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# INSOMNIA SEVERITY INDEX AND SMARTPHONE USAGE PATTERNS AMONG MEDICAL STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

**Background:** Constant usage and addiction to cell phones has affected the people physically, psychologically, and socially. As smartphone becomes inalienable part in our daily use and its hazards needs to be monitored.
**Objective:** This study was conducted to assess prevalence of insomnia and also pattern of usage of smartphone among medical students.
**Materials and Methods:** An institution based cross-sectional study was conducted among 834 medical students by using a semi-structured questionnaire. Insomnia was measured using ISI (Insomnia Severity Index) Scale and pattern of smartphone usage like daily average duration of usage, average monthly data expenditure, usage at night time, at restricted places etc.
**Results:** Around 9% and 27% of subjects were found to be having clinical insomnia and sub threshold insomnia respectively. First exposure to smartphone, accumulated smartphone use, usage after 11 pm, usage while eating, average monthly bill were significantly associated with prevalence of insomnia.
**Conclusion:** Sleep hygiene, target specific behaviors like screen time has to be inculcated in student wellness and mentorship programmes.
**Keywords:** Insomnia Severity Scale, Smart phone, Medical students.

## INTRODUCTION

According to recent Deloitte Study, India will have 1 billion smartphone users by 2026 and driving force will be rural India. India is poised to become second largest smart phone manufacturer in next 5 years.[1] Mobile phones have become a ubiquitous part of our daily lives. Initially, mobile phones were used only as a communication tool; but, these days, mobile phones function as mobile computers that serve us with music player, games, internet, video camera, calculator, alarm clock, and many more other perceived benefits as increased accessibility and social connectivity, reduced loneliness, and security in emergency situations.[2] The rapid proliferation of smartphone technology in India has fundamentally altered the daily routines of students, positioning these devices as the primary portal for internet access and social engagement.[3]

Unfortunately, communication technology has some negative effects also. Constant usage and addiction to cell phones has affected the people physically, psychologically, and socially. Excessive mobile phone use has been found to be associated with health problems such as impaired concentration, headache, dizziness, fatigue, thermal sensations in and around ear, facial dermatitis, stress, sleep disturbances owing to night-time use, and frustration.[4] This pervasive digital immersion, often exceeding four to six hours of daily usage, has emerged as a significant public health concern due to its direct correlation with compromised sleep hygiene and irregular nocturnal routines.[5]

Current surveys indicate that a majority of Indian students engage in extended screen exposure immediately prior to bedtime, a practice that frequently delays sleep onset and disrupts natural circadian rhythms.[6] psychologically people get

addicted to mobile phones that have led to emotional stress. Students may also show cognitive/behavioral salience in which they constantly think about their phones when they are not using it or keep on checking their mobile phones for missed calls or messages.

As smartphone use is increasing becoming part of your lives, it is important for us to critically examine its utility and health impact; hence this study was conducted to assess its usage and apparent health impact.

**Aims and Objective**

To estimate prevalence of insomnia using ISI scale and pattern of usage of smartphones among medical students of NMC Raichur.

## MATERIALS AND METHODS

This study was institution based cross-sectional study, conducted in Navodaya Medical College, Raichur. MBBS students and interns were included as study participants. The study was conducted using a pretested Google form among all four MBBS phases along with Interns to get maximum responses. After explaining the study, students who volunteered to participate in study were taken as subjects. Response rate was 87.5%. A total of 834 responses were collected during the study, which was conducted between July to October 2025.

**Data Collection**

Data was collected by means of Google forms. It had both open ended and close ended questions. Google form consisted of 3 main sections. First section included socio-demographic details like age, gender, place of staying, parent's education and occupation, family income, type of family. Second section consisted of pattern of mobile usage like type of smart phone used, daily average duration of usage, usage of various apps and purpose of use, average monthly data expenditure usage at night time, usage at restricted places like classroom, library and on bikes etc. Third section consisted of self-reported health problems if any like headache, vision problems, hearing problems, musculoskeletal problems, ring anxiety etc.

