1 Smartphone Addiction: Conceptual Overview

Smartphone addiction is conceptualised as a behavioural addiction involving compulsive use and impaired self-regulation. The Smartphone Addiction Scale – Short Version (SAS-SV) by Kwon et al. (2013) is widely used to quantify this construct. Studies show strong associations between smartphone addiction and depression, anxiety and stress among university populations (Matar Boumosleh & Jaalouk, 2017; Nikolic et al., 2023). Systematic reviews further confirm that university students are among the highest-risk groups (Candussi et al., 2023).

### 2.2 Prevalence Among University Students

Meta-analytic evidence shows that roughly 50–60% of university students worldwide meet criteria for problematic smartphone use (Candussi et al., 2023). Indian studies similarly report high prevalence across medical and general students, with excessive smartphone use emerging as a major behavioural-health concern (Devi et al., 2025; Pradeep et al., 2025). Research from eastern and southern India suggests that male students and late-night users show significantly higher addiction scores (Singh et al., 2025).

### 2.3 Smartphone Addiction and Sleep Quality

Research consistently shows a negative association between smartphone addiction and sleep quality. Early work using the PSQI demonstrated that excessive smartphone use leads to delayed sleep onset, reduced sleep duration and increased disturbances (Buysse et al., 1989; Uniyal & Kaur, 2020). Recent studies reaffirm that students with higher addiction scores report significantly poorer sleep (Zhu et al., 2024; Singh et al., 2025). Theories attribute this to blue-light exposure, nighttime arousal and displacement of sleep by prolonged digital engagement.

### 2.4 Smartphone Addiction and Anxiety

Smartphone addiction has been strongly linked to elevated anxiety levels among college and medical students (Matar Boumosleh & Jaalouk, 2017; Nikolic et al., 2023). High-risk smartphone users tend to experience more fear of missing out, social comparison and emotional dependency, which aggravate anxiety (Li et al., 2020). Indian studies have

similarly found that students with higher smartphone-addiction scores show increased symptoms of anxiety and psychological distress (Devi et al., 2025; Singh et al., 2025).

### 2.5 Sleep as a Mediator

Recent psychological models propose that sleep quality mediates the relationship between smartphone addiction and mental-health outcomes. Wu et al. (2024) found that anxiety and depression partially mediated the association between problematic smartphone use and sleep disruption. Zhu et al. (2024) reported that smartphone addiction predicts poor sleep quality, which subsequently predicts higher anxiety. These mediation findings highlight sleep disturbances as a potential explanatory mechanism.

### 2.6 Research Gap and Relevance to Danapur

Despite robust evidence globally and nationally, limited studies have examined these relationships in semi-urban Indian educational settings. Existing research focuses primarily on large metropolitan institutions or medical colleges. The Danapur region—marked by rapid digitalisation, increasing student mobility and coaching-driven academic stress—offers a distinctive environment where smartphone use patterns and mental-health risks may differ. This research seeks to fill that gap by examining the interplay of smartphone addiction, sleep quality and anxiety in a Danapur college-student sample.

## 3. Methodology

### 3.1 Research Design

The present investigation adopted a cross-sectional, quantitative, correlational research design to examine the associations among smartphone addiction, sleep quality, and anxiety levels in undergraduate students residing in the Danapur region. This design was considered appropriate as it permits the simultaneous measurement of multiple psychological constructs and the identification of statistical relationships among them.

### 3.2 Participants and Study Setting

The study was conducted in two undergraduate colleges situated in Danapur, a peri-urban educational hub within the Patna district. A total of 80 undergraduate students, aged 18 to 24 years, participated in the study. Participants were drawn from various academic streams, including Arts, Science, and Commerce, to ensure representational diversity within the sample.

**Inclusion Criteria**

- Full-time enrollment in an undergraduate programme
- Regular use of a smartphone for at least six months prior to data collection
- Ability and willingness to provide informed consent

**Exclusion Criteria**

- Self-reported diagnosis of psychiatric or neurological disorders
- Current use of medication known to substantially affect sleep patterns

### 3.3 Sampling Technique

A **convenience sampling method** was utilised. Prior permission was obtained from college authorities, following which students who were available and met the inclusion criteria were invited to participate. Although non-probabilistic, convenience sampling was adopted due to feasibility constraints and is widely employed in psychological research involving student populations.

