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PREVALENCE OF SMARTPHONE ADDICTION AND ITS ASSOCIATION WITH ANXIETY AND DEPRESSION AMONG NURSING STUDENTS AT THE UNIVERSITY OF MEDICINE AND PHARMACY, THAI NGUYEN UNIVERSITY

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ABSTRACT

Background: The rapid increase in smartphone use presents mental health challenges for students, particularly those in health-science fields facing high academic demands. This study examined the prevalence of smartphone addiction and its relationship with anxiety and depression among nursing students at the University of Medicine and Pharmacy, Thai Nguyen University. **Objectives:** This study aimed to (1) assess the prevalence of smartphone addiction among nursing students at the University of Medicine and Pharmacy, Thai Nguyen University; (2) examine the association between smartphone addiction and anxiety and depression among these students, including factors related to excessive smartphone use. **Methods:** A cross-sectional descriptive study was conducted between March and September 2025 at the University of Medicine and Pharmacy, Thai Nguyen University. A convenience sample of 403 nursing students participated. The Smartphone Addiction Scale - Short Version (SAS-SV) measured smartphone addiction, and the Kessler Psychological Distress Scale (K10) assessed anxiety and depression.

Data analyzed with SPSS 20.0 using descriptive statistics and appropriate tests for associations. **Results:** Among the 403 students, the prevalence of smartphone addiction was 16.1% (65/403). Most students (83.6%) reported using smartphones for ≥ 4 hours/day. The primary reasons for use were entertainment (53.8%), social networking (30.3%), and studying (14.6%). K10 classifications were: no anxiety and depression 44.9%, mild 36.5%, moderate 9.2%, and severe 9.4%. Smartphone addiction rates increased with the severity of anxiety and depression levels: no anxiety and depression (2.2%), mild (14.3%), moderate (40.5%), and severe (65.8%). Logistic regression analysis indicated that students with anxiety and depression had significantly higher odds of smartphone addiction (OR = 16.8; 95% CI: 5.97 - 47.1; $p < 0.001$). **Conclusions:** Smartphone addiction among nursing students is prevalent, and it is associated with anxiety and depression. Targeted interventions are needed to enhance psychological counseling, promote smartphone time management, improve sleep quality, and evaluate prevention strategies.

Keywords: Smartphone use; Smartphone addiction; Anxiety; Depression; Nursing students

TỶ LỆ NGHIỆN ĐIỆN THOẠI THÔNG MINH VÀ MỐI LIÊN QUAN VỚI LO ÂU, TRẦM CẢM Ở SINH VIÊN ĐIỀU DƯỠNG TẠI TRƯỜNG ĐẠI HỌC Y - DƯỢC, ĐẠI HỌC THÁI NGUYÊN

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TÓM TẮT

Đặt vấn đề: Sự gia tăng nhanh chóng trong việc sử dụng điện thoại thông minh đang đặt ra nhiều thách thức đối với sức khỏe tâm thần của sinh viên, đặc biệt là những người học trong lĩnh vực khoa học sức khỏe với áp lực học tập cao. Nghiên cứu này nhằm xác định tỷ lệ nghiện điện thoại thông minh và mối liên quan với lo âu, trầm cảm ở sinh viên điều dưỡng tại Trường Đại học Y - Dược, Đại học Thái Nguyên.

Mục tiêu: (1) Xác định tỷ lệ nghiện điện thoại thông minh ở sinh viên điều dưỡng tại Trường Đại học Y - Dược, Đại học Thái Nguyên; (2) Phân tích mối liên quan giữa nghiện điện thoại thông minh với lo âu và trầm cảm, đồng thời xem xét một số yếu tố liên quan đến việc sử dụng điện thoại quá mức. **Phương pháp:** Nghiên cứu mô tả cắt ngang được thực hiện từ tháng 3 đến tháng 9 năm 2025 tại Trường Đại học Y - Dược, Đại học Thái Nguyên. Mẫu nghiên cứu gồm 403 sinh viên điều dưỡng được chọn theo phương pháp thuận tiện. Nghiện điện thoại thông minh được đánh giá bằng thang đo Smartphone Addiction Scale - Short Version (SAS-SV), và lo âu, trầm cảm được đánh giá bằng thang đo Kessler Psychological Distress Scale (K10). Dữ liệu được phân tích bằng phần mềm SPSS 20.0 với thống kê mô tả và các phép kiểm định phù hợp. **Kết quả:** Trong số 403 sinh viên, tỷ lệ nghiện điện thoại thông minh là 16,1% (65/403). Phần lớn sinh viên (83,6%) sử dụng điện thoại ≥ 4 giờ/ngày. Mục đích sử dụng chủ yếu là giải trí (53,8%) và mạng xã hội (30,3%), trong khi chỉ 14,6% chủ yếu sử dụng cho học tập. Phân loại theo thang K10 cho thấy: không có lo âu, trầm cảm chiếm 44,9%; mức độ nhẹ 36,5%; trung bình 9,2%; và nặng 9,4%. Tỷ lệ