Google form also had "Insomnia Severity Index" which is a seven-question tool designed by Charles M Morin et al, each question has five-point Likert scale and scoring of 0, 1, 2, 3 and 4 is given accordingly. At the end, scoring is done by summing up of all the points from seven questions. A score of 0 to 7 indicates No clinical Insomnia, 8 to 14 indicates Sub -threshold Insomnia, 15 to 21 indicates Moderate Insomnia and 22 to 28 indicates Severe Insomnia. This tool is validated in field and has good sensitivity and specificity. 7, 8

Data was entered in excel sheet 2019 and analysed and presented in percentages and proportions.

## RESULTS AND DISCUSSION

This institution-based study of 834 undergraduate medical students and interns at Navodaya Medical College, Raichur, found that about one in eleven students (9.1%) had clinically significant insomnia on the Insomnia Severity Index (ISI). A further 27.3% had sub-threshold insomnia, so that more than one-third (36.5%) reported insomnia symptoms of at least sub-threshold severity. Smartphone use was intense: 57.6% used their device for three hours or more each day, 87.5% used it after 11 pm at least sometimes, and 60.9% consumed 1.5 GB or more of mobile data daily.

Clinical insomnia showed a graded association with every marker of use intensity examined, namely accumulated daily use, night-time use and daily data consumption. It was also associated with behaviors suggestive of compulsive use, including phone use while eating, use in restricted settings such as classrooms and libraries, and feelings of guilt about use. By contrast, the stage of education at which students were first exposed to a smartphone, or acquired their own, was not associated with insomnia. Taken together, these findings suggest that current patterns of use, particularly at night, matter more for sleep than the length of time a student has owned a phone.

**Prevalence of insomnia**

The prevalence of clinical insomnia in this study (9.1%; moderate 7.3%, severe 1.8%) is lower than that reported by Telgote et al. among 275 undergraduates at a medical college in Akola, Maharashtra. Using the same instrument, they found insomnia of any severity in 52% of students, with 17.1% moderate and 5.1% severe.[9] Our estimate of any insomnia symptoms (ISI 8 or more; 36.5%) is also lower than theirs.

Meta-analyses consistently show that sleep problems are common among medical students. The most recent global synthesis of 109 studies reported a pooled prevalence of poor sleep quality of 55.6%, an estimate of about 56% for India, and mean nightly sleep duration of only 6.5 hours.[10] Earlier reviews reached similar conclusions.[11,12] Among university students more broadly, a systematic review found insomnia prevalence ranging from 9.4% to 38.2% across countries,[13] which places our clinical estimate at the lower end and our sub-threshold estimate towards the upper end of that range.

Three methodological differences probably explain much of the gap between our findings and other Indian reports. First, most Indian studies use the Pittsburgh Sleep Quality Index (PSQI), whose "poor sleep quality" category captures a broader and milder construct than clinical insomnia on the ISI; a Tamil Nadu study, for example, classified 72.4% of medical students as poor sleepers on the PSQI.[14] Second, the ISI cut-off of 15 used here for clinical insomnia is conservative. In its validation study, a cut-off of 10 gave the best balance of sensitivity (86.1%) and

specificity (87.7%) for detecting insomnia cases in a community sample.[7] 27.3% of our students in the sub-threshold band therefore include an unknown proportion that would be classified as cases at that lower threshold. Third, our sample spanned all four phases of the MBBS course and the internship year, whereas smaller single-batch surveys may capture students at periods of peak academic stress. Even allowing for these differences, more than one in three students reporting at least sub-threshold insomnia represents a substantial and largely unrecognized burden.

