Original Article

Prevalence of Nomophobia and Relationship with Anxiety and Depression among University Students in Southern Thailand

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Objective: To determine the prevalence of nomophobia or no mobile phone phobia, and to find out its relationship with anxiety and depression among university students.

Materials and Methods: A cross-sectional descriptive study was conducted in a largest university in Southern Thailand, between July 2020 and October 2020. Data were collected using an online self-questionnaire, including personal and educational data, smartphone usage characteristics, the Thai version of the Nomophobia Questionnaire (NMP-Q), and the Thai Hospital Anxiety and Depression scale (Thai-HADS).

Results: Six hundred thirty-eight university students completed the online self-questionnaires. The median age was 20 years (IQR 19 to 21 years), 77% were female, and 81.8% were undergraduate student. The prevalence of nomophobia was 76.1%, with the highest prevalence of severity level was moderate nomophobia (59.6%). Prevalence of anxiety and depression were 14.3% and 6.6%, respectively. Multivariate analysis showed the significant factors associated with nomophobia were being female (OR_{adj} 1.64; 95% CI 1.072 to 2.521), having anxiety (OR_{adj} 3.47; 95% CI 1.604 to 7.510), using smartphones to access social media (OR_{adj} 2.84; 95% CI 1.333 to 6.067), and smartphone checking less than every 30 minutes (OR_{adj}, 4.32; 95% CI 2.344 to 7.961) and every 30 to 60 minutes (OR_{adj} 1.97; 95% CI 1.089 to 3.556).

Conclusion: The present study provided evidence that nomophobia is an emerging mental health problem in the university students. The COVID-19 situation may further exacerbate this issue. University students with nomophobia should be carefully monitored for anxiety, especially in female. The present study information is important to reduce smartphone usage and access to social media.

Keywords: Nomophobia; Anxiety; Depression; University; Student; Thailand

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The growth of technological advancements, such as, mobile phones and smartphones has become a main stay of living for the present generation[1]. In 2019, 89.6% of the Thai population were smartphone users. Those aged 25 to 34 years old were the most frequent users of a smartphone (97.1%), followed by those aged 15 to 24 years old (96.9%)[2]. The effect of frequently using a smartphone is the beginning of a psychological problem when they are afraid of being detached from the smartphone connectivity, or now called nomophobia, which is an abbreviated form of: "no mobile phone phobia"[3,4]. Nomophobia is defined by Yildirim et al[5] as the fear of being unable to use their smartphone and being unable to communicate through their smartphone. People would feel discomfort and anxiety when their smartphone was unavailable. Nomophobia is considered a modern age phobia being introduced into the authors' lives as a byproduct of the interaction between people and mobile information and communication technologies, especially smartphones. Nomophobia categorizes as one of anxiety symptoms, and the early symptom of the extreme phobia or fear and anxiety without smartphone[4]. The prevalence of nomophobia has been found in both Thailand and in other countries at a rate of 42.6% to 99.5%[4,6,7].

The health effects of frequently using a smartphone are physical problems, such as optical problems, and mental health problems[8]. Evidence found that nomophobia or smartphone addiction was associated with mental problem, especially anxiety and depression. According to an Indian

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study, nomophobia is significantly associated with depression, anxiety, and poor quality of life in adolescents[9]. A Lebanese study found that smartphone addiction significantly affected depression and anxiety in university students[10]. Demirci et al study indicated that depression, anxiety, and sleep quality may be associated with smartphone overuse in Turkish university students[11]. Additionally, the report of Thomée et al also found that a high frequency of daily mobile phone usage may be a risk factor for developing symptoms of depression[12]. Furthermore, a Korean study has reported the association between the usage of a smartphone of five hours or more a day and the suicidal attempts among students[3]. There has been a study of smartphone usage and mental health problems in Thailand, and the results concluded that smartphone and tablet addiction had a significant impact on depression and stress[13].

Although, there have been studies on the prevalence of nomophobia and associated factors, the studies regarding the situation of nomophobia in Thailand and its relationship with anxiety and depression in university students have rarely been reported. Therefore, the present study aimed to determine the prevalence and severity level of nomophobia and the relationship between nomophobia with depression and anxiety in the students at Prince of Songkla University (PSU), Hat Yai campus. PSU is the largest university in Southern Thailand. It consists of 17 faculties, divided into three principal areas, including health sciences, science and technology, and social sciences and management. The present study results would be useful for the early detection, and prevention of the most common psychological problems, especially depression and anxiety in university students[14,15].

Materials and Methods

Study design and setting

A cross-sectional descriptive study was conducted in PSU, Hat Yai Campus, between July and October 2020. The study protocol was approved by the Office of Human Research Ethics Committee (HREC), Faculty of Medicine, PSU (REC 63-052-9-4). Action informed consents were obtained from the participants prior to enrollment into the study.

Participants and sample calculation

Participants included university students studying in the academic year of 2019 (n=15,586). The inclusion criteria were undergraduate students who had been using smartphones, and were able to read and understand Thai. The exclusion criteria were international university students, and students who had history of, or were receiving treatment for psychiatric disorders. The sample size was calculated for estimating a finite population proportion of the prevalence of nomophobia (0.8) in Thai university student[6]. A marginal error (0.05) was used to determine the target simple size (n=243) for the present study.

Data collection

Data were collected using an online self-questionnaire designed by Google Forms. The authors distributed online self-questionnaires through social media platform such as Line App and Facebook, by the Student Affairs personnel, PSU. The authors used convenience sampling of university students in the Hat Yai campus, within the 17 faculties. The faculties were divided into three principal areas, 1) Health Sciences including Dentistry, Medical Technology, Nursing, Medicine, Pharmacy, Veterinary Science, Traditional Thai Medicine, 2) Science and Technology including: Natural Resources, Science, Engineering, Sino-Thai International Rubber College, Agro-Industry, and 3) Social Sciences and Management including Law, Management Sciences, Liberal Arts, Economics, PSU International College. Participants willing to participate in the present study answered the questionnaire once. ID numbers were assigned to each participant, and only those ID numbers were used on the data sets for analyses. No personally identifiable data were stored, and individual confidentiality was ensured. Data accessing was strictly granted only to the researchers.

Study tools

The questionnaires comprised of four parts, including personal and educational demographic data, and smartphone usage characteristics, the Thai version of the Nomophobia Questionnaire (NMP-Q), and the Thai version of the Hospital Anxiety and Depression scale (Thai-HADS).

Personal and educational demographic data consisted of gender, age, marital status, faculty, education years and smartphone usage characteristics data, consisting of: duration of daily smartphone usage, frequency of checking their smartphone, and purpose of smartphone usage.

The Thai version of NMP-Q[6]

The Thai version of NMP-Q was developed by Prasan et al[6], was translated from the NMP-Q of

Yildirim et al[5], and was used to identify nomophobia in the present study. This instrument consisted of 20 items and a Likert scale of seven levels, wherein, level 1 is strongly disagree and Level 7 is strongly agree. By using the following evaluation criteria, less than or equal to 20 points was absence of nomophobia, a score of 21 to 59 points was mild nomophobia, a score of 60 to 99 points was moderate nomophobia, and a score of 100 to 140 points was severe nomophobia. The Thai version of NMP-Q has content validity from a psychiatrist and Cronbach's alpha=0.910[6].

Nomophobia was defined by Yildrim[5] in 2016 as "the fear of unable to use both their smartphone and unable to communicate through their smartphone, people would feel discomfort and anxiety when smartphone was unavailable". In the present study, the researchers defined nomophobia as the participants who had the Thai version of NMP-Q ranging from moderate to severe level of nomophobia, because a moderate level upwards might have impact on daily life. The participants were normal ranging from an absent to mild level of nomophobia[6].

The Thai-HADS[16]

This instrument developed by Nilchaikovit et al[16], is a self-answered questionnaire. It consists of 14 questions, and is divided into seven anxiety-related questions, which are all odd-numbered questions, and seven depression-related questions, which are all even-numbered questions. Scoring for each answer is on a Likert scale, with a score of 0 to 3. Scoring is done separately for anxiety and depression, with the range of points in each section of 0 to 21 points. The groups are classified as follows, a score of 0 to 7 points are no psychiatric disorders, or non-cases, a score of 8 to 10 points are high anxiety or depression and possibly psychiatric disorders or doubtful cases, and a score of 11 to 21 points are anxiety or depression at a stage considered a psychiatric disorder, or cases. The anxiety-related questions have a Cronbach's Alpha of 0.86, and the depression-related questions have a Cronbach's Alpha of 0.83[16].

Data editing

The data were double entered, for detection of any inaccuracy in the records of the computer database management system, using Epi-Data version 3.1 software.

Data analysis

Data were analyzed using the R® program 4.0.0. Categorical data were presented as percentages, continuous data were presented as median and interquartile range (IQR). The chi-squared test and Fisher's exact test were used to compare between the characteristics of the groups, according to nomophobia. The logistic regression analysis was used to determine the variables associated with nomophobia. The variables had been included in the multivariate analysis when a p-value less than 0.2 was observed in the univariate analysis. Adjusted odds ratios (OR_{adj}), and 95% confidence intervals (CI) were also derived. The level of statistical significance was set at p-value of less than 0.05.

Results

Six hundred forty-two participants responded online filling the self-questionnaires. The researchers excluded four participants who met the exclusion criteria of having a history of treatment for psychiatric disorders. Six hundred thirty-eight participants completed the questionnaires, or 4.1% (638 of 15,586) of the total university student. The baseline characteristics are shown in Table 1. The median age of participants was 20 years (IQR 19 to 21 years). Most of them were female (77%), and single (82.4%). Thirty-five-point seven percent studying in social science and management, and most were undergraduate student during their first to third year (81.8%).

The prevalence of anxiety and depressive disorders are shown in Table 1. These were assessed by using the Thai-HADS. The participants having scores of 11 to 21 were interpreted as having anxiety or depression, which were considered psychiatric disorders. The results showed participants with anxiety and depression were 14.3% and 6.6%, respectively.

Smartphone usage characteristics are shown in Table 2. The present study results also showed more than half of the participants used their smartphone for 4 to 8 hours per day (58.0%). Almost half of the participants had frequency of checking their smartphones less than every 30 minutes (48.6%). Most participant's purposes for using their smartphones were to access social media programs, and to access information via the internet at 95.0% and 92.8%, respectively.

The prevalence and severity level of nomophobia was assessed by the Thai version of NMP-Q, as shown in Table 3. The present study reported the prevalence of nomophobia from a moderate level upwards. The prevalence of nomophobia was 76.1%. Regarding the severity level of nomophobia, the results showed that

Table 1. Personal and educational characteristics (n=638)

Personal and educational variable	Total (n=638)	Normal (n=153)	Nomophobia (n=485)	Crude OR (95% CI)	p-value
Sex; n (%)					0.005[a]*
Male	147 (23.0)	48 (32.7)	99 (67.3)	Reference	
Female	491 (77.0)	105 (21.4)	386 (78.6)	1.78 (1.75 to 2.12)	
Age (years); median (IQR) [min-max]	20 (19 to 21) [18 to 30]	20 (19 to 21) [18 to 22]	20 (19 to 21) [18 to 30]		0.268[b]
Status					0.444[a]
Couple	112 (17.6)	30 (26.8)	82 (73.2)	Reference	
Single	526 (82.4)	123 (23.4)	403 (76.6)	1.19 (0.72-1.94)	
Group of faculties; n (%)					0.122[a]
Science and technology group	188 (29.5)	55 (29.3)	133 (70.7)	Reference	
Health sciences group	222 (34.8)	50 (22.5)	172 (77.5)	1.42 (0.88 to 2.27)	
Social sciences and management group	228 (35.7)	48 (21.0)	180 (79.0)	1.55 (0.96 to 2.40)	
Graduation year; n (%)					0.662[a]
Lower graduation years (1st to 3rd)	522 (81.8)	127 (24.3)	395 (75.7)	Reference	
Higher graduation years (4th to 6th)	116 (18.2)	26 (22.4)	90 (77.6)	1.11 (0.67 to 1.87)	
Anxiety; n (%)	91 (14.3)	8 (8.8)	83 (91.2)	3.74 (1.76 to 7.92)	<0.001[a]*
Depression; n (%)	42 (6.6)	6 (14.3)	36 (85.7)	1.96 (0.81 to 4.75)	0.128[a]

