

The Emerging Phenomenon of Nomophobia in Young Adults: A Systematic Review Study

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Review Article

Abstract

Background: Nomophobia (No MOBILE PHOne PhoBIA) refers to the worry or fear that individuals experience when they are without their mobile phone or they are unable to use it. The term was first coined in 2008 and it is considered a modern type of phobia. The aim of the present study was to retrieve and review the most relevant literature on the prevalence of nomophobia and its relationship with psychosocial and physical health among young adults.

Methods: A systematic literature review was conducted according the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) for original papers on the phenomenon of nomophobia in young adults using the Nomophobia Questionnaire (NMP-Q) as the main measuring instrument. The literature was focused on the 3 main topics of prevalence and level of nomophobia, nomophobia and psychosocial effects, and nomophobia and physical health in young adults.

Findings: The initial literature corpus consisted of 370 articles of which 40 met the inclusion criteria and were analyzed in detail. Nomophobia was observed among 15.2%-99.7% of the participants. Research findings indicated increased psychological, emotional, social, and physical side effects due to excessive smartphone use.

Conclusion: The excessive use of the smartphone is an emerging threat for social, mental, and physical health. There is an increased need for further research in this regard as it is evolving into an epidemic outbreak and concerns directly the field of public health.

Keywords: Internet addiction disorder; Anxiety; Young adults; Psychiatric rehabilitation; Health status

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Introduction

Tracing back to the early stages of the evolutionary history of life, human beings have invented and created things to facilitate their everyday living.¹ Communication technique was among the most important steps and telephones provided one way of contact. Since their invention, wired phones have evolved to mobile phones. The present day society tends to get acquainted with every change in the field of communication technology.² The initially invented mobile phone has been turned into the smartphone, which is not only a tool of communication, but also a data storage medium, camera, and a music and game device. Communication technology plays a significant role in everyday life; however, the unrestrained use of the smartphone leads to the development of behavioral addictions.³

Nomophobia is the abbreviation for "No-MOBile PHone PhoBIA" and is defined as the fear of being unable to use or being unreachable via one's smartphone.⁴ It is a modern time phobia as a consequence of the interaction with new technologies.^{5,6}

The term nomophobia was first coined by the UK's post office study in 2008 that was assigned to YouGov, an international research and analytics group organization founded in the UK. The aim of the study was to assess the risk of stress disorders due to the excess use of smartphