Review Article

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Smartphone Addiction among Nursing and Health Students

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ABSTRACT

Background: Smartphones are integral to human life and are in great demand by young people to communicate, use various applications, study, watch, and play games, browse the internet, and listen to music. However, for most people, the cumulative daily time spent on smartphones is quite long. This review aimed to analyze the risks of smartphone addiction among health students. **Methods:** This study was conducted by searching four electronic databases, ProQuest, CINAHL EBSCO, PubMed, and Science Direct, from 2016 to 2022. The keywords used were "Smartphone Addiction" AND "Medical" OR "Nursing" OR "Psychology" OR "Health." **Results:** Of the 923 articles screened, 25 met the inclusion criteria. The results showed that 15.6%–81.1% of nursing and health students were addicted to smartphones, having an average use of five hours daily. **Conclusion:** Nursing and health students have the potential to become addicted to smartphones, with an impact on psychology (e.g., stress, anxiety, depression, and neuroticism), sleep disorders, and general health. Therefore, the need for interventions from various parties, such as students, families, universities, and health workers, through psychoeducation and self-management for nursing and health students is necessary.

Keywords: Health Students; Medical; Nursing; Smartphone Addiction

INTRODUCTION

Global data indicate that smartphone use has rapidly increased. Andrews *et al.* (2015) reported that approximately two billion people worldwide use smartphones. However, in 2020, Newzoo reported a rapid increase, with 3.6 billion smartphone users, namely in China (953.55 million), India (492.78 million), America (273.76 million), and Indonesia (170.4 million). Thus, the number of smartphone users has continued to increase (Newzoo, 2020).

In the era of Industry Revolution 4.0 and Society 5.0, smartphones have become integral to human life. The improved smartphone features available at competitive prices allow most people to use them. Smartphones increase the ease of communicating, searching for learning references, obtaining quick access to videos, games, and music for entertainment, and working through Zoom meetings, Facebook, and Google Meets (Tasijawa, 2022).

Smartphones have both beneficial and adverse effects on users. Consequently, excessive smartphone use has attracted the attention of researchers in education, sociology, and psychiatry. Several studies have reported smartphone addiction among adolescents. For example, research by Albursan *et al*. (2019) in the Middle East revealed that adolescents in Jordan showed higher smartphone addiction (59.8%) than those in Sudan, Yemen, and Saudi Arabia. Lopez-Fernandez (2017) reported excessive smartphone use rates of 12.5% in Belgium and 21.5% in Spain. Other studies have shown that smartphone addiction is significantly related to an increase in psychological disorders among students (e.g., fatigue, stress, and emotions), academic performance, relationships with others, and self-regulation (Bolle, 2014; Gökçearslan *et al*., 2016; Kim *et al.*, 2017; Seo *et al.*, 2016). So, future studies including a broader range of universities in future studies will enhance the understanding of the connection between social media addiction and academic performance in nursing students, with consideration for various variables to better evaluate the relationship and the need for further research to unveil fundamental frameworks between the two factors (Fauzi *et al*., 2021).

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The primary symptom of smartphone use is that separation from smartphones leads to an increase in anxiety, even when given access to the internet. The fundamental reason for using a smartphone is to stay in touch with friends; however, smartphone use is also a symbol of one's status (i.e., people who use smartphones are considered more affluent and educated) and a valuable tool to reach out for emergencies, entertainment, mobility, and maintaining one's personal life (Balakrishnan & Raj, 2012; Körmendi *et al.*, 2016). Cassidy (2006) reported that smartphone use among teenagers is considered a positive addiction, not a negative one, because of the social impact of its use; for example, it can improve self-image through an increase in social status, especially with a specific or the latest model (Cassidy, 2006; Körmendi *et al.*, 2016).

Previous studies suggest that adolescents are at risk for smartphone addiction. However, further research is required to understand this phenomenon. The current review could address these gaps. Therefore, this exploration would help determine whether health students are addicted to smartphones.

METHODOLOGY

The method used in this study is a literature review following the PRISMA checklist. The authors searched the EBSCO, Science Direct, PubMed, and ProQuest electronic databases in December 2022 to minimize potential publication bias and then conducted a follow-up search across the three databases between 2016 and 2022.