IQR=interquartile range; OR=odds ratio; CI=confidence interval

[a] Pearson chi-square test; [b] Mann-Whitney U test; * Statistical significance (p<0.05)

Science and technology group: Natural Resources, Science, Engineering, Sino-Thai International Rubber College; Agro-Industry Health Sciences group: Dentistry, Medical Technology, Nursing, Medicine, Pharmacy, Veterinary Science, Traditional Thai Medicine; Social Sciences and Management group: Law, Management Sciences, Liberal Arts, Economics, PSU International College

Table 2. Smartphone usage characteristics (n=638)

Smartphone usage variable	Total (n=638); n (%)	Normal (n=153); n (%)	Nomophobia (n=485); n (%)	Crude OR (95% CI)	p-value
Duration of daily smartphone usage					0.001[a]*
Less than 4 hours a day	58 (9.1)	23 (39.7)	35 (60.3)	Reference	
4 to 8 hours a day	370 (58.0)	94 (25.4)	276 (74.6)	1.92 (1.03 to 3.55)	
More than 8 hours a day	210 (32.9)	36 (17.1)	174 (82.9)	3.17 (1.58 to 6.27)	
Frequency of checking smartphone					<0.001[a]*
More than 1 hour	62 (9.7)	27 (43.5)	35 (56.5)	Reference	
Every 30 to 60 minutes	266 (41.7)	78 (29.3)	188 (70.7)	1.85 (1.00 to 3.39)	
Less than every 30 minutes	310 (48.6)	48 (15.5)	262 (84.5)	4.20 (2.22 to 7.87)	
Purpose of smartphone usage					
Access social media programs	606 (95.0)	138 (22.8)	468 (77.2)	2.99 (1.35 to 6.54)	0.002[a]*
Access information via internet	592 (92.8)	143 (24.2)	449 (75.8)	0.87 (0.38 to 1.85)	0.712[a]
Watch a movie or video clip	562 (88.1)	132 (23.5)	430 (76.5)	1.24 (0.68 to 2.18)	0.427[a]
Listen to music	557 (87.3)	126 (22.6)	431 (77.4)	1.71 (0.99 to 2.89)	0.035[a]*
Search educational information	543 (85.1)	127 (23.4)	416 (76.6)	1.23 (0.72 to 2.06)	0.402[a]
Take a photograph	505 (79.0)	118 (23.4)	386 (76.6)	1.15 (0.72 to 1.82)	0.514[a]

OR=odds ratio; CI=confidence interval

[a] Pearson chi-square test; * Statistical significance (p<0.05)

59.6% of participants had a moderate nomophobia, while 16.5% had severe nomophobia.

In the univariate model, nomophobia was significantly associated with female gender, anxiety, duration of usage of smartphones per day, smartphone checking frequencies, using smartphones to listen to music, and access to social media programs, as shown in Table 1 and 2. After adjusting for potential confounders, the multivariate analysis was performed to evaluate the association between nomophobia and the various variables when a p-value less than 0.2 was observed in the univariate analysis; including, gender,

Table 3. Prevalence and severity level of nomophobia (n=638)

Severity level of nomophobia	n (%)
Normal	153 (23.9)
Absent of nomophobia	1 (0.1)
Mild nomophobia	152 (23.8)
Nomophobia	485 (76.1)
Moderate nomophobia	380 (59.6)
Severe nomophobia	105 (16.5)

group of faculties, anxiety, depression, duration of daily smartphone usage, frequency of checking the smartphone, using smartphones to listen to music and access to social media programs.