nghiện điện thoại thông minh tăng theo mức độ lo âu, trầm cảm: không có triệu chứng (2,2%), nhẹ (14,3%), trung bình (40,5%) và nặng (65,8%). Phân tích hồi quy logistic cho thấy sinh viên có lo âu, trầm cảm có nguy cơ nghiện điện thoại thông minh cao hơn có ý nghĩa thống kê (OR = 16,8; KTC 95%: 5,97 - 47,1; p < 0,001). **Kết luận:** Nghiện điện thoại thông minh ở sinh viên điều dưỡng là vấn đề đáng quan tâm và có liên quan chặt chẽ với lo âu, trầm cảm. Cần triển khai các can thiệp nhằm tăng cường tư vấn tâm lý, quản lý thời gian sử dụng điện thoại, cải thiện chất lượng giấc ngủ và đánh giá các chiến lược phòng ngừa.

Từ khóa: Sử dụng điện thoại thông minh; Nghiện điện thoại thông minh; Lo âu; Trầm cảm; Sinh viên điều dưỡng

INTRODUCTION

Smartphones have transformed many aspects of daily life. These devices have evolved to support a wide array of tasks, including document editing, entertainment, and communication. They also provide quick and convenient access to diverse information via the Internet [1]. Epidemiological data indicate that up to 80% of students use smartphones daily, with an average usage time of 5 to 7 hours per day [2, 3]. Recent studies have raised concerns about excessive smartphone use among students. Smartphone addiction is characterized by significant disruption of daily activities due to overuse, which can lead to psychological issues such as anxiety and depression [3].

In nursing education and clinical settings, smartphones support student learning by providing

access to textbooks, learning management systems, reference materials, and online classes. However, a 2019 study with 511 students found that impulsivity was linked to excessive smartphone use, while poor perseverance and distractibility contributed to difficulties maintaining focus [4].

Globally, of the 7.3 billion mobile phone users, 63% use smartphones; in Vietnam, this proportion exceeds 84% [5]. Among medical and pharmacy students, 78% use smartphones, with 57.3% reporting poor sleep quality [6]. At the University of Medicine and Pharmacy, Thai Nguyen University, where students face significant academic and hospital-based training pressures, a study of 964 students revealed depression in 31.4% and anxiety in 42.1%. Most cases were mild to moderate, though 5.1% and 9.8% experienced severe to very severe depression and anxiety, respectively. Female gender, earlier academic year, and stress were linked to higher depression rates, while increased anxiety was associated with academic year and stress [7].

Another study reported that 38.5% of final-year students experienced stress, with moderate stress most prevalent (12.8%), followed by mild (11.7%), severe (10.1%), and very severe (3.9%). Stress prevalence varied by major: Pharmacy students had the highest rates (57.3%), followed by Dentistry (47.4%), General Medicine and Laboratory Technology (37.8%), Nursing (34.3%), and Preventive Medicine with the lowest (18.6%) [8].

Although previous studies have explored smartphone use and mental health outcomes among students, evidence on the relationship between smartphone addiction and anxiety and depression remains

insufficient. In particular, there is a lack of research focusing on nursing students in Vietnam that employs standardized measures such as the Smartphone Addiction Scale - Short Version (SAS-SV) and the Kessler Psychological Distress Scale (K10). To address this gap, this study was conducted. To minimize potential misunderstandings and response errors during data collection, the study focused on nursing students.