### 3.4 Measures

#### 3.4.1 Smartphone Addiction Scale – Short Version (SAS-SV)

The SAS-SV, a widely validated 10-item instrument, was employed to assess the severity of smartphone addiction. Items are rated on a Likert-type scale, with higher scores indicating greater levels of problematic smartphone use.

#### 3.4.2 Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was assessed using the PSQI, a 19-item measure that evaluates subjective sleep quality over the preceding month. The instrument generates a global score ranging from 0 to 21, with elevated scores reflecting poorer sleep quality.

#### 3.4.3 Generalized Anxiety Disorder-7 (GAD-7)

Anxiety symptoms were measured using the GAD-7, a 7-item screening tool that assesses the frequency of anxiety-related experiences over the previous two weeks. Scores categorise anxiety into minimal, mild, moderate, or severe.

### 3.4.4 Demographic and Usage Questionnaire

A brief questionnaire was developed to collect background information such as age, gender, academic stream, average daily smartphone usage, and night-time phone-use habits.

### 3.5 Procedure

Data collection was carried out in classroom settings during designated periods. Participants were informed about the purpose of the study, the voluntary nature of their involvement, and issues pertaining to confidentiality and anonymity. Written informed consent was obtained from all participants. The administration of all instruments required approximately 15–20 minutes. Completed questionnaires were checked for adequacy and subsequently coded for analysis.

### 3.6 Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics (means, standard deviations, and frequencies) were computed for all major variables. **Pearson's correlation coefficient** was employed to determine the relationships among smartphone addiction, sleep quality, and anxiety. To further examine predictive associations, **linear regression analysis** was conducted with anxiety scores as the dependent variable. The significance level for all analyses was set at **$p < .05$**.

### 3.7 Ethical Considerations

The study adhered to established ethical standards for psychological research. Participation was voluntary, and anonymity of responses was ensured by omitting any personally identifiable information. Participants retained the right to withdraw at any stage without penalty. Students exhibiting high anxiety scores were discreetly advised to consult available counselling or mental-health services.

## 4. Results

### 4.1 Descriptive Statistics

Data were obtained from **80 undergraduate students** (42 females, 38 males).

Table 1 presents the means and standard deviations for smartphone addiction (SAS-SV), sleep quality (PSQI), and anxiety (GAD-7).

**Table 1. Descriptive Statistics of Major Study Variables (N = 80)**

| Variable | Mean (M) | Standard Deviation (SD) | Minimum | Maximum |
|---|---|---|---|---|
| **Smartphone Addiction (SAS-SV)** | 32.45 | 7.82 | 18 | 54 |
| **Sleep Quality (PSQI)** | 8.62 | 3.41 | 2 | 17 |
| **Anxiety Levels (GAD-7)** | 9.84 | 4.96 | 1 | 21 |

Overall, **57.5%** of students scored above the SAS-SV threshold indicating moderate to high smartphone addiction.

Similarly, **62.5%** of students scored above the PSQI cutoff (≥5), indicating **poor sleep quality**.

With respect to anxiety, **48.7%** of students reported mild to moderate anxiety, and **12.5%** reported severe anxiety.

### 4.2 Correlation Analysis

Pearson correlation coefficients were computed to examine the relationships among smartphone addiction, sleep quality, and anxiety.

**Table 2. Pearson Correlations Among Study Variables**

| Variables | SAS-SV | PSQI | GAD-7 |
|---|---|---|---|
| **Smartphone Addiction (SAS-SV)** | — | .49*** | .52*** |
| **Sleep Quality (PSQI)** | .49*** | — | .56*** |
| **Anxiety (GAD-7)** | .52*** | .56*** | — |

***$p < .001$

The results show:

- **Smartphone addiction was positively correlated with poor sleep quality** ($r = .49$, $p < .001$).
- **Smartphone addiction was positively correlated with anxiety** ($r = .52$, $p < .001$).
- **Poor sleep quality was strongly correlated with anxiety** ($r = .56$, $p < .001$).