Furthermore, nomophobia was significantly associated with female gender (OR_{adj} 1.64; 95% CI 1.072 to 2.521), anxiety (OR_{adj} 3.47; 95% CI 1.604 to 7.510), using a smartphone to access social media (OR_{adj} 2.84; 95% CI 1.333 to 6.067), the frequency of checking the smartphone less than every 30 minutes (OR_{adj} 4.32; 95% CI 2.344 to 7.961) and every 30 to 60 minutes (OR_{adj} 1.97; 95% CI 1.089 to 3.556) in the multivariate model, as shown in Table 4.

Discussion

The population surveyed in the present study consisted of university students who have been using smartphones, with the main aim was to examine the prevalence of nomophobia. The present results showed that the prevalence of nomophobia was high (76.1%). The severity levels of nomophobia were divided into moderate and severe, 59.6% and 16.5%, respectively. According to the previous studies, the prevalence of nomophobia varied, from 42.6% to 99.5%. Yildirim, found that only 42.6% of Turkish college students had nomophobia[4]. On the other hand, the study conducted by Prasan et al found the prevalence of nomophobia was 99.5% in Thai university students[6]. Each study had different prevalence. This might have been due to the various evaluation methods of the study. Currently, the definition of nomophobia is not clearly defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V). The present study used the Thai version of the NMP-Q, a worldwide questionnaire to determine nomophobia level as the NMP-Q has been translated into many languages. When the researchers considered a list of questions in the NMP-Q and definition of nomophobia in the previous studies[4,5], they defined nomophobia categories as one of anxiety symptoms, and the early symptom of the extreme fear and anxiety without smartphone. Secondly, the present study reported the prevalence of nomophobia from moderate levels upwards, which suggested the moderate level of nomophobia began to affect daily life. This was consistent with the study by Yildirim et al, suggesting that a moderate level means users cannot go along without checking their smartphone[4]. Third, the rapid growth of technological advancements, such as smartphones, has become a main stay of living for the present generation, indicating that nowadays people cannot live without their smartphone.

The present study assessed anxiety and depression, by using the Thai-HADS, and found that university students had anxiety and depression at 14.3 and 6.6%, respectively. These results were consistent with Ribeiro et al[14], which found that anxiety (41.4%) was the most common symptom of stress in university students, followed by depression (8.2%), and that both anxiety and depression occurred simultaneously (7.0%). However, the results of Jiranukool et al[15] were different. They found that the most common diagnoses of Thai university students visiting the psychiatric clinic, were depressive disorders, adjustment disorders, and anxiety disorders with prevalence of 36.5, 23.2, and 20.2%, respectively. When comparing the prevalence of anxiety and depression with studies in Thai university students, they also used other screening tools, and found that the prevalence of anxiety was 53.8%[17], with the prevalence of depression being 31.9% to 45.0%[17,18]. The present study found that the prevalence of anxiety and depression was lower than the previous study in

Table 4. Factors associated with nomophobia analysed by multivariate for model

Variable	Crude OR (95% CI)	p-value (Wald's test)	Adjusted OR (95% CI)
Female	1.78 (1.15 to 2.72)	0.023*	1.64 (1.072 to 2.521)
Anxiety	3.74 (1.76 to 7.92)	0.002*	3.47 (1.604 to 7.510)
Using a smartphone to access social media programs	2.99 (1.35 to 6.54)	0.007*	2.84 (1.333 to 6.067)
Checking a smartphone every 30 to 60 minutes	1.85 (1.00 to 3.39)	0.025*	1.97 (1.089 to 3.556)
Checking a smartphone less than every 30 minutes	4.20 (2.22 to 7.87)	<0.001*	4.32 (2.344 to 7.961)

OR=odds ratio; CI=confidence interval

Multivariate analysis, using the Wald's test regression analysis, * Statistical significance (p<0.05)

Thai university students. It could be seen that each study had a different prevalence due to the various evaluation tools and demographics of each study.