This study aimed to:

1. Assess the prevalence of smartphone addiction among nursing students at the University of Medicine and Pharmacy, Thai Nguyen University, in 2025.

2. Examine the association between smartphone addiction, anxiety and depression among these students, including factors related to excessive smartphone use.

METHODS

Study design: A cross-sectional descriptive study.

Setting and period: This study was conducted at the University of Medicine and Pharmacy, Thai Nguyen University, from March to September 2025.

Participants and sample size

Participants were regular nursing students who had used a smartphone for at least six months and voluntarily agreed to participate. Exclusion criteria included students who declined to participate or withdrew during data collection, as well as questionnaires with more than 20% missing data. Any incomplete responses meeting these conditions were excluded from the analysis to ensure data quality. A convenience sampling method was applied.

Using a single-proportion sample size formula based on a reported smartphone addiction prevalence of 62.9% among nursing students by Nguyen Thi Hong Anh and colleagues [9], the minimum required sample was 359. Adding 10% for potential non-response increased the target to 395. The final dataset included 403 valid questionnaires.

Instruments

Smartphone Addiction Scale - Short Version (SAS-SV): A brief scale assessing smartphone addiction with cutoff scores of ≥ 31 for males and ≥ 33 for females, using a 6-point Likert scale [10]. The Vietnamese version used in this study was adapted from previously validated translations, with reported Cronbach's alpha of 0.91 in Vietnamese student populations [6].

Kessler Psychological Distress Scale (K10): A 10-item measure of anxiety and depression experienced over the past four weeks. Scores classify anxiety and depression levels as follows: 10 - 19 (healthy), 20 - 24 (mild), 25 - 29 (moderate), and 30 - 50 (severe) [11]. The Vietnamese K10 has demonstrated good internal consistency, with Cronbach's alpha of 0.89 in a local validation study [12].

The questionnaire also collected demographic data (age, gender, year of study, residence, family income), smartphone use habits (hours per day, primary purpose, use before sleep), and related variables including insomnia, fear of missing out (FOMO), and academic pressure.

Data collection: Questionnaires were administered and collected either in person or via Google Forms, overseen by the research team. Participant anonymity

was maintained, and ethical approval was obtained. Written or electronic informed consent was obtained before participation.

Data analysis

Descriptive statistics (frequencies, percentages) were reported. Chi-square tests evaluated associations between categorical variables.

Logistic regression analysis was conducted to estimate odds ratios (ORs) and 95% confidence intervals (CIs). Smartphone addiction was dichotomized based on the SAS-SV cutoff (0 = not addicted, 1 = addicted). Anxiety and depression was classified using the K10, with scores < 20 coded as 0 (no) and scores ≥ 20 coded as 1 (yes). Statistical significance was set at $p < 0.05$.

Ethical issue: The study was approved by the Ethics Committee of Thai Nguyen University of Medicine and Pharmacy under approval number 222/ĐHYD-HĐĐĐ date on 28/02/2025. Participation was voluntary, with the option to withdraw at any time, and all data were kept confidential.

RESULTS

Participant characteristics

Table 1. Demographic characteristics of the study sample (n = 403)

Demographic characteristics	Number (n = 403)	Percentage (%)
Year of study		
First year	90	22.3
Second year	110	27.3
Third year	122	30.3
Fourth year	81	20.1
Gender		
Male	74	18.4
Female	329	81.6

Age (years)		
18	29	7.2
19	95	23.6
20	169	41.9
21	83	20.6
22	26	6.5
24	1	0.2
Most recent GPA		
< 1.99	41	10.2
2.0 - 2.49	217	53.8
2.5 - 3.19	114	28.3
> 3.2	31	7.7
Ethnicity		
Hà Nhì	1	0.2
Hmong	1	0.2
Kinh	365	90.6
Mông	1	0.2
Mường	5	1.2
Nùng	3	0.7
Sán Dìu	3	0.7
Tày	23	5.7
Thái	1	0.2
Religion		
None	403	100
Current residence		
Renting alone	247	61.3
Dormitory/shared rental	116	28.8
Living with family	39	9.7
Other	1	0.2
Average monthly family income (million VND)		
< 5	0	0
5 - 10	86	21.3
10 - 15	317	78.7