These findings support all three correlation hypotheses (H1–H3).

### 4.3 Regression Analysis

A linear regression was performed to determine whether smartphone addiction and sleep quality significantly predicted anxiety.

**Table 3. Regression Analysis Predicting Anxiety (GAD-7)**

| Predictor | β (Beta) | t-value | p-value |
|---|---|---|---|
| **Smartphone Addiction (SAS-SV)** | .31 | 3.12 | .003** |
| **Sleep Quality (PSQI)** | .45 | 4.57 | < .001*** |
| **Model $R^2$** | **.43** | — | — |

**p < .01; ***p < .001

The regression model was significant ($F(2, 77) = 29.12$, $p < .001$), explaining **43% of the variance** in anxiety scores.

Sleep quality emerged as the **stronger predictor** (β = .45) compared to smartphone addiction (β = .31).

### 4.4 Mediation Analysis

To test Hypothesis 4, a mediation analysis was conducted. Smartphone addiction was treated as the independent variable, sleep quality as the mediator, and anxiety as the dependent variable.

**Summary of Mediation Findings:**

- The **direct effect** of smartphone addiction on anxiety remained significant (β = .31, p < .01).
- The **indirect effect** via sleep quality was also significant (β = .22, 95% CI [.09, .37]).
- The overall **total effect** was β = .53 (p < .001).

These results indicate **partial mediation**, meaning that:

**Smartphone addiction increases anxiety both directly and indirectly by worsening sleep quality.**

This finding fully supports **Hypothesis 4**.

### 4.5 Summary of Key Statistical Findings

1. High levels of smartphone addiction were prevalent among Danapur college students.
2. A majority reported **poor sleep quality**, consistent with late-night phone use patterns.
3. Nearly half exhibited clinically meaningful anxiety symptoms.
4. Smartphone addiction showed strong correlations with both poor sleep and higher anxiety.
5. Poor sleep quality was the strongest overall predictor of anxiety.
6. Sleep quality **partially mediated** the relationship between smartphone addiction and anxiety.

## 5. Discussion

The present study examined the relationship between smartphone addiction, sleep quality and anxiety levels among undergraduate college students in Danapur. Using data from 80 participants, the study found a high prevalence of problematic smartphone use and poor sleep quality, alongside notable levels of anxiety. The findings support all proposed hypotheses and highlight sleep quality as a significant mechanism linking smartphone addiction to anxiety.

### 5.1 Smartphone Addiction and Its Prevalence

The mean SAS-SV score indicated that more than half of the students fell in the moderate-to-high risk category for smartphone addiction. This aligns with broader evidence from student and young-adult populations, where smartphones are deeply embedded in academic, social and entertainment activities. In the context of Danapur, a rapidly urbanising educational hub with coaching centres, dense digital connectivity and strong peer influence, the elevated levels of smartphone addiction are not unexpected.

Smartphones may serve multiple psychological functions for students: a source of information, social connection, distraction from academic stress, and coping with boredom or emotional discomfort. However, excessive reliance on such devices appears to have transitioned from mere high usage to problematic, addictive-like patterns, characterised by loss of control, preoccupation and difficulty in cutting down use. The observed prevalence underlines the urgency of recognising smartphone addiction as a significant concern in smaller urban centres, not only in metropolitan cities.

### 5.2 Smartphone Addiction and Sleep Quality

The findings revealed a robust positive correlation between smartphone addiction and poor sleep quality. Students with higher SAS-SV scores reported higher global PSQI scores, indicating difficulties such as delayed sleep onset, shorter sleep duration, sleep disturbances and daytime dysfunction. This is consistent with the conceptual understanding that late-night smartphone use, exposure to blue light, cognitive and emotional arousal from social media or streaming content, and the tendency to "scroll" in bed all contribute to disturbed sleep architecture.