The keyword combination used in the search was: "Smartphone Addiction" and "Medical" or "Nursing" or "Psychology" or "Health". The inclusion criteria for the literature review were studies that: (1) only selected a sample of students in the Faculty of Health Sciences with excessive smartphone use; (2) used any research design but had to be original research rather than systematic reviews, meta-analyses, or any other review type; and (3) were from any country but were written in English.

RESULTS

The search identified 923 articles; however, after checking for duplications, 119 articles were found, leaving 804. The researcher then selected papers that required more full-text; 129 articles were found, resulting in 675 articles. Subsequently, the researchers screened the abstracts of each article, ultimately excluding 650. Finally, 25 papers were reviewed. The selection flow is shown in Figure 1.

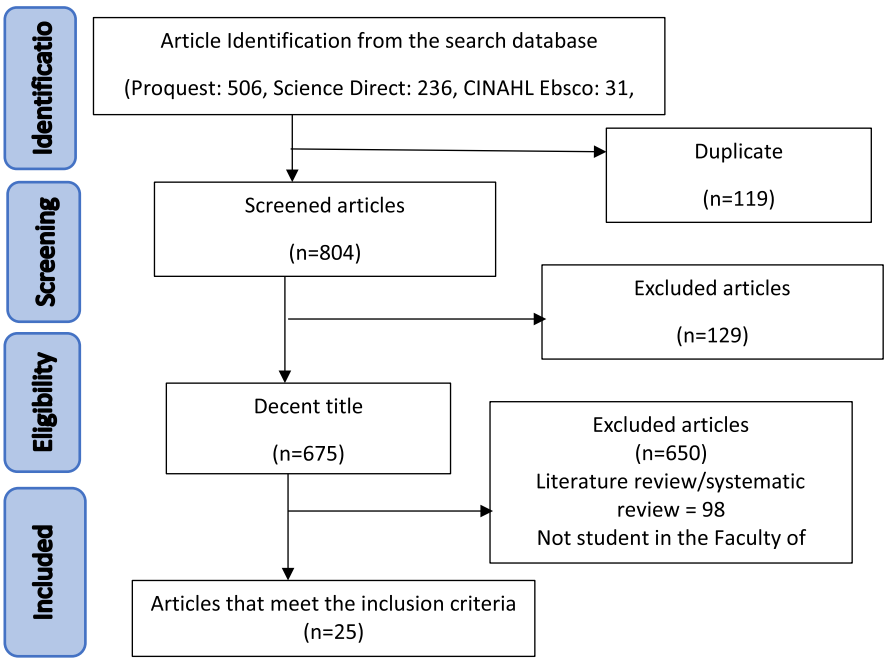

Figure 1: Article Selection Process

Table 1: Results of Article Reviews

Author/Year	Country	Design	Sample	Intervention	Instrument	Results
Mohammadi *et al*. (2018)	Iran	Descriptive analytics	350 nursing, dentistry, public health, and pharmacy students.	The intervention involved distributing questionnaires for validity and reliability in Iran	CPOSQ, SNAQ, YIAQ	The study found that smartphone addiction was significantly associated with internet addiction (p=0.001)
Sok *et al*. (2019)	Korea	Cross-sectional	139 Nursing Students	Participants were screened after being informed of the procedure. A double-blind method was used, and research assistants were trained to reduce errors.	SCS, DLSC, GICC	This study revealed no difference between the risk group and the general group regarding daily stress, self-control, and communication skills when it was associated with smartphone addiction.
Basu *et al*. (2018)	India	Cross-sectional	388 medical students	The intervention was conducted using a questionnaire designed by the researcher	Self-designed 20-item MPAS.	The results showed that the use of smartphones was 363 (93.6%). However, smartphones were used for academic purposes less (46.6%) when compared to internet browsing 287 (74%), group messaging 256 (66.1%), and browsing social media 252 (64.8%). Further, the presence of symptoms related to the inability to concentrate that lasted for at least three days in the previous six months was reported by 102 (26.4%) students. 155 (39.9%) college students had lower rates of smartphone addiction in adolescents compared to older students.
Chen *et al*. (2017)	China	Cross-sectional	1,441 medical students	The SAS-SV questionnaire assessed smartphone addiction among students, and psycho-behavioral, demographic, and smartphone use data was collected.	SAS-SV, Self-Rating Anxiety Scale, Center for Epidemiologic Studies Depression Scale, PSQI	The prevalence of smartphone addiction was higher in men (30.3%) than in women (29.3%). Influencing factors are playing games, excessive factors, and sleep disturbances.

