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Association Between Smartphone Addiction and Quality of Sleep in Pre-Clinical Medical Students at Navamindradhiraj University

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ABSTRACT

Objectives: To determine the prevalence of smartphone addiction and examine its association with sleep quality among pre-clinical medical students, a population vulnerable to academic stress without the confounding effect of clinical shift work.

Materials and Methods: A cross-sectional descriptive study was conducted at the Faculty of Medicine, Vajira Hospital, Navamindradhiraj University. A total of 190 medical students in Years 1–3 were selected using stratified sampling. Data were collected using a self-administered questionnaire covering demographic and smartphone-use behaviors, the Smartphone Addiction Scale: Thai Short Version, and the Thai Pittsburgh Sleep Quality Index. Chi-square tests and binary logistic regression were performed to identify factors associated with poor sleep quality.

Results: The prevalence of smartphone addiction was 49.5%, and 56.8% of participants had poor sleep quality (Pittsburgh Sleep Quality Index > 5). Students with poor sleep quality reported longer smartphone use, more frequent phone checking, and a higher proportion reported social networking use. In multivariable logistic regression analysis, smartphone addiction was independently associated with poor sleep quality (adjusted odds ratio [AOR] = 5.38; 95% confidence interval [CI]: 2.44–11.84; $p < 0.001$). Daily smartphone use for 5–6 hours (AOR = 3.40; 95% CI: 1.18–9.83; $p = 0.024$), use for more than 6 hours (AOR = 4.56; 95% CI: 1.64–12.68; $p = 0.004$), and social networking use (AOR = 7.06; 95% CI: 1.00–49.82; $p = 0.049$) were also independently associated with poor sleep quality.

Conclusion: Smartphone addiction is common among pre-clinical medical students and is independently associated with poor sleep quality. Higher odds of poor sleep quality were also observed among students with prolonged daily smartphone use and social networking use. Digital wellness education focusing on sleep hygiene, screen-time regulation, and healthy social media use may be beneficial for this population.

Keywords: medical students, sleep quality, smartphone addiction, social media, Thailand

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INTRODUCTION

Digital transformation globally has enhanced the pace of the incorporation of digital technology into everyday life. In Thailand, the use of smartphones is widespread, with the National Statistical Office statistics showing that 95.5% of those aged 6 years and older use mobile phones, and that the level of smartphone penetration is 96.1% among users.[1]

Although smartphones have positively changed communication and learning, the substantial amount of time spent using them has come to be known as a behavioral addiction with significant health effects.[2] The most recent systematic reviews and meta-analyses have found the relationships between problematic smartphone use and adverse mental health outcomes to display a strong correlation with depression, anxiety, and sleep disturbances.[3,4]

Sleep quality is a determinant of the health and academic performance of medical students. In this demographic, sleep deprivation is already predisposed because of the strict academic requirements involved.[5] The culture of being enabled 24/7 by smartphones makes students vulnerable to sleep deprivation. The underlying mechanisms include physiological arousal from interactive media, which postpones sleep onset, while exposure to blue light suppresses melatonin release and disrupts circadian rhythms.[6,7]

Although systematic reviews and meta-analyses have reported an association between smartphone addiction and sleep disturbance among medical students, most available evidence has been derived from populations outside Thailand and may not fully reflect local educational, cultural, and behavioral contexts. Thai medical students may differ in patterns of smartphone use, social media engagement, academic demands, and sleep-related behaviors. Moreover, evidence focusing specifically on Thai pre-clinical medical students remains limited. Focusing on pre-clinical students (years 1–3) allows assessment of smartphone-related sleep problems before exposure to overnight clinical duties and shift work,[8] which are major confounding factors among clinical-year students. Therefore, this study aimed to determine the prevalence of smartphone addiction and investigate its association with sleep quality among pre-clinical medical students at Navamindradhiraj University to inform targeted wellness interventions.

MATERIALS AND METHODS

The present cross-sectional descriptive study was conducted at the Faculty of Medicine, Vajira Hospital, Navamindradhiraj University, during the academic year 2025. The study population consisted of medical students enrolled in the pre-clinical years (years 1–3). This group was selected to minimize the confounding effect of clinical shift work on sleep patterns. Eligible participants were students aged over 18 years who were current smartphone users and provided informed consent. Students who declined participation or submitted incomplete questionnaires were excluded.

The sample size was calculated using the single population proportion formula,[9] based on a previously reported prevalence of smartphone addiction among medical students of 44.7%,[10] with a 5% margin of error and a 95% confidence level. An additional 10% was added to account for potential non-response, resulting in a total sample size of 190 students. Stratified sampling was applied according to academic year to ensure proportional representation.

Data were collected using a self-administered questionnaire consisting of three sections. The first section gathered demographic information and smartphone-use behaviors, including age, sex, academic year, underlying diseases, daily duration of smartphone use, frequency of device checking, use before bedtime, and primary purposes of use, such as social networking, education, entertainment, news, gaming, and other purposes. The second section included the Smartphone Addiction Scale: Thai Short Version (SAS-SV-TH)[2,11] a 10-item instrument rated on a 6-point Likert scale with total scores ranging from 10 to 60. Cut-off scores for smartphone addiction were > 31 for males and > 33 for females. The third section consisted of the Thai version of the Pittsburgh Sleep Quality Index (T-PSQI),[12] which evaluates sleep quality over the previous month. A global score greater than 5 indicates poor sleep quality.

Statistical analyses were performed using SPSS version 29. Descriptive statistics were used to summarize participant characteristics and smartphone-use behaviors. Chi-square tests were applied to compare categorical variables between students with good and poor sleep quality. Univariable logistic regression analysis was first performed to estimate crude odds ratios for factors associated with poor sleep quality. Variables that were clinically relevant or statistically significant in bivariate analysis were then entered into the multivariable logistic regression model. These variables included underlying disease, daily smartphone use duration, use for social networking, and smartphone addiction status. Adjusted

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odds ratios (AORs) with 95% confidence intervals (CIs) were reported. Statistical significance was defined as $p < 0.05$. The study protocol was approved by the Institutional Review Board of Navamindradhiraj University (certificate of approval no. 067/2023). Written informed consent was obtained from all participants prior to data collection. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

A total of 190 pre-clinical medical students participated in the study. The mean age was 19.61 ± 1.08 years, and 52.6% were female. Participants were relatively evenly distributed across academic years. The overall prevalence of poor sleep quality (PSQI > 5) was 56.8%. No significant differences in sleep quality were observed according to sex, age, or academic year; however, underlying disease was significantly associated with poor sleep quality in univariable analysis.

Smartphone usage behaviors indicated extensive daily use. Overall, 42.6% of students reported using smartphones for more than 6 hours per day. Compared with students with good sleep quality, students in the poor sleep quality group reported longer daily smartphone use and higher frequency of phone checking. Smartphone use for more than 6 hours per day was reported by 54.6% of students with poor sleep quality, compared with 26.8% of those with good sleep quality. Students in the poor sleep quality group also a higher proportion of students in the poor sleep quality group reported using smartphones for social networking, entertainment, news, gaming, and other purposes. Use before bedtime was very common in both groups and did not differ significantly between students with good and poor sleep quality **(Table 1)**.

The prevalence of smartphone addiction, based on the SAS-SV-TH cut-off criteria, was 49.5%. A significantly higher proportion of students classified as having smartphone addiction reported poor sleep compared with non-addicted students. Specifically, 71.3% of students in the poor sleep quality group were classified as having smartphone addiction, compared with 20.7% in the good sleep quality group.

In the multivariable logistic regression analysis, smartphone addiction, longer daily smartphone use, and social networking use were independently associated with poor sleep quality **(Table 2)**. Students with smartphone addiction had 5.38 times higher odds of poor sleep quality than those without smartphone addiction (AOR = 5.38; 95% CI: 2.44–11.84; $p < 0.001$). Compared with students who used smartphones for less than 5 hours per day, those who used smartphones for 5–6 hours per day had 3.40 times higher odds of poor sleep quality (AOR = 3.40; 95% CI: 1.18–9.83; $p = 0.024$),

Table 1 Smartphone usage characteristics by sleep quality

Variable	Total (n = 190)	Good sleep (n = 82)	Poor sleep (n = 108)	P-value
Daily duration, n (%)				< 0.001*
1–2 hours	11 (5.8)	10 (12.2)	1 (0.9)	
3–4 hours	44 (23.2)	32 (39.0)	12 (11.1)	
5–6 hours	54 (28.4)	18 (22.0)	36 (33.3)	
> 6 hours	81 (42.6)	22 (26.8)	59 (54.6)	
Daily frequency, n (%)				< 0.001*
1–10 times	21 (11.1)	17 (20.7)	4 (3.7)	
11–20 times	46 (24.2)	27 (32.9)	19 (17.6)	
21–50 times	76 (40.0)	27 (32.9)	49 (45.4)	
51–100 times	41 (21.6)	10 (12.2)	31 (28.7)	
> 100 times	6 (3.2)	1 (1.2)	5 (4.6)	
Use before bedtime, n (%)	186 (97.9)	80 (97.6)	106 (98.1)	1.000
Reasons for use, n (%)				
Social network	175 (92.1)	69 (84.1)	106 (98.1)	< 0.001*
Entertainment	174 (91.6)	69 (84.1)	105 (97.2)	0.001*
Education	171 (90.0)	72 (87.8)	99 (91.7)	0.379
News	141 (74.2)	53 (64.6)	88 (81.5)	0.009*
Games	106 (55.8)	37 (45.1)	69 (63.9)	0.010*
Others	17 (8.9)	1 (1.2)	16 (14.8)	0.001*
Smartphone addiction status				< 0.001*
Addicted	94 (49.5)	17 (20.7)	77 (71.3)	
Not Addicted	96 (50.5)	65 (79.3)	31 (28.7)	

Abbreviation: n, number

*Significant at $p<0.05$

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and those who used smartphones for more than 6 hours per day had 4.56 times higher odds of poor sleep quality (AOR = 4.56; 95% CI: 1.64–12.68; p = 0.004). Use for social networking was also independently associated with poor sleep quality (AOR = 7.06; 95% CI: 1.00–49.82; p = 0.049). Underlying disease was significant in the crude analysis but was not statistically significant after adjustment (AOR = 3.02; 95% CI: 0.66–13.81; p = 0.155).

Table 2 Multivariable logistic regression for factors associated with poor sleep quality

Variable	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Underlying disease	3.92 (1.09, 14.14)	0.037*	3.02 (0.66, 13.81)	0.155
Duration per day				
< 5 hours	Reference		Reference	
5–6 hours	6.46 (2.79, 14.98)	< 0.001*	3.40 (1.18, 9.83)	0.024*
> 6 hours	8.66 (3.93, 19.12)	< 0.001*	4.56 (1.64, 12.68)	0.004*
Use for social network	9.99 (2.19, 45.62)	0.003*	7.06 (1.00, 49.82)	0.049*
Smartphone addiction	9.50 (4.82, 18.70)	< 0.001*	5.38 (2.44, 11.84)	< 0.001*

Abbreviation: CI, confidence interval; OR, odds ratio

*Significant at p < 0.05

DISCUSSION

This study demonstrated a high prevalence of smartphone addiction (49.5%) and poor sleep quality (56.8%) among Thai preclinical medical students. These findings underscore the growing public health relevance of problematic smartphone use in young adult populations, particularly within academically demanding environments such as medical schools. The prevalence observed in this study is consistent with recent international research conducted among medical students in Asia, Europe, and Latin America, suggesting that excessive smartphone use is a global phenomenon rather than a region-specific concern.[4,9] The comparable prevalence rates reported across different cultural contexts may reflect the ubiquitous integration of smartphones into educational systems, social interaction, and entertainment platforms. Similar findings have also been reported among first-year Bachelor of Medicine and Bachelor of Surgery students in India, among whom smartphone addiction was significantly associated with poor sleep quality.[13]

The observed prevalence of poor sleep quality (56.8%) is similarly aligned with previous meta-analyses indicating that sleep disturbances are highly prevalent among university students, particularly those enrolled in medical training programs.[3] Academic stress, high cognitive workload, examination pressure, and prolonged study hours have traditionally been cited as contributing factors. Similar associations between smartphone addiction and psychological distress have also been reported among Thai preclinical medical students.[14] However, the addition of pervasive digital engagement may amplify this vulnerability.

A strong and independent association between smartphone addiction and poor sleep quality was identified in this study. Students classified as having smartphone addiction had more than fivefold higher odds of reporting poor sleep quality after adjustment for selected covariates. This magnitude of association is clinically meaningful and supports the possibility that problematic smartphone use may contribute to sleep disturbance among pre-clinical medical students. Previous systematic reviews and meta-analyses have similarly demonstrated that problematic smartphone use is associated with insomnia symptoms, shorter sleep duration, prolonged sleep latency, and reduced sleep efficiency.[3]

The relationship between smartphone use duration and sleep quality appeared to be duration-related. Compared with students who used smartphones for less than 5 hours per day, those who used smartphones for 5–6 hours per day and more than 6 hours per day had higher odds of poor sleep quality. This suggests that duration of exposure may be an important behavioral factor. Prolonged use may increase cumulative exposure to screen-emitted blue light, delay bedtime, and reduce total sleep time. In addition, extended smartphone engagement may displace restorative activities such as relaxation, reading, or face-to-face interaction, potentially reinforcing maladaptive sleep routines.[6,15]

The underlying mechanisms linking smartphone use to sleep disturbance are multifactorial and may involve both physiological and psychological pathways. From a physiological perspective, exposure to blue wavelength light may suppress melatonin secretion, shift circadian

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rhythm timing, and delay sleep onset. Experimental studies have demonstrated that evening exposure to light-emitting devices affects sleep, circadian timing, and next-morning alertness.[6] However, physiological light exposure may represent only one component of the problem.

Psychological mechanisms may also play an important role. Social networking platforms are designed to maximize engagement through notifications, social validation, and algorithm-driven content personalization. These features may reinforce repeated checking behavior, emotional arousal, and difficulty disengaging from online activities. Pre-sleep cognitive stimulation, particularly exposure to emotionally charged or socially comparative content, may prolong sleep latency by increasing rumination and arousal. The concept of fear of missing out (FoMO) has also been implicated as a mechanism linking social media use with sleep disturbance, as individuals may feel compelled to remain online to maintain social connectedness.[7,16]

In this study, use for social networking was independently associated with poor sleep quality. This finding is consistent with previous research showing that social media use, particularly around bedtime, is associated with sleep disturbance among young adults.[15,17] However, use before bedtime itself was not significantly different between students with good and poor sleep quality in the present study. This may be because bedtime smartphone use was highly prevalent in both groups, limiting its ability to distinguish sleep-quality status. Therefore, the type and engagement level of smartphone use, rather than bedtime use alone, may be more relevant to poor sleep quality. Interactive social platforms generate bidirectional communication, emotional investment, and repeated checking behavior, which may delay disengagement and contribute to poorer sleep outcomes.

Importantly, the focus on pre-clinical students helped reduce confounding from overnight hospital duties and clinical shift work. Clinical rotations are known to disrupt circadian rhythms and sleep patterns due to irregular schedules and night shifts.[8] By studying students before their clinical-year exposure, this study provides evidence that smartphone-related behaviors are associated with poor sleep quality even in the absence of clinical shift-work exposure.

The findings of this study may have implications for student wellness and medical education. Sleep deprivation among medical students has been associated with impaired cognitive performance, reduced attention, mental health problems, and poorer academic functioning.[18] Given that smartphone addiction and prolonged smartphone use are potentially modifiable behaviors, preventive strategies focusing on digital habits and sleep hygiene may be considered.

Digital wellness education could be incorporated into student support programs, emphasizing screen-time awareness, time management, notification control, and sleep hygiene practices. Behavioral strategies such as establishing device-free periods before bedtime, reducing stimulating social media use at night, and limiting exposure to light-emitting screens may help reduce pre-sleep arousal and support healthier sleep routines.[6,16,17] Mindfulness-based or stress-reduction approaches may also be considered as adjunctive strategies, particularly for students with high pre-sleep cognitive arousal. However, future intervention studies are needed to evaluate the effectiveness of these approaches specifically among Thai medical students.

Despite its strengths, this study has several limitations. The cross-sectional design precludes causal inference, and the relationship between smartphone use and poor sleep quality may be bidirectional. Smartphone-use behaviors and sleep quality were self-reported, which may have introduced recall and social desirability biases, and objective measures such as screen-time records, actigraphy, or polysomnography were not used. The study also did not assess the timing, duration, content, or emotional intensity of bedtime smartphone use, nor potential psychological mediators such as anxiety, depression, stress, fear of missing out, and academic burnout.[19] Furthermore, the study was conducted at a single medical school in Bangkok, which may limit the generalizability of the findings. Nevertheless, by focusing on Thai pre-clinical medical students without the confounding effects of clinical shift work, this study provides relevant evidence of the association between smartphone addiction and poor sleep quality. Future multicenter longitudinal studies incorporating objective measurements and psychological factors are warranted.

CONCLUSION

Smartphone addiction is common among pre-clinical medical students and is independently associated with poor sleep quality. Higher odds of poor sleep quality were also observed among students with prolonged daily smartphone use and social networking use. Digital wellness education should be considered in medical student support programs, with emphasis on sleep

hygiene, screen-time regulation, and healthy social media use to promote student well-being and academic functioning.

Conflict of Interest

The authors have no conflict of interest related to this manuscript.

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During the preparation of this manuscript, the authors used ChatGPT (OpenAI) solely for language editing, grammar improvement, and readability enhancement. The authors reviewed and edited all AI-assisted text and take full responsibility for the content, accuracy, and scientific integrity of the final published work. No confidential or identifiable participant information was entered into the AI tool.

Author Contributions

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Data curation: N.H.
Formal analysis: N.H., A.T.
Funding acquisition: –
Investigation: N.H.
Methodology: N.H., A.T.
Project administration: N.H.
Resources: N.H., A.T.
Software: N.H.
Supervision: A.T.
Validation: N.H., A.T.
Visualization: N.H.
Writing – original draft preparation: N.H.
Writing – review & editing: N.H., A.T.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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