The present study reported about half of the participants used their smartphone for four to eight hours per day (58.0%) and had frequency of checking their smartphones less than every 30 minutes (48.6%). Most participant's purposes for using their smartphones were to access social media programs, and to access information via the internet. The present study was conducted during the COVID-19 situation. The result might be greater than in normal time. It was possible that university students used social media application on their smartphone as an essential tool to access COVID-19 situation, attend online classroom, and communicated with other people. These were similar to previous study among COVID-19 situation. Saadeh et al reported that most Jordan university student (85%) increased using smartphone during the home quarantine, with 42% using smartphone for more than six hours a day[19]. Additionally, Benden et al found college student ranked smartphone as their most frequently used technology (64.0%) and time spent on smartphones averaged over 4.4 hours per day, during COVID-19 situation[20].

The secondary aim of the present study was to examine the relationship between nomophobia with depression and anxiety. After multivariate analysis, the results showed that the significant factors associated with nomophobia were female gender, anxiety using smartphones for assessing social media applications, and checking their smartphone less than every 30 minutes and every 30 to 60 minutes. However, depression was not associated with nomophobia, according to the present study.

In studies, nomophobia was associated with female gender, consistent with the present study that females had higher levels of nomophobia severity than males[4,7]. From the United Kingdom study in 2012, 66% of mobile phone users were reported to be suffering from nomophobia, and higher among female users at 70%, than male users at 61%[21]. Similarly, Gezgin[22] conducted a study on the nomophobic behavior of adolescents in Turkey and found female high school students to be more nomophobic than male students. This would demonstrate that females are more susceptible to nomophobia compared to males as expressing feelings of anxiety when they are unable to use or has lost their mobile phones[23]. The researchers speculate that females are more likely to use their smartphone for social use than their male counterparts. This was consistent with a late 2012 survey, by the Pew Research Center's, showing that social media is more appealing to females than males[24]. On the other hand, Frangos et al reported that males were more attracted to process-oriented usage types, such as playing games or entertainment[25]. Furthermore, the previous study reported that females were more likely to feel the stressful effects of negative interpersonal events, and therefore experienced higher levels of social stress[26,27]. Finally, these results are suggestive that females have a higher chance of developing nomophobia than males.

According to the present study, university students with anxiety have more associated factors for nomophobia. This is consistent with the previous studies showing that nomophobia was associated with anxiety[12,28-30]; in that, anxious students are afraid of being detached from smartphone connectivity. It may be speculated that it is likely that anxious students may seek applications in smartphones to communicate, or 'ventilate' with others. In contrast, it is likely that the symptoms of anxious students may worsen if they perceived others had a better life via social media. Additionally, excessive smartphone use may disrupt the student's academic achievement contributed to anxiety[31]. However, it is unclear why university students with depression were not associated with nomophobia in the present study. In contrast with previous studies, depression was associated with nomophobia. A study by Jun found that depressive symptoms increased the level of addiction to mobile phones among Korean adolescents[32]. The report of Thomée et al also found that a high number of daily cell phone usage may be a risk factor for developing symptoms of depression, in both men and women[12]. Additionally, Kumar found smartphones can decrease social interaction and cause loneliness, which leads to depression[33]. Moreover, previous evidence showed that nomophobia was associated with academic performance[28] and other mental health issues in students, such as stress, sleep disturbances, or insomnia[12,13,30]. For further study, the researchers suggest determining the relationship between nomophobia with other mental health problem or academic performance in university students.

These study results found that university students who check their smartphones frequently have more associated factors of nomophobia than students who check their smartphone for a period exceeding one hour. This was consistent with Schwaiger et al[34], which studied the prevalence and predictive factors of nomophobia among university students in Pakistan. They found that the habit of frequently checking

the smartphone screen is an associated factor of nomophobia. This might be explained that student felt discomfort for time away from the smartphone screen and was unable to communicate through their smartphone[5]. According to the present study result, students who check their smartphone less than 30 minute (4.32 folds) were associated with nomophobia higher than students who check every 30 to 60 minutes (1.97 folds). However, the present study design was cross-sectional study. Causally between two variables cannot be a conclusion. Similarly, Thomée et al report that a high frequency of mobile phone usage may be a risk factor for mental health problem[12]. Therefore, higher frequency of smartphone checking increased the rate of nomophobia and other mental health problem such as, sleep disturbances, and symptoms of depression.