Venkatesh *et al.* (2016)	Saudi Arabia	Cross-Sectional	205 dental students	A questionnaire was administered that included demographic details, smartphone use, and smartphone addiction	SAS-SV, Body Mass Index, and Self Reported for stress	Results show that high-stress levels, low physical activity, high body mass index, extended smartphone usage, and increased frequency of use occurred. Another study showed that early morning use of smartphones and social media was significantly associated with smartphone addiction.
Tangmunkongvorakul *et al*. (2019)	Thailand	Cross-Sectional	One hundred eighty students from Health Sciences.	Participants were asked to complete a questionnaire	FS, YDQI	Results show that 45.8% of students overused their smartphones. In addition, students who overused smartphones had lower psychological scores than students who did not overuse smartphones (p<0.001)
Gutiérrez-Puertas *et al*. (2019)	Spain, Portugal	Comparative study	258 nursing students	Development of 20 NMP-Q questionnaires by Yildim and Correia in 2015 using a Likert-type scale	NMP-Q	Portuguese students felt more anxious (54.7%) about the battery than Spanish students (35.4%). However, Portuguese students had a higher need for communication with smartphones than Spanish students. The findings also show that the Nomophobia scores in students from both countries were higher than the average.
Boonluksiri (2018)	Thailand	Cross-Sectional	89 medical students	The intervention used a questionnaire, including students' demographic characteristics smartphone use habits, sleep disorders, and sleep quality instruments	SAS, PSQI, ESS.	The results showed that 77.5% of students had sleep problems, and 43.6% slept in class. Further, 70.8% of all students use smartphones excessively before bedtime. Overuse of smartphones was significantly associated with poor sleep quality (odds ration' 3.46) and napping in class (odds ratio=4.09)

Bartwal & Nath (2020)	India	Cross-Sectional	451 medical students	The NMP-Q instrument measured the prevalence of Nomophobia	NMP-Q	Mild Nomophobia was seen in 15.5% of students; 67.2% had moderate Nomophobia, while 17.3% had severe Nomophobia
Siddiqi *et al*. (2017)	Oman	Cross-Sectional	129 medical students	Instrument construction by researchers about smartphones in English and Arabic	The researcher made the observational questionnaire.	100% of respondents use smartphones while 85% of respondents were on mobile phones, 65% send messages, 20% play games, and 7% make calls during lectures. When the students are sleeping, their smartphones were not turned off (70%), placed under the pillow (33%), and on the bedside table (60%). Further, 83% of parents do not limit their child's smartphone use. The impact of smartphones on health was recognized by 90% of the respondents.
Miri *et al*. (2019)	Iran	Cross-Sectional	360 medical students	Data collection included demographic questionnaires, PMPAS, and SF-12	PMPAS and SF-12	75% of participants reported moderate to severe smartphone addiction. There was a significant relationship between psychological problems and smartphone addiction (p<0.001), and no meaningful relationship was observed for physical function (p=0.25)
Alhazmi *et al*. (2018)	Saudi Arabia	Cross-Sectional	203 medical students	A questionnaire was administered	SAS	The overall prevalence of smartphone addiction was 36.5%. A significant association existed between daily mobile phone usage time and smartphone addiction (p<0.02)
Javaid *et al.* (2019)	Pakistan	Cross-Sectional	220 physiotherapy doctoral students	Three questionnaires ere given: demographics, smartphone use, and smartphone addiction instruments	SAS	The students used their smartphones for more than 6 hours (30%) compared to only 1.8% who use them less than 10 minutes daily. Respondents' fastest waking duration using a smartphone was 5 minutes (50.9%), while 12.3% operate for more than 60 minutes.

