

Impact of Nocturnal Smartphone Use on Sleep Quality among College-going Students

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ABSTRACT

Background: Smartphone use has become an inseparable part of modern life, particularly among adults. A rising concern is nocturnal smartphone use, which is more prevalent in college-going students due to academic, social, and recreational demands. Although the harmful effects of smartphone use on sleep are well recognized, limited research has focused specifically on the prevalence and impact of nocturnal smartphone use among Indian college-going students. Understanding this association is essential to identify at-risk populations, promote awareness, and develop preventive strategies.

Method: A cross-sectional, online questionnaire-based study was conducted among college 544 students aged 18–29 years using convenience sampling who are currently enrolled in undergraduate or postgraduate courses, own a smartphone, used it night and can understand English. Data was collected through a Google Form consisting of demographic details, smartphone usage patterns and the Pittsburgh Sleep Quality Index to measure sleep quality. The mean age of the participants was 22.66 ± 2.79 years, the mean duration of smartphone uses after 9 PM was 1.64 ± 0.71 hours/day, and the mean PSQI score was 7.66 ± 3.31 . Data were analyzed using descriptive statistics and the Spearman correlation coefficient.

Results: Among 544 students who completed the study, 85% reported smartphone use exceeding one hour after 9 PM, with mean daily screen time above 2 hours. Poor sleep quality (Pittsburgh Sleep Quality Index scores > 5) was seen in 62%. Spearman's correlation showed a significant positive relationship between nocturnal smartphone use and Pittsburgh Sleep Quality Index scores ($r = 0.518$, $p < 0.001$). Similarly, whole-day screen time showed positive correlation with Pittsburgh Sleep Quality Index scores ($r = 0.12$, $p = 0.008$).

Conclusion: Nocturnal smartphone use was associated with poor sleep quality among college-going students. These findings highlight the importance of promoting healthy nighttime smartphone use habits and provide a basis for future longitudinal studies to further investigate this association.

Keywords: Nocturnal Smartphone use, Sleep quality, Pittsburgh Sleep quality index, College students

INTRODUCTION

Sleep is an essential biological process. Adequate sleep is required for better physical and mental health and overall well-being especially in children and adolescents. Humans spend nearly one-third of their lives sleeping. Unfortunately, sleep deprivation among adolescents is increasingly common worldwide. Sleep hygiene can be affected

by many lifestyle factors, but excessive mobile phone use has received increasing attention as an important cause of sleep disturbances in adolescents [1]. Young adults (18-29 years) are among the most active smartphone users especially at night which makes them more vulnerable to sleep-related problems [2]. Research from the United States reported that around 90% of young adults under the age of 30 used electronic devices before going to sleep. Reviews of previous studies also found that bedtime media use often leads to sleeping later and getting less overall sleep [3]. Research indicates that young adults often perceive smartphones as devices that require them to remain available at all times, leading to disturbed sleep patterns. These include difficulty falling asleep, poor sleep quality, reduced sleep duration, and excessive daytime tiredness caused by increased cognitive and emotional arousal before bedtime [4]. Carter et al. reported that using media devices at bedtime is strongly associated with poor sleep quality and increased daytime sleepiness [5]. Smartphone use in dark environments may disrupt sleep through several pathways, including exposure to radiofrequency electromagnetic fields that can affect the brain and alter normal sleep patterns. Over the past two to three decades, a significant reduction in sleep duration has been observed which has been connected to an increased risk of obesity, diabetes, and other long-term health problems [1]. The body follows a natural 24-hour rhythm known as the circadian rhythm, which controls sleep patterns, hormone release, and daily functioning. Research suggests that nighttime smartphone use, especially exposure to blue light from LED screens, can disrupt these rhythms and negatively affect melatonin secretion and alter normal sleep patterns. Previous studies have linked this behaviour with poor sleep quality, reduced concentration, fatigue, and behavioral issues, particularly in younger populations who are more sensitive to light exposure [6]. Compared to individuals who

sleep well, poor sleepers are more likely to feel fatigued during the day and have difficulties with concentration, cognition, and classroom attention. Research suggests that many smartphone users experience poor sleep and higher stress levels, leading to impaired concentration and learning capacity [7]. Research investigating the relationship between bedtime smartphone use, sleep disturbances, among college students remains limited. In recent years, nocturnal smartphone use among college-going students has increased considerably because of academic, social, and leisure activities. Excessive smartphone use before sleep may disturb normal sleep patterns and negatively influence physical, psychological, and academic well-being. Thus, this study is aimed to assess the correlation between smartphone use after 9 PM and Pittsburgh Sleep Quality Index scores (PSQI) scores among college-going students and the correlation between whole-day screen time and sleep quality among college-going students.