**Daily duration of use and data consumption**

Clinical insomnia rose steadily with accumulated daily use, from 2.7% among students using their phone for less than two hours to 6.6%, 9.3% and 15.5% in the 2–3 hour, 3–4 hour and four-hours-or-more groups ($p<0.001$). Across the same range, the proportion with any insomnia symptoms more than doubled, from 22.5% to 49.5%. Daily data consumption showed a parallel gradient, with clinical insomnia in 5.8% of students using less than 1.5 GB, 8.3% of those using 1.5–3 GB and 18.4% of those using more than 3 GB. Because data volume rises sharply with video streaming and continuous social media use, it is a rough but partly objective proxy for the type as well as the amount of use, and it is less prone to recall error than self-estimated screen hours. These gradients are consistent with the wider literature. A meta-analysis of studies in medical students reported a pooled correlation of 0.30 between smartphone addiction scores and PSQI scores, with students averaging 4.9 hours of smartphone use a day;,[15] Telgote et al. reported a similar correlation ($r=0.35$) between smartphone addiction and insomnia severity in Maharashtra.[9] Studies from southern India have likewise linked mobile phone use and smartphone addiction to poor sleep quality among medical students.[14,16] Evidence from other populations points in the same direction. A meta-analysis of more than 125,000 children and adolescents found that bedtime access to and use of portable media devices was associated with inadequate sleep quantity, poor sleep quality and excessive daytime sleepiness.[17] In a Swedish prospective cohort of young adults, high mobile phone use at baseline predicted sleep disturbances among men at one-year follow-up, and self-perceived overuse predicted sleep disturbances among women.[18] The monotonic dose–response pattern in our data, rather than a single threshold effect, makes it less likely that the association is entirely artefactual, although a cross-sectional design cannot establish its direction.

**Smartphone use after 11 pm**

Habitual use after 11 pm was linked to the highest prevalence of clinical insomnia of any use-intensity category. Clinical insomnia was present in 20.6% of students who used their phones late at night most of the time, compared with 6.0% of occasional users and 5.8% of those who never did so ($p<0.001$); any insomnia symptoms were reported by 53.9%, 32.0% and 29.8%, respectively.

Two features of this pattern deserve comment. First, late-night use was the norm rather than the exception: 87.5% of students used their phones after 11 pm at least sometimes, and 21.6% did so habitually. This exceeds the 61% night-time use reported among medical students in Tamil Nadu.[14] Second, insomnia prevalence was almost identical among occasional users and non-users, which suggests that risk is concentrated in habitual late-night use. This has a practical implication: interventions need not aim at abstinence from evening phone use, but should target its routine extension into the sleep period.

Studies in adults show similar results. Among Belgian adults, bedtime mobile phone use independently predicted higher insomnia scores, later rise times and greater fatigue.[19] Several mechanisms plausibly link late-night use to insomnia. Short-wavelength light from screens suppresses melatonin and delays the circadian clock; in a controlled crossover trial, reading on a light-emitting device before bed lengthened sleep latency, delayed melatonin onset by about 1.5 hours and reduced next-morning alertness compared with reading a printed book.[20] Interactive content such as messaging, social media and video raises cognitive and emotional arousal at bedtime, and screen time directly displaces time that would otherwise be spent asleep.[21,22]

Smartphones also make bedtime procrastination easier. This is the tendency to go to bed later than intended without any external reason, and it is linked to weaker self-regulation and insufficient sleep.[23] In residential settings such as hostels, where students live away from family routines, the absence of external bedtime cues and the influence of peer schedules may amplify these effects; future analyses of these data should examine whether place of residence modifies the association.

**Phone use while eating, in restricted settings and monthly expenditure**

Behaviours suggesting difficulty in disengaging from the phone were also associated with insomnia. Students who used their phones while eating (29.7%) had twice the prevalence of clinical insomnia of those who did not (14.1% vs 7.0%). Those who used them in restricted settings such as classrooms and libraries (14.6%) showed a similar excess (16.4% vs 7.9%).

Neither behaviour is likely to disturb sleep directly. More plausibly, both are markers of salience, the component of behavioural addiction in which an activity comes to dominate a person's thinking and behavior.[24] They identify students whose phone use extends into settings where social or institutional norms would ordinarily restrain it, and the same lack of restraint is likely to carry over into the bedroom. Simple questions about these behaviours could therefore serve as low-cost screening items for problematic use in student wellness programmes.