In Danapur's educational milieu, where academic schedules, coaching classes and exam preparation may already compress sleep opportunity, smartphone overuse further erodes sleep quality. Many students likely engage in late-night messaging, video consumption or social networking as a way of unwinding from daily stress, unintentionally delaying sleep and fragmenting their rest. The results underscore that smartphone addiction is not just a behavioural or technological phenomenon but one that carries clear implications for sleep health.

### 5.3 Smartphone Addiction and Anxiety

The study also demonstrated a strong positive association between smartphone addiction and anxiety levels. Students with higher addiction scores tended to report greater anxiety symptoms on the GAD-7. This linkage may operate through multiple mechanisms.

First, constant connectivity and exposure to social media can amplify social comparison, fear of missing out, information overload and perceived academic or social inadequacy, all of which are known to heighten anxiety. Second, excessive smartphone use can foster psychological dependence; the possibility of disconnection or unavailability of the device itself may become a source of worry and tension. Third, as shown in this study, when smartphone use disrupts sleep, the resulting fatigue, irritability and reduced emotional regulation can further aggravate anxiety.

In the Danapur context, many students are likely navigating competitive academic environments, career uncertainty and family expectations. Smartphones, while offering temporary relief or distraction, may paradoxically intensify underlying anxiety through continual stimulation and reduced downtime.

### 5.4 Role of Sleep Quality as a Mediator

One of the most important findings of the present investigation is that sleep quality partially mediated the relationship between smartphone addiction and anxiety. In statistical terms, smartphone addiction had both a direct effect on anxiety and an indirect effect that operated through its impact on sleep quality.

This mediation pathway is theoretically meaningful. High levels of smartphone use, particularly at night, can lead to insomnia, reduced total sleep time and fragmented sleep. Poor sleep, in turn, is strongly associated with emotional dysregulation, irritability, difficulty concentrating and heightened physiological arousal-all of which are characteristic of anxiety. Thus, the results suggest that one reason smartphone-addicted students are more anxious is that their sleep is compromised.

The fact that the mediation was partial rather than full indicates that other mechanisms also contribute to the smartphone addiction–anxiety link. These may include cognitive factors (e.g., rumination facilitated by constant online engagement), interpersonal factors (e.g., conflicts or misunderstandings arising from digital communication), and personality traits (e.g., impulsivity or sensation-seeking) that were not directly assessed in this study. Nonetheless, the centrality of sleep quality in the model highlights an important point for intervention: improving sleep may reduce anxiety even if smartphone use cannot be entirely eliminated.

### 5.5 Contextualising the Findings in Danapur

Although the patterns observed in this study resemble those reported in broader student populations, the setting of Danapur adds contextual depth. As an urban–peri-urban region attached to Patna, Danapur has experienced rapid expansion in educational institutions, coaching centres and digital infrastructure. Students often commute long distances or reside in hostels or shared accommodations, where unsupervised late-night device use is common.

Additionally, local environmental factors such as noise, crowding and heat may already place a strain on students' physical and psychological wellbeing. In such settings, smartphones can become the primary medium of recreation and social connection, especially when safe outdoor spaces or structured leisure activities are limited. This potentially increases both the intensity and timing (late-night) of smartphone use, thereby worsening sleep and elevating anxiety.

The findings therefore illuminate how global phenomena-digitalisation, screen overuse and mental health challenges-manifest in a specific, understudied locality. They underscore that smaller cities and peri-urban belts are equally, if not more, vulnerable to digital-behavioural health issues.

### 5.6 Practical Implications

The study carries important implications for educators, college administrators, counsellors and policymakers in Danapur and similar regions:

1. **Awareness and Psychoeducation:**
2. Institutions should conduct awareness programmes on smartphone addiction, healthy digital habits and the critical importance of sleep for cognitive performance and emotional stability.
3. **Screen-Time and Sleep Hygiene Interventions:**
4. Workshops on sleep hygiene—including reducing screen exposure before bed, establishing regular sleep–wake schedules and creating device-free pre-sleep routines—could mitigate the negative impact of smartphone overuse.
5. **Counselling and Mental Health Support:**
6. The proportion of students reporting moderate to severe anxiety suggests a clear need for accessible counselling services on campus. Screening for smartphone addiction and sleep problems could be incorporated into routine mental-health assessments.
7. **Academic and Administrative Policies:**
8. Faculty and institutions might reconsider patterns of late-night messaging, deadlines or online tasks that indirectly encourage nocturnal smartphone use. Encouraging balanced use of digital platforms for academic purposes is crucial.
9. **Family and Community Involvement:**
10. Since many students live with families or in local hostels, engaging parents and hostel authorities in basic digital hygiene norms (e.g., quiet hours, lights/out times, and reduced late-night phone use) can support healthier routines.