MATERIALS & METHODS

A cross-sectional observational analytical study was conducted among college-going student in Ahmedabad. The study was conducted across various undergraduate and postgraduate colleges in Ahmedabad, Gujarat, India. A convenience sampling technique was used for participant recruitment. Participants eligible for the study were college-going young adults aged 18–29 years who were enrolled in undergraduate or postgraduate courses, owned a smartphone, used smartphones at night, and understood English. Exclusion criteria included primary sleep disorders, night shift employment, prescribed sleep medication use, pregnancy, and known chronic medical conditions. The subjective sleep quality and sleep disturbance was assessed using Pittsburgh Sleep Quality Index Scale [8]. The students were informed about the study and informed consent was obtained when filling the form. Data were collected using a Google Form, which was

distributed through friends, family members, and peer networks, and further shared among college-going students to reach a wider population using social media platforms like WhatsApp and Instagram. The study was carried out in accordance with the ethical principles of the Declaration of Helsinki and its subsequent amendments. Sample size was calculated based on previous studies using the formula as per previously done articles [3]

$$n = z^2pq/d^2$$

where $p = 0.5$

$q = 1 - p = 0.5$

$z = 1.96$ (for 95%CL),

$d = 0.05$

$n = 384$

There were about 10 demographic questions and The Pittsburgh Sleep Quality Index (PSQI) was used to assess different aspects of sleep quality and sleep disturbances.

Pittsburgh Sleep Quality Index (PSQI) [8]

The Pittsburgh Sleep Quality Index (PSQI) was a standardized questionnaire, used to assess an individual's sleep quality during the previous month. It included 19 questions divided into seven areas such as: Subjective sleep quality, Sleep latency, Sleep duration, Habitual sleep efficiency, Sleep disturbances, Use of sleeping medication, Daytime dysfunction. The questionnaire consisted of 19 questions categorized into seven components related to different aspects of sleep and daytime functioning. Each component received a score from 0 to 3, and the combined global score ranges from 0 to 21. Higher scores represented poorer sleep quality, while scores greater

than 5 indicate clinically significant sleep difficulties.

Statistical Analysis

Statistical analysis of the study data was carried out using SPSS version 20. Descriptive analysis and Spearman's correlation test were employed to assess the association between variables, while the significance level for the analysis was fixed at 5% ($p < 0.05$).

RESULT

A Total of 544 Participants with mean age 22.66 ± 2.79 participated in the study. Among the study participants, females constituted the majority 68.9%, while males accounted for 30.6%. Additionally, bedtime smartphone use was highly prevalent, as 76.3% of participants kept their phones beside them while sleeping and 87.7% checked their phones before bedtime. Participants reported using their smartphones after 9 PM for an average duration of 1.64 ± 0.71 hours per day and the mean whole-day screen time was 2.03 ± 0.75 hours. Poor sleep quality ($PSQI > 5$) was seen in 62%. the participants had mean PSQI score of 7.66 ± 3.31 , highlighting the presence of sleep disturbances and poorer sleep quality among the study group.

Spearman's Correlation analysis showed that participants who used smartphones more frequently after 9 PM had higher PSQI scores ($r = 0.518$, $p < 0.001$). Similarly, whole-day screen time was positively correlated with PSQI scores ($r = 0.12$, $p = 0.008$) indicating poorer sleep quality with increased nighttime smartphone use; as shown in figures 1 and 2.