Chronic illness		
Yes	1	0.2
No	402	99.8
Currently using medication		
None	402	99.8
Sertraline	1	0.2

The majority of participants were female (81.6%, 329/403) and most were aged 19 - 21 years (86.1%). Year of study distribution was: 1st year 22.3% (90), 2nd year 27.3% (110), 3rd year 30.3% (122), 4th year 20.1% (81). Most students lived alone in rental housing (61.3%), and the family monthly income for the majority ranged from 10 to 15 million VND (78.7%). Only one student reported a chronic illness and current pharmacotherapy (sertraline).

Smartphone use habits

Table 2. Smartphone use habits (n = 403)

Variables	Number (n = 403)	Percentage (%)
Average daily use (hours)		
< 2	7	1.7
2 - 4	59	14.6
4 - 8	162	40.2
> 8	175	43.4
Main purpose of use		
Studying	59	14.6
Entertainment (games, etc.)	217	53.8
Social networking	122	30.3
Communication	5	1.2
Using smartphone before sleep		
Never	4	1.0
Occasionally	127	31.5
Often	187	46.4

Always	85	21.1
Time of most frequent use		
Daytime	62	15.4
Evening	219	54.3
Late night (after 11 p.m.)	144	35.7
All day	73	18.1
Insomnia due to phone use		
No	60	14.9
Occasionally	234	58.1
Often	109	27.0
Perception of phone dependence		
No	19	4.7
Yes, mild	202	50.1
Yes, moderate	166	41.2
Yes, severe	16	4.0

Most students (83.6%) used smartphones for ≥ 4 hours daily, with 43.4% exceeding 8 hours. Primary uses were entertainment (53.8%) and social networking (30.3%). Nearly 70% used their phones frequently before bed, peaking in the evening (54.3%) and after 11 PM (35.7%). Insomnia related to phone use was common, with 27% often and 58.1% occasionally experiencing it. Self-perceived dependence was mild (50.1%) and moderate (41.2%).

Psychological aspects of smartphone use

Table 3. Psychological aspects of smartphone use (n = 403)

Items	Number (n)	Percentage (%)
Frequently use smartphones to relieve negative emotions		
Yes	267	66.3
No	136	33.7
Feel stressed when unable to use smartphones		
Yes	145	36.0
No	258	64.0

Compare themselves with others through smartphones		
Never	218	54.1
Occasionally	153	38.0
Frequently	32	7.9

Most students (66.3%) frequently used their smartphones to alleviate negative emotions. Only 36.0% reported feeling stressed when unable to use their phones, while 54.0% did not. Over half (54.1%) never compared themselves to others based on phone content; however, 38.0% sometimes and 7.9% often engaged in such comparisons.

Smartphone addiction (SAS-SV)

SAS-SV scores among 403 students ranged from 10 to 60, with most scores concentrated between 20 - 30. Using cutoffs (male ≥ 31, female ≥ 33), 65 students (16.1%) were classified as having smartphone addiction/problematic smartphone use.