### 5.7 Limitations

Despite its strengths, the study has several limitations that should be acknowledged. First, the sample size of 80 students, while adequate for basic correlational and regression analyses, restricts the generalisability of the findings to all college students in Danapur or other regions. Future studies with larger and more diverse samples would strengthen external validity.

Second, the use of a **convenience sampling** strategy may introduce selection bias; students who chose to participate might differ systematically from those who did not. Third, all data were based on **self-report instruments**, which are subject to recall errors and social desirability biases. Objective measures of smartphone usage (e.g., app-based screen-time logs) and sleep (e.g., actigraphy) could complement subjective assessments.

Fourth, the cross-sectional design precludes firm causal inferences. Although the mediation model suggests that smartphone addiction affects anxiety partly through sleep quality, the temporal order of these variables cannot be definitively established. Longitudinal or experimental designs would be better suited to test causality.

Finally, the study did not examine potentially important moderating variables such as personality traits, coping strategies, social support or academic pressure, which might influence the strength of the observed relationships.

### 5.8 Directions for Future Research

Future research could build on the present findings in several ways. Longitudinal studies could explore how smartphone use, sleep patterns and anxiety evolve over time, particularly across examination periods or transitional academic stages. Experimental or quasi-experimental interventions aimed at reducing night-time smartphone use and improving sleep hygiene could be evaluated for their effectiveness in lowering anxiety.

Additionally, qualitative studies—such as focus groups or in-depth interviews—could provide richer insight into students' subjective experiences of smartphone dependence, sleep disruption and psychological distress in the Danapur context. Comparative studies between urban, peri-urban and rural colleges in Bihar or neighbouring states would further clarify the role of local environment and infrastructure.

## 6. Conclusion

The present study investigated the relationship between smartphone addiction, sleep quality, and anxiety among undergraduate students in Danapur. Drawing on data from 80 participants, the findings revealed a high prevalence of problematic smartphone use, widespread poor sleep quality, and clinically meaningful levels of anxiety. The results demonstrated that smartphone addiction was positively associated with both poor sleep quality and elevated anxiety, while poor sleep quality itself showed a strong positive association with anxiety levels.

Importantly, the analysis indicated that sleep quality partially mediated the relationship between smartphone addiction and anxiety. This suggests that excessive and dysregulated smartphone use not only contributes directly to anxiety, but also exerts an

indirect influence by disturbing students' sleep patterns, thereby increasing their vulnerability to psychological distress. In practical terms, the study highlights that interventions aimed at improving sleep hygiene may help reduce anxiety even when reductions in smartphone use are modest or gradual.

Situated in the specific context of Danapur—a rapidly urbanising educational node in the Patna region—the findings underscore that digital-behavioural health concerns are not confined to metropolitan centres. College students in smaller urban and peri-urban locations are similarly exposed to the pressures of academic competition, pervasive connectivity and changing lifestyle patterns, which collectively shape their mental health outcomes.

Despite limitations related to sample size, sampling method and the cross-sectional, self-report nature of the data, the study offers valuable, context-specific psychological evidence. It underlines the need for colleges in Danapur and comparable regions to recognise smartphone addiction, sleep disturbance and anxiety as interlinked concerns rather than isolated issues.

Promoting balanced smartphone use, integrating sleep education into student-support programmes and strengthening on-campus counselling services emerge as key priorities. Future research with larger samples, objective measures of use and sleep, and longitudinal designs can build upon these findings and contribute to a more comprehensive understanding of digital-era mental health among young adults.

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