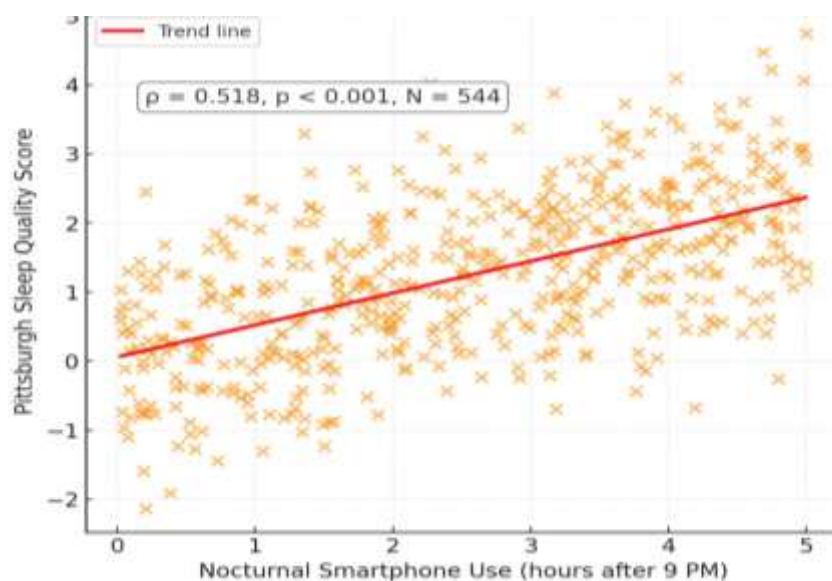


Figure 1: Correlation of nocturnal smartphone use with sleep quality

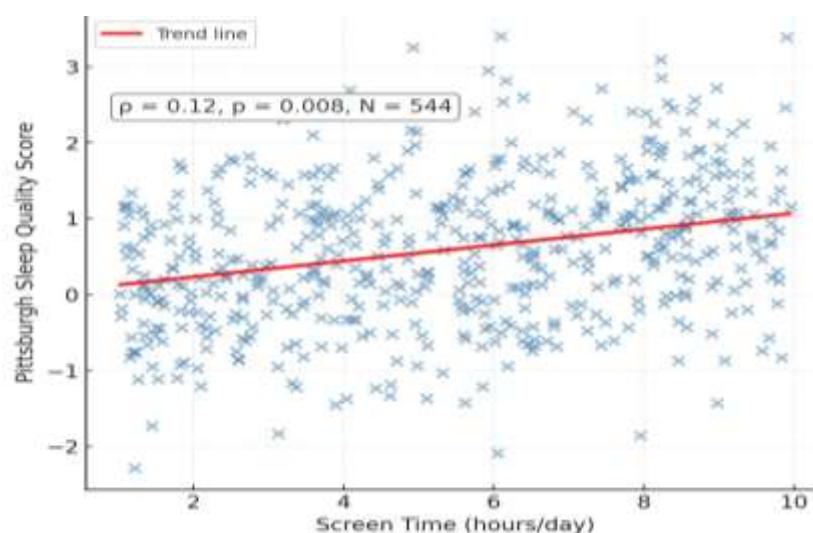


Figure 2: Correlation of whole day screen time with sleep quality

DISCUSSION

The present study suggests that increased nighttime phone use was moderately and significantly associated with poorer sleep quality (PSQI scores), college students who used smartphones excessively after 9 PM tended to have poorer sleep quality. In addition, whole-day screen time also showed a weak but statistically significant positive correlation with PSQI scores. These findings reveal that prolonged exposure to screens, especially after 9 PM, may contribute to sleep disturbances and reduced overall sleep quality.

Similar findings have been reported by Alshobaili FA et al., who observed that employees with greater smartphone use at

bedtime were more likely to experience poor sleep quality and emphasized the need to increase awareness regarding the adverse effects of excessive smartphone use on sleep, overall health, and workplace productivity [9]. Likewise, Joshi SC et al. reported that bedtime smartphone use was significantly associated with longer sleep latency and shorter sleep duration among young adults, supporting the relationship between nighttime smartphone use and impaired sleep quality [4].

Severinsen ER et al. found that night-time smartphone use was associated with longer sleep duration but did not observe a direct association with menstrual disturbances in young adult women. However, poor sleep

quality and shorter sleep duration were associated with menstrual disturbances, highlighting the need for further prospective research to better understand these relationships [10]. Menstrual disturbances were not evaluated in the present study. Previous studies have also suggested that excessive smartphone use among young adults is associated with poorer sleep quality, shorter sleep duration, daytime sleepiness, and impaired concentration, supporting the findings of the present study [4].

However, the findings of the present study should be interpreted in the context of its methodological limitations. As this was a cross-sectional observational study, the temporal relationship between nocturnal smartphone use and poor sleep quality could not be established. Therefore, while a significant association was observed, it remains possible that poor sleep quality may contribute to increased nighttime smartphone use, rather than smartphone use leading to poor sleep. In addition, sleep quality and smartphone use were assessed using self-reported questionnaires, which may have introduced recall and response bias. The use of convenience sampling and recruitment of participants exclusively from colleges in Ahmedabad may also limit the generalizability of the findings to other populations. Furthermore, objective measures of smartphone use and sleep, such as digital screen-time tracking or actigraphy, were not included.

Despite these limitations, the present study provides valuable evidence regarding the association between nocturnal smartphone use and sleep quality among Indian college-going students. The findings highlight the importance of increasing awareness about healthy nighttime smartphone habits and sleep hygiene among young adults. Physiotherapists and other healthcare professionals may contribute by providing education on healthy lifestyle practices, promoting regular physical activity, addressing posture-related discomfort associated with prolonged smartphone use,

and encouraging behavioral strategies that support good sleep hygiene. Future longitudinal and interventional studies using objective measures of smartphone use and sleep quality are recommended to determine the direction of this association and evaluate the effectiveness of strategies aimed at reducing nighttime smartphone use.

CONCLUSION

The present study found a significant positive association between nocturnal smartphone use and poor sleep quality among college-going students. Students reporting greater smartphone use after 9 PM tended to have higher PSQI scores. However, because of the cross-sectional observational design, causal relationships cannot be established. These findings highlight the need for promoting healthy nighttime smartphone habits and support the need for future longitudinal and interventional studies to further investigate this association.

Declaration by Authors

Ethical Approval: The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

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Conflict of Interest: The authors declare no conflict of interest.

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