Self-reported use in restricted settings was considerably lower in our study than in earlier Indian reports. In Kolhapur, 56.5% of medical students used

their phones during college hours.[25] In Mangalore, students who experienced phantom ringing ("ringxiety") reported very high rates of phone use in classrooms and libraries.[26] Our lower figure may reflect institutional rules on phone use in teaching areas, differences in how restricted areas were defined or social desirability bias, since students may under-report behaviour they know to be prohibited.

Average monthly expenditure on the phone was associated with insomnia (p=0.002), but the relationship was not graded. Clinical insomnia was 9.0% among students spending less than Rs 500 a month, 5.9% among those spending Rs 500–1,000 and 12.0% among those spending more than Rs 1,000. In India, inexpensive bundled data plans mean that the monthly bill reflects the plan chosen, handset instalments and household income at least as much as actual use. Expenditure is therefore a weak proxy for exposure, and this U-shaped pattern should not be over-interpreted; daily data consumption, which showed a clear gradient, is the more informative measure.

**Feeling guilty about smartphone use**

The steepest gradient in the study was for guilt about smartphone use. Clinical insomnia rose from 2.9% among students who never felt guilty to 7.6% among those who sometimes did, 21.6% among those who felt guilty most of the time and 34.9% among those who always did, a roughly twelvefold difference across the scale (p<0.001). Any insomnia symptoms rose from 18.5% to 67.4%. One in seven students (14.0%) felt guilty most of the time or always.

Guilt about use is best understood as an expression of perceived loss of control. It corresponds to the conflict component of behavioural addiction, in which a person recognises that a behaviour is excessive and harmful yet continues it.[24] This interpretation is consistent with the view, supported by a systematic review and meta-analysis, that harms are associated less with the amount of smartphone use than with particular problematic patterns of smartphone-related behavior.[27] It also accords with the Swedish cohort, in which self-perceived overuse, rather than frequency of use alone, predicted later sleep disturbance among women.[18] In Maharashtra, smartphone addiction among medical students was similarly associated with a perceived negative impact of phone use on academic performance and with facing criticism about it.[9]

The strength of this association also calls for caution. Problematic smartphone use is consistently associated with depression and, to a lesser extent, anxiety, [28] and guilt is itself a feature of low mood. Students with depressive or anxiety symptoms may therefore be more likely both to report guilt about phone use and to experience insomnia, so psychological distress is a probable confounder that our bivariate analysis could not address. Reverse causation is also plausible: students who cannot sleep may turn to their phones during wakeful periods at night and then feel guilty about it. Despite these uncertainties, a single question about guilt identified a group in whom more than one-third had clinical insomnia, which makes it a promising candidate item for brief screening.

**Sleep duration**

One in four students (25.9%) reported sleeping less than six hours a night. In this group, clinical insomnia was nearly twice as common as among those sleeping 6–8 hours (13.9% vs 7.3%), and more than half (55.1%) reported at least sub-threshold insomnia. Adults are advised to sleep seven to nine hours a night, [29] and a global meta-analysis estimated that medical students sleep on average only 6.5 hours, with at least 30% falling short of the recommended range.[10] Because our middle category (6–8 hours) straddles the seven-hour threshold, the true proportion of students sleeping less than recommended is likely to be higher than 25.9%.

The association between short sleep and insomnia is partly definitional, since difficulty initiating or maintaining sleep shortens sleep and the ISI captures dissatisfaction with sleep and daytime impairment. Notably, students who reported sleeping more than eight hours (23.0%) had a prevalence of clinical insomnia (7.8%) similar to that of the 6–8 hour group. Long reported sleep may reflect extended time in bed, including time spent awake on the phone, or compensatory sleep after weekday restriction, rather than restorative sleep; the questionnaire did not distinguish weekday from weekend sleep or time in bed from time asleep.

These findings matter for medical training. Sleep loss impairs attention, memory consolidation and learning,[30] and a meta-analysis has linked disrupted sleep in medical students to poorer academic performance.[31] For interns, who formed part of our sample and carry direct clinical responsibilities, sleep deficiency also carries implications for patient safety.