Moreover, the present study found that most university students often used social media applications, and the participants who used smartphones for social media purposes were significantly associated with nomophobia. Similarly, Ayar et al found that social media could affect nomophobia levels[35]. Young people can easily access social media via smartphones to facilitate communication, and information exchange. Therefore, young people use social media applications as an essential tool for contact with other people. Thus, it may be necessary for university students who live or study away from home to use social media applications for contacting with family and friends. Additionally, it may be because university students require interesting content from others such as, liking content on social media, or the sharing and receiving of messages. It may be speculated that university students are worried of being detached from their smartphone, because they may miss information from someone within their social media group.

Limitations and further study suggestions

The present study largest limitation was the inappropriate period of the study, as the present study was conducted during the COVID-19 pandemic. Therefore, the researchers had to use online self-questionnaires to collect the data and distribute questionnaires though social media platform. Because of these, most participants were students who used smartphones regularly, which might have caused selection bias, and the prevalence of nomophobia being overestimated. Therefore, for further research, paper questionnaire should be used to collect data, to avoid this bias. Secondly, the researchers used convenience sampling to distributed online self-questionnaires through the Student Affairs personnel, PSU. Because of this, the number of participants were more than a calculated target simple size and while the proportion of the group of faculties were appropriate, most participants were female undergraduate students in their first to third year. Therefore, the present study had high internal validity, but might have limited external validity. The findings cannot be generalized to university students with characteristics that differed from these participants. Hence, for further study a stratified sampling should be performed to distribute the questionnaire. Thirdly, at present, nomophobia has no definite diagnostic criteria, therefore, there was lack of standard diagnostic tool, according to DSM-V. However, as this may be an emerging mental health problem, it is important to determine, or compare, nomophobia with other psychological disorders to examine sameness and unlikeness for feasible diagnostic criteria. The present study used the Thai version of NMP-Q, a worldwide questionnaire to determine nomophobia level. Fourthly, the present study data were collected during the COVID-19 situation, so the university students might be using smartphones to attend online classroom and they may have checked their smartphone more than usual. The Thai version of NMP-Q was performed to determine level of nomophobia. Students who might have more anxiety or fear of being without smartphone during this situation might lead to an overestimated of NMP-Q score. Fifthly, the present study was a cross-sectional study, so it could not determine the cause of nomophobia. Hence, further research is proposed in the form of an analytic study to determine the predictive factors that cause nomophobia. Lastly, the present study aimed to determine relationship between nomophobia with depression, anxiety, demographic data, and smartphone usage. However, the previous study showed the relationship between depression and anxiety with other variables. The researchers' suggestion for further research is measure relationship between depression and anxiety with other factors.

Conclusion

The present study provided evidence that nomophobia is an emerging mental health problem in university students. The COVID-19 situation may further exacerbate these issues. The associated factors were female, anxiety, frequency of checking the smartphone, and using smartphones for social media. This information is important to reduce smartphone usage and access to social media. University students with nomophobia should be carefully monitored for

anxiety, especially female.

What is already known on this topic?

There have been studies on the prevalence of nomophobia and associated factors. However, studies regarding the situation of nomophobia in Thai university students and its relationship with anxiety and depression in the university students have rarely been reported.

What this study adds?

The findings of this study showed that nomophobia is an emerging mental health problem in Thai university students. The factors associated with nomophobia were female gender, anxiety, checking of smartphone frequently, and use of smartphones for social media. These study results will be useful for the early detection, and prevention of depression and anxiety in the university students.

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Conflicts of interest

The authors have no conflicts of interest to be declared.

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