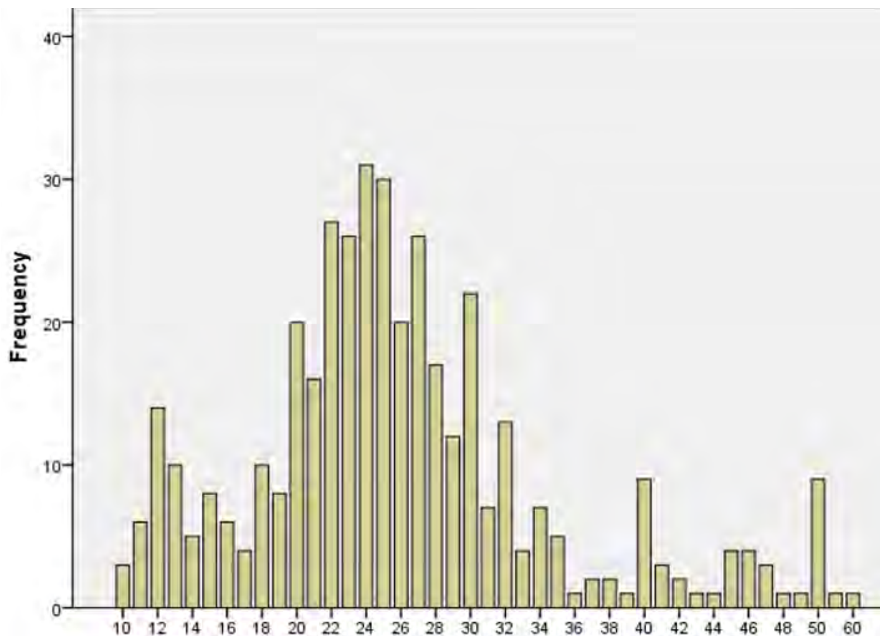

Figure 1. Score distribution of the SAV-SV scale among students

Anxiety and depression (K10)

K10 scores ranged from 10 to 44. Most students scored in the 18 - 22 range. By category: no anxiety and depression 181 (44.9%); mild 147 (36.5%); moderate 37 (9.2%); severe 38 (9.4%).

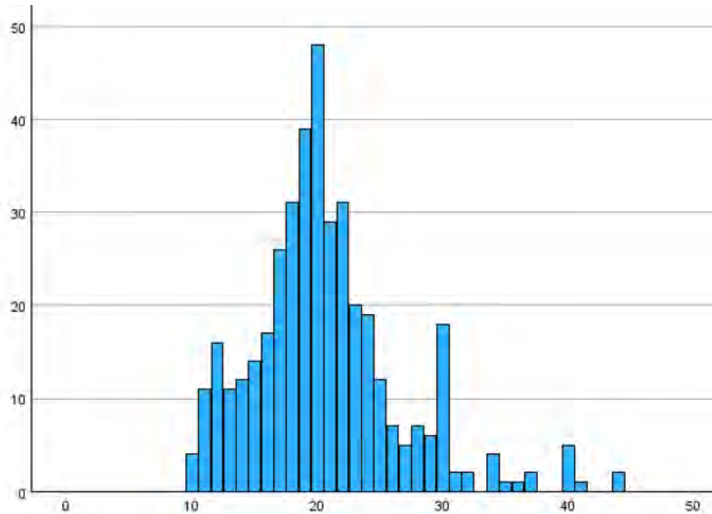

Figure 2. Score distribution of the K10 scale among students

Distribution of smartphone addiction and levels of anxiety and depression

Table 4. Distribution of smartphone addiction and levels of anxiety and depression (n = 403)

Level of anxiety and depression	Smartphone addiction		Total
	Normal n (%)	Addicted n (%)	
No anxiety and depression	177 (97.8%)	4 (2.2%)	181 (100%)
Mild anxiety and depression	126 (85.7%)	21 (14.3%)	147 (100%)
Moderate anxiety and depression	22 (59.5%)	15 (40.5%)	37 (100%)
Severe anxiety and depression	13 (34.2%)	25 (65.8%)	38 (100%)
Total	338 (83.9%)	65 (16.1%)	403 (100%)

Smartphone addiction showed a clear increasing trend across levels of anxiety and depression. The prevalence rose markedly from 2.2% among students

without anxiety/depression to 65.8% among those with severe symptoms.

Factors related to anxiety and depression among nursing students

Table 5. Factors related to anxiety and depression (n = 403)

Factors	No anxiety and depression n (%)	Anxiety and depression n (%)	*p*-value
Smartphone addiction			***< 0,001*****
No	177 (97,8)	4 (2,2)	
Yes	161 (72,5	61 (27,5)	
Academic year			***0.014***
1st year	46 (51.1)	44 (48.9)	
2nd year	56 (50.9)	54 (49.1)	
3rd year	40 (32.8)	82 (67.2)	
4th year	39 (41.8)	42 (51.9)	
Gender			***0.176***
Male	28 (37.8)	46 (62.2)	
Female	153 (46.5)	176 (53.5)	
Age (years)			***0.800***
18	14 (48.3)	15 (51.7)	
19	45 (47.4)	50 (52.6)	
20	76 (45.0)	93 (55.0)	
21	33 (39.8)	50 (60.2)	
22	13 (50.0)	13 (50.0)	
24	0 (0.0)	1 (100.0)	
Grade Point Average (GPA)			***0.065***
< 2.0	12 (29.3)	29 (70.7)	
2.0 - 2.5	108 (49.8)	109 (50.2)	
2.5 - 3.2	46 (40.4)	68 (59.6)	
> 3.2	15 (48.4)	16 (51.6)	
Current residence			***0.068***
Living alone	122 (49.4)	125 (50.6)	