Hanafi *et al*. (2019)	Indonesia	Cross-Sectional	185 medical students	A questionnaire was administered	The Indonesian version of the SAS is the Indonesian version of the modified TCI.	Research shows that the average smartphone use is 7.83 hours daily. Meanwhile, age also played an essential role with the first use (age 7.62 years).
Aguilera-Manrique *et al.* (2018)	Spain	Cross-Sectional	304 nursing students	A questionnaire was administered	NMP-Q	This finding reported that when practicing clinically and not using a smartphone, a positive correlation was found between health students experiencing Nomophobia (p=0.040)
Song *et al*. (2022)	China	Cross-Sectional	666 medical students	A questionnaire was administered	GAD-7, the Chinese version of SAS-SV, PROMIS Sleep Disturbance Scale	Smartphone addiction has a significant impact on anxiety and anxiety that arises due to sleep disturbances (p<0.01)
Zhou *et al*. (2022)	China	Cross-Sectional	1445 nursing students	A questionnaire was administered	IPASN, ASES, ABS, SAS-SV	44.26% of students experienced academic burnout with a professional attitude and negative academic self-efficacy. Smartphone addiction significantly impacts academic burnout and academic self-efficacy and professional attitude (p<0.01)
Brubaker & Beverly (2020)	United States	Cross-Sectional	385 osteopathic medical students	A questionnaire was administered	Maslach Burnout Inventory, Perceived Stress Scale-4, Pittsburgh Sleep Quality Index, SAS-SV	They observed a significant relationship between emotional exhaustion, depersonalization, sleep quality, stress, and smartphone addiction among osteopathic medical students (p<0.001)
Jahagirdar *et al*. (2021)	India	Cross-Sectional	626 medical students	A questionnaire was administered	SAS-SV	These findings report that 100% of respondents had smartphones, with 83.2% using smartphones for more than 4 hours. There was a significant relationship between smartphone addiction and eye strain, blurred vision, tingling in palms, and auditory (p<0.05)

Chatterjee & Kar (2021)	India	Cross-Sectional	224 medical students	A questionnaire was administered	SAS-SV, GHQ-12, PSQI	The prevalence of smartphone addiction is 33.3% for women and 46.1% for men. Most reported poor sleep quality (63.4%), and with 62.1% reporting poor health status.
Wang *et al*. (2021)	China	Online survey	769 medical students	A questionnaire was administered	Perceived Stress Scale, Mobile Phone Addiction Index Scale, Positive and Negative Affect Scale, and Positive Psychological Capital Questionnaire	Negative emotions and stress were positively correlated with smartphone addiction (p<0.01)
Alkhateeb *et al.* (2020)	Saudi Arabia	Online survey	1941 medical and nonmedical students	A questionnaire was administered	SAS	The prevalence of smartphone addiction is 19.1%. Smartphone addiction was higher in women than men (p<0.001)
Dhamija *et al*. (2021)	India	Cross-Sectional	500 medical students	A questionnaire was administered	SAS-SV, Rosenberg self-esteem scale, and PSQI	The prevalence of smartphone addiction was 52%, with addiction being higher in men than women. In addition, there is a significant relationship between smartphone addiction and sleep disturbance
Lei *et al*. (2020)	Malaysia	Cross-Sectional	574 medical students	A questionnaire was administered	SAS-SV, USMaP-i, DASS-21	The prevalence of smartphone addiction is 40.6%, and it was higher in men (49.2%) than in women (36.6%). These findings indicate a significant relationship between smartphone addiction and psychological health (anxiety, depression, stress), and neuroticism

SAS (Smartphone Addiction Scale), SAS-SV (Short version of the Smartphone Addiction Scale), NMP-Q (Nomophobia questionnaire), TCI (Temperament and Character Inventory), PMPAS (Persian version of the Mobile Phone Addiction Scale), SF-12 (short-form 12 questionnaires), PSQI (Pittsburgh Sleep Quality Index), ESS (Epworth Sleepiness Scale), FS (Flourishing Scale), YDQI (Young Diagnostic Questionnaire for Internet Addiction), CSS (Communication Skills Scale), MPAS (Mobile Phone Addiction Scale), GICC (Global Interpersonal Communication Competence Scale), CASI (Computer Assisted Self-Interviews), SCS (Self-Control Scale), DLSC (Daily Life Stress Scale), GICC (Global Interpersonal Communication Competence Scale), CPOSQ (Cell Phone Overuse Scale Questionnaire), SNAQ (Social network addiction questionnaire), YIAQ (Yang Internet Addiction Questionnaire), GAD-7 (Generalized Anxiety Disorder-7 item Scale), IPASN (Instrument of Professional Attitude for Student Nurse), ASES (Academic Self-efficacy Scale), ABS (Academic Burnout Scale), General Health Questionnaire (GHQ-12), Depression Anxiety Scales (DASS-21), modified USM Personality Inventory (USMaP-i)