**First exposure to a smartphone and first personal smartphone**

Neither the stage of education at first exposure to a smartphone (p=0.09) nor the stage at which students acquired their own device (p=0.41) was associated with insomnia, and neither showed a consistent gradient. Taken together with the strong associations for current behavior, this suggests that how students use their phones now matters more for sleep than cumulative years of exposure.

The ownership pattern is nonetheless informative. Although 45.7% of students had first used a smartphone during their school years, more than half (56.2%) acquired their own device only after joining the MBBS course, and only 12.0% owned one while at school. This is consistent with parental restriction of personal phones during the examination-focused pre-university years. For many students, therefore, entry into medical college coincides with unrestricted personal access to a smartphone, often while living away from home for the first time. This transition is a natural window for preventive education, for example within the foundation course at the start of the MBBS program. As younger cohorts with earlier personal ownership enter medical college, this

pattern is likely to change, and the question should be revisited in future surveys.

**Implications for medical education and student health**

These findings point to three practical steps. First, sleep and smartphone use should be screened routinely. The seven-item ISI takes less than five minutes to complete, and two simple questions, on habitual use after 11 pm and on guilt about phone use, identified groups in whom one-fifth to one-third had clinical insomnia. Such screening could be embedded in existing mentorship and student wellness programmes, with referral pathways for students who also show signs of depression or anxiety.

Second, health education should target specific behaviors rather than total screen time. Messages focused on keeping the phone out of reach at bedtime, setting a consistent device-off time and avoiding phone use in bed are more realistic than calls for abstinence. They are also supported by evidence that bedtime access to a device, even without active use, is associated with poorer sleep.[17] The foundation course and hostel orientation at entry to medical college are natural points for such education.

Third, students with clinical insomnia need access to effective treatment. Psychological interventions, particularly cognitive behavioral approaches, improve sleep in college students,[32] and a meta-analysis of randomized trials reported moderate-to-large effects with a number needed to treat of about three.[33] Digital detox interventions are popular, but evidence for their effectiveness remains inconsistent;[34] they should therefore complement, rather than replace, sleep-focused interventions. Institutional rules on phone use in teaching areas may help attention in class, but are unlikely to improve sleep unless accompanied by measures that address night-time use.

**Strengths and limitations**

The study's strengths are a large sample covering all MBBS phases and interns, a high response rate, and a validated instrument with established cut-offs.[7, 8] It also examined several dimensions of use, which showed that associations were consistent across different measures of exposure.

**Limitations**

- The cross-sectional design precludes causal inference, and reverse causation is plausible for night-time use and guilt.
- Exposures were self-reported in categories, without objective usage logs.
- The analysis was bivariate. Psychological distress, MBBS phase, sex, residence and examination periods may confound the associations, and problematic use is strongly linked to depression and anxiety.[28]
- Smartphone addiction was not measured with a validated scale such as the SAS-SV.[9]
- The voluntary online format and social desirability bias may have distorted reporting of prohibited behaviors.
- Findings come from a single institution.

Future studies should use longitudinal designs, objective measures and multivariable models.