Dormitory/shared housing	41 (35.3)	75 (64.7)	
With family	18 (46.2)	21 (53.8)	
Other	0 (0.0)	1 (100.0)	
Perceived academic pressure			***0.021***
None	3 (15.8)	16 (84.2)	
Moderate	119 (44.4)	149 (55.6)	
High	57 (52.3)	52 (47.7)	
Very high	2 (28.6)	5 (71.4)	
Primary purpose of smartphone use			***0.884***
Learning	24 (40.7)	35 (59.3)	
Entertainment	97 (44.7)	120 (55.3)	
Social media	58 (47.5)	64 (52.5)	
Communication	2 (40.0)	3 (60.0)	
Average daily smartphone use (hours)			***0.128***
< 2 h	3 (42.9)	4 (57.1)	
2 - 4 h	29 (49.2)	30 (50.8)	
4 - 8 h	82 (50.6)	80 (49.4)	
> 8 h	67 (38.3)	108 (61.7)	

[*] Chi-square test; significance level p < 0.05; [**] OR = 16.77 (95% CI: 5.97-47.1).

Logistic regression analysis indicated that students with smartphone addiction had significantly higher odds of anxiety and depression compared to those without addiction (OR = 16.77; 95% CI: 5.97 - 47.10; p < 0.001). In bivariate analyses, anxiety and depression prevalence increased significantly with academic year, peaking at 59.2% in fourth-year students (p = 0.014). Female students and those aged 19 - 20 had higher rates, but differences were not significant (p > 0.05). Students with average GPA (2.0 - 2.5) showed higher anxiety/depression rates, nearing significance (p = 0.065). Those living in dormitories/shared housing had higher prevalence (64.7%) than others, though not significant (p = 0.068). Academic pressure was strongly associated

with anxiety and depression, rising from 15.4% (no pressure) to 71.4% (very high pressure) (p = 0.021). Other factors, including smartphone use purpose and duration, showed no significant associations. In summary, smartphone addiction, academic year, and pressure were significantly linked to anxiety and depression, while other factors were not.

DISCUSSION

In this study, the prevalence of smartphone addiction among nursing students was 16.1%. Although most students used smartphones at typical levels, a notable subgroup was at risk of addiction, which may adversely impact both academic performance and mental health. This prevalence is substantially lower than the 62.9% reported by Nguyễn Thị Hồng Anh and colleagues among nursing students at Dong A University and Phenikaa University [9]. Similarly, Nguyễn Minh Tâm and colleagues documented high smartphone use among high school and university students, accompanied by health issues such as sleep disturbances and psychological disorders [6]. Internationally, a meta-analysis reported smartphone overuse prevalence among nursing students ranging from 23% to 31%, associated with stress, anxiety, and reduced academic performance [13].

Differences between this and previous studies may reflect variations in assessment tools (e.g., SAS-SV(10) vs. PSU(4)), inconsistent classification criteria, or differences in social context and study habits among students in Thai Nguyen province, Vietnam.

Association between smartphone addiction and anxiety and depression

The analysis showed that students experiencing anxiety and depression were 16.8 times more likely to overuse smartphones than those without anxiety and depression (OR = 16.8; 95% CI: 5.97 - 47.1; p < 0.001). This association highlights the prominent role of anxiety and depression in driving excessive smartphone use, confirming the study's initial hypothesis that these mental health conditions are closely linked to smartphone addiction among nursing students.