DISCUSSION

Previous research has examined excessive smartphone use among nursing and health students. The review findings indicated that studies have been conducted in Spain (Aguilera-Manrique *et al.*, 2018;

Gutiérrez-Puertas *et al.*, 2019), Pakistan (Javaid *et al.*, 2019), Saudi Arabia (Alhazmi *et al.*, 2018; Alkhateeb *et al.*, 2020; Venkatesh *et al.*, 2016), Iran (Miri *et al.*, 2019; Mohammadi *et al.*, 2018), Oman (Siddiqi *et al.*, 2017), India (Bartwal & Nath, 2020; Basu *et al.*, 2018; Dhamija *et al.*, 2021; Jahagirdar *et al.*, 2021), Thailand (Boonluksiri, 2018; Tangmunkongvorakul *et al.*, 2019), Turkey (Cerit *et al.*, 2018), China (Chen *et al.*, 2017; Song *et al.*, 2022; Wang *et al.*, 2021; Zhou *et al.*, 2022), the United States (Brubaker & Beverly, 2020), South Korea (Sok *et al.*, 2019), Malaysia (Lei *et al.*, 2020), and Indonesia (Hanafi *et al.*, 2019). The studies' samples included students of medicine, dentistry, nursing, physiotherapy, and other health sciences. The most widely used instrument to assess smartphone addiction in the review was the Smartphone Addiction Scale (SAS).

Prevalence of Smartphone Users and Addiction among Nursing and Health Students

Mohammadi *et al*. (2018) reported that smartphone use among most students was regular, with only 15.6% having high or excessive rates of use. Basu *et al*. (2018) also reported that 93.6% of the Indian medical students in the study were smartphone users, and 39.9% were addicted to smartphones. The rates reported in another study were higher; 75% of students experienced moderate or severe smartphone addiction, with higher smartphone addiction scores among single and younger students (p<.001) (Miri *et al*., 2019).

Tangmunkongvorakul *et al*. (2019) found that smartphone addiction among women was 58.7% (Tangmunkongvorakul *et al*., 2019), differing from a study that showed that men (93) had higher total Smartphone Addiction Scale scores than women (89) (Alhazmi *et al*., 2018). Similarly, another study reported that the prevalence of smartphone addiction was 30.3% for men and 29.3% for women (Chen *et al*., 2017), and another indicated that 63.8% of male students were addicted to smartphones compared to 39.3% of female students (Javaid *et al*., 2019). However, one study found no significant gender differences in smartphone addiction (Basu *et al.*, 2018).

A study conducted in India by Jahagirdar *et al*. (2021) reported that the prevalence of smartphone addiction among medical students was 81.1%. Findings from the same country indicated that 33.3% of women and 46.1% of men experienced smartphone addiction (Chatterjee & Kar, 2021), with a prevalence of 52% (Dhamija *et al.*, 2021). Lei *et al*. (2020) also reported that 40.6% of medical students in Malaysia experienced smartphone addiction, with men having higher rates of addiction than women. However, Alkhateeb *et al*. (2020) found that the prevalence of sex addiction was higher in women than in men (p<0.001). These findings are concerning for medical students because of the increased risk of smartphone addiction; thus, health students must be aware of and assess the status of their smartphone addiction and provide corrective interventions. These findings also indicated no gender differences (men vs. women) in experiencing smartphone addiction. A study emphasizes the importance of identifying smartphone usage patterns and addiction risks to prevent associated health problems, motivating educators to promote responsible smartphone practices and mitigate psychological and health issues (Machado, Pai, & Kotian, 2023).

How Long is Duration of Smartphone Use for Nursing and Health Students?