| Variables | | Clinical Insomnia | | | | | | Total | | P Valu |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No Insomnia | | Sub threshold | | Clinical Insomnia | | | | |
| First Exposure to smart Phone | School | 231 | 60.6 % | 112 | 29.4 % | 38 | 10.0 % | 179 | 100 % | 0.09 |
| | PUC | 217 | 66.8 % | 87 | 26.8 % | 21 | 6.5% | 314 | 100 % | |
| | MBBS | 82 | 64.1 % | 29 | 22.7 % | 17 | 13.3 % | 234 | 100 % | |
| First Personal Smart Phone | School | 57 | 57.0 % | 30 | 30.0 % | 13 | 13.0 % | 100 | 100 % | 0.4 |
| | PUC | 174 | 65.7 % | 72 | 27.2 % | 19 | 7.2% | 265 | 100 % | |
| | MBBS | 299 | 63.8 % | 126 | 26.9 % | 44 | 9.4% | 469 | 100 % | |
| Accumulated Smartphone usage single day | Less than 2 hours | 86 | 77.5 % | 22 | 19.8 % | 3 | 2.7% | 111 | 100 % | <0.001 |
| | 2 to 3 hours | 161 | 66.2 % | 66 | 27.2 % | 16 | 6.6% | 243 | 100 % | |
| | 3 to 4 hours | 182 | 65.0 % | 72 | 25.7 % | 26 | 9.3% | 280 | 100 % | |
| | 4 hours and more | 101 | 50.5 % | 68 | 34.0 % | 31 | 15.5 % | 200 | 100 % | |
| Smartphone usage after 11 pm | Never | 73 | 70.2 | 25 | 24 | 6 | 5.8 | 104 | 100 % | <0.001 |
| | Sometimes | 374 | 68 | 143 | 26 | 33 | 6 | 550 | 100 % | |
| | Most of times | 83 | 46.1 | 60 | 33.3 | 37 | 20.6 | 180 | 100 % | |
| Average data usage in single day | Less than 1.5 GB | 233 | 77.5 | 74 | 22.7 | 19 | 5.8 | 326 | 100 % | <0.001 |
| | 1.5 to 3 GB | 216 | 59.8 | 115 | 31.2 | 30 | 8.3 | 361 | 100 % | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | More than 3 GB | 81 | 55.1 | 39 | 26.5 | 27 | 18.4 | 147 | 100 % | |
| **Usage smart phone while eating** | YES | 137 | 55.2 | 76 | 30.6 | 35 | 14.1 | 248 | 100 % | <0.001 |
| | NO | 393 | 67.1 | 152 | 25.9 | 41 | 7.0 | 586 | 100 % | |
| **Usage of smart phone in restricted areas** | YES | 62 | 50.8 | 40 | 32.8 | 20 | 16.4 | 122 | 100 % | <0.001 |
| | NO | 468 | 65.7 | 188 | 26.4 | 56 | 7.9 | 712 | 100 % | |
| **Average monthly smartphone bill** | Less than 500rs | 97 | 62.6 | 44 | 28.4 | 14 | 9.0 | 155 | 100 % | <0.001 |
| | 500 to 1000rs | 230 | 71.4 | 73 | 22.7 | 19 | 5.9 | 322 | 100 % | |
| | More than 1000rs | 203 | 56.9 | 111 | 31.1 | 43 | 12.0 | 357 | 100 % | |
| **Average sleep duration** | Less than 6hrs | 97 | 44.9 | 89 | 41.2 | 30 | 13.9 | 216 | 100 % | <0.001 |
| | 6hrs to 8hrs | 301 | 70.7 | 94 | 22.1 | 31 | 7.2 | 426 | 100 % | |
| | More than 8hrs | 132 | 68.8 | 45 | 23.4 | 15 | 7.8 | 192 | 100 % | |
| **Guilty while using smartphone** | Never | 167 | 81.5 | 32 | 15.6 | 6 | 2.9 | 205 | 100 % | <0.001 |
| | Sometimes | 323 | 63.1 | 150 | 29.3 | 39 | 7.6 | 512 | 100 % | |
| | Most of times | 26 | 31.5 | 32 | 43.2 | 16 | 21.6 | 74 | 100 % | |
| | Always | 14 | 32.5 | 14 | 32.5 | 15 | 35.0 | 43 | 100 % | |
| | Total | 530 | 63.6 % | 228 | 27.3 % | 76 | 9.1% | 834 | 100 % | |

## CONCLUSION

About one in eleven students had clinical insomnia, and more than one-third had at least sub-threshold symptoms. Insomnia rose with longer daily use and heavier data consumption, and most steeply with habitual use after 11 pm and guilt about use. The stage at which students first got a phone made no difference. Problematic patterns of use, not ownership, are the right target. Routine sleep screening, behavior-specific education at entry to medical college, and access to insomnia treatment should be part of student support.

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