These findings align with Nguyễn Thị Hồng Anh et al. (2024), who reported that students who overused smartphones were 2.5 times more likely to experience anxiety [9]. Similarly, Đàm Thị Bảo Hoa (2023) identified high anxiety rates among medical students connected to academic pressure and training environments [7]. International studies also support this association. For example, Dikeç & Kebapçı (2018) demonstrated a strong link between smartphone addiction and anxiety in university students [2]. Hashemi et al. (2022) found excessive smartphone use significantly related to anxiety and stress [14]. Notably, the strength of the association in this study (OR = 16.8) exceeds that reported in most previous research.

The high OR may reflect the underlying data distribution. Specifically, table 4 shows smartphone addiction rising from 2.2% (4 of 181) in the no-anxiety and depression group to 65.8% (25 of 38) in the severe anxiety and depression group. Dichotomizing K10 into no-anxiety and depression vs. anxiety and depression merges these extremes, resulting in 27.5% addiction in the anxiety and depression group versus 2.2% in no-anxiety and depression, driving a large OR

= 16.8) that reflects the pattern but may seem inflated. While common and aligned with international cut-offs, dichotomizing K10 reduces detail and masks the clear dose-response trend: addiction rises from 2.2% (anxiety and depression) to 14.3% (mild), 40.5% (moderate), and 65.8% (severe). Future research should treat K10 as ordinal or continuous to preserve severity information and avoid inflated effect sizes from collapsing categories.

Several mechanisms may explain this relationship. First, nighttime smartphone use disrupts sleep, increasing anxiety and fatigue [6,15]. Second, FOMO (Fear of Missing Out) combined with constant social media notifications may produce persistent, uncontrollable stress [4]. Third, anxiety may lead students to use smartphones as a coping mechanism, which can then strengthen and worsen the anxiety cycle over time [3,13]. Thus, the relationship is likely bidirectional: anxiety promotes smartphone addiction, which in turn exacerbates anxiety.

Several variables showed notable trends with anxiety and depression despite not reaching conventional significance. Academic pressure ($p = 0.021$), current residence ($p = 0.068$), and GPA ($p = 0.065$) exhibited near-significant associations, suggesting that the learning environment, living conditions, and academic performance may contribute to anxiety and depression and affect smartphone-related behaviors. Limited statistical power may have constrained detection of stronger or more stable associations. Future research should examine these factors more thoroughly by expanding multivariable models, increasing sample size. Academic pressure, in particular, appears closely

linked to both anxiety and depression and smartphone use patterns [7,8].

The findings should also be interpreted in the specific context of Thai Nguyen University of Medicine and Pharmacy, where nursing students often face intensive academic schedules, early clinical placements, and exposure to emotionally demanding hospital environments [8]. These characteristics may heighten vulnerability to both anxiety and depression and maladaptive coping behaviors such as excessive smartphone use. Although the university has implemented several forms of academic advising and counseling support, accessibility and utilization remain limited. Therefore, the present study provides evidence to support the development of targeted mental-health screening, digital-wellbeing training, and early intervention programs tailored to the needs of nursing students in this setting.

Strengths and limitations

Strengths of this study include its focus on nursing students, a specific but under-researched population in Vietnam, providing novel and practical insights. The findings were compared with national and international literature, enhancing their reliability and generalizability. Validated instruments (SAS-SV and K10) were employed to measure smartphone addiction and anxiety/depression levels.

Limitations include the cross-sectional design, which prevents causal inferences. Data were self-reported, introducing potential biases such as recall and social desirability bias. Additionally, potential mediators (e.g., sleep disturbances, FOMO, social support) and

protective factors (e.g., resilience, coping skills) were not comprehensively examined.

CONCLUSION

The prevalence of smartphone addiction among nursing students at the University of Medicine and Pharmacy, Thai Nguyen University was 16.1% and was significantly associated with levels of anxiety and depression (K10). These findings highlight the urgent need for targeted interventions. In particular, universities should consider implementing structured mental health support programs, such as counseling services, stress-management workshops, and training on time and sleep hygiene, integrated into existing student support activities. Priority should be given to third- and fourth-year students, who appear to experience higher academic pressure and may be more vulnerable to anxiety and depression and problematic smartphone use.

Additionally, the development of campus-based or digital tools to promote responsible smartphone use may help students self-regulate their behavior. Future longitudinal and multi-center studies are needed to clarify causal pathways and to evaluate the effectiveness of these intervention models when applied in real academic settings.

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