The duration of smartphone use among health students varied. Tangmunkongvorakul *et al*. (2019) revealed that 366 (45.8%) of 800 students from three disciplines (i.e., health, science and technology, humanities, and social sciences) spent at least five hours daily on their smartphones. Similarly, among the 189 medical students in a study conducted in Oman who reported their smartphone use, 50% used the internet for more than 4 hours daily (Siddiqi *et al*. 2017). Other findings demonstrated a significant association between the duration of daily cell phone use and smartphone addiction (p<.02) (Alhazmi *et al*. 2018), with 66 students having scores indicating smartphone addiction, including 24 (55.8%) using their smartphones more than 5 hours daily, 17 (34.7%) using them 4-5 hours daily, and 13 (27.7%) using them. They reported that it could be used for 2–5 hours. Three hours a day, 12 students (28.6%) used it less than 2 hours a day (Alhazmi *et al*., 2018).

Javaid found that 30% of physiotherapy doctoral program students used smartphones for 6 hours per day (Javaid *et al.*, 2019). Further, 27.7% reported opening their smartphone 21–50 times daily, while 8.6% used their smartphone less than five times a day. After waking up, 50.9% of the students used smartphones within 5 minutes, while only 12.3% used them after more than 60 minutes. The average daily usage time of

smartphones was 7.83 hours (SD = 4.03), the highest of all findings in the review (Hanafi *et al*., 2019).

What do Nursing and Health Students Access Through their Smartphones?

Healthy students' use of smartphones has two purposes: academic and entertainment. The percentage of students accessing smartphones for academic purposes, such as scientific information and news, was relatively high (80.99%) (Mohammadi *et al*., 2018). Many educational materials are available online, and students may feel more comfortable using smartphones than laptops or desktop computers (Alhazmi *et al.*, 2018). However, another study in India with 388 medical students revealed that smartphone use for academic purposes was relatively low (46.6%) compared to accessing it for entertainment (Basu *et al*., 2018). Similarly, during college, 85% of students reported leaving their cell phones "on," 65% sent messages, 20% even played games, and 7% received or made calls (Siddiqi *et al*., 2017).

According to Hanafi *et al*., smartphone use for entertainment is associated with harmful coping mechanisms that reduce depression and anxiety and increase the risk of smartphone addiction (Hanafi *et al.*, 2019). Students access entertainment through smartphones, such as social media (64.8%) and group messaging (66.1%) (Basu *et al*., 2018). Mohammadi also reported that the level of smartphone addiction for accessing social networks is relatively high, including communication with friends (94.39%), entertainment and fun (71.65%), and sharing movies and photos (48.59%) (Mohammadi *et al.*, 2018). Boonluksiri (2018) revealed that smartphones were primarily used for communication with family and friends (93.1%), listening to music, browsing the internet or social media, and spending time (40.4%). Additionally, they spent time when they were bored (91.4%), alone (86%), and waiting for someone (74.1%) (Boonluksiri, 2018).

Is there an Impact of Excessive Smartphone Use on Nursing and Health Students'?

Excessive smartphone use was significantly associated with psychological problems (e.g., stress, anxiety, and burnout), sleep disturbances, and poor eye health. For example, a study from Thailand among 800 college students revealed that excessive smartphone use had higher rates of psychological problems than those who did not use smartphones excessively (B = 1.60; $p<0.001$) (Tangmunkongvorakul *et al*., 2019). Psychological issues occur because of the reduction in face-to-face interactions and the tendency to feel that social relationships are less supportive and contribute to happiness (Tangmunkongvorakul *et al.*, 2019).

Lei *et al*. (2020) examined 574 medical students and found that smartphone addiction could affect psychological health (i.e., stress, anxiety, and depression) and neuroticism. Wang *et al*. (2021) revealed that managing negative emotions was essential for overcoming smartphone addiction. In addition, excessive smartphone use can contribute to sleep disturbances and an inability to concentrate (Basu *et al*., 2018; Boonluksiri, 2018).

Another study reported that out of 89 medical students in Thailand, 77.5% had sleep problems, 43.6% slept in class, and 70.8% of all college students reported excessive smartphone use at bedtime (Boonluksiri, 2018). Moreover, the reported sleep quality among the medical students in India in Chatterje and Kar's (2021) study was relatively low (63.4%), as was their reported poor health (62.1%). Thus, smartphone addiction appears to be detrimental to general health and medical students' sleep quality.

Siddiqi reported that 70% of college students did not turn off their cell phones at bedtime, 33% kept them under their pillows, and 60% on their bedside tables (Siddiqi *et al.*, 2017). Further, 90% of the students knew that electromagnetic cell phone waves can cause health problems (Siddiqi *et al*., 2017). Additionally, a significant relationship was observed between mental health issues and smartphone addiction (r =0.35, $p<0.001$) (Miri *et al.*, 2019).

Other studies have reported an increase in nomophobia owing to smartphone addiction. Nomophobia is a new term used to describe feelings of restlessness, anxiety, and discomfort caused by not using smartphones. For example, Aguilera-Manrique research in Spain with 304 Academy students who were conducting practical work in the clinic revealed a positive correlation between smartphone use and nomophobia (p =0.04) and comfort using smartphones (p =0.027) (Aguilera-Manrique *et al*., 2018). This study showed that students felt discomfort when unable to use their smartphones and wanted to operate them immediately.

Gutiérrez-Puertas's study of Spanish and Portuguese nursing students had high nomophobia scores (Gutiérrez-Puertas *et al.*, 2019). However, Portuguese students reported higher anxiety (54.7%) than Spanish students (35.4%) when their smartphone batteries ran out (Gutiérrez-Puertas *et al.*, 2019). Medical students also reported exhibiting distinct nomophobia: 15.5% experienced mild nomophobia, 67.2% had an average level, and 17.3% experienced severe nomophobia (Boonluksiri, 2018). The nomophobia factor's highest score (4.54) was reported when individuals could not communicate or communicate via a smartphone (Boonluksiri, 2018).

Health students were highly dependent on smartphones during the COVID-19 pandemic, which could be viewed as a dependence on smartphones for online learning, a potential risk factor for smartphone addiction. Research by Song *et al*. (2022) during the COVID-19 pandemic with a sample of 666 medical students revealed that anxiety was significantly related to excessive smartphone use, and smartphone addiction directly impacted pressure due to sleep disturbances. Thus, there are two sound effects of being anxious regarding smartphone use; however, excessive smartphone use affects sleep disturbances. These findings have implications for health programs emphasizing students' sleep and mental health.

Zhou *et al*. (2022) also revealed that during the COVID-19 pandemic, 44.26% of a sample of 1445 nursing students experienced academic burnout, with smartphone addiction being a determining factor. Thus, strategies for improving professional attitudes and academic self-efficacy can prevent and alleviate academic burnout. Another study with 385 osteopathic medical students revealed that smartphone addiction could have a significant impact on emotional exhaustion (2.3%), depersonalization was relatively high (17.4%), and low self-actualization was reported by 80.5% of the medical students (Chatterjee & Kar, 2021). They also reported poor sleep quality and high stress (p<0.001). These findings suggest that health education is essential for assisting with students' mental health and burnout prevention.

Additionally, the study by Jahagirdar *et al*. (2021) found smartphone addiction resulted in eye strain (67.9%), blurred vision (31.4%), and tingling in the palms and auditory (30.9%). Problems with eye health are notable because 80% of students in this study reported having to use a cell phone before going to bed. Another study shows the prevalence of smartphone addiction among Chinese nursing postgraduates. The study reveals relationships with loneliness, perceived stress, resilience, and sense of security, and identify influencing factors and predictors of smartphone addiction in this population (Liu *et al*., 2023).

CONCLUSION

This review highlights the complexity of the information related to nursing and health students' smartphone use. The findings of 25 articles showed that the prevalence of smartphone addiction ranged from 15.6% to 81.1%, with no gender differences. The reported duration of smartphone use averaged more than four hours per day for academic and entertainment purposes. Smartphone addiction in students was related to sleep disturbances, concentration problems, and nomophobia. Given the information obtained from this review, smartphone addiction was experienced by health students. Therefore, comprehensive research on the impact of excessive smartphone use among this population of students is recommended. However, long-term use of smartphones for work and academic purposes is not associated with smartphone addiction.

Further, these findings also have implications for Indonesia, a country with one of the highest rates of smartphone use among early childhood and adolescence, given the health impacts that can be experienced as adults. Healthcare professionals in community health centers should consider smartphone use interventions that could be offered during early childhood and adolescence. Thus, the observations from this review can be used to inform training and health education programs aimed at reducing the negative impacts of smartphones.

Conflicts of Interest

The authors declared no conflict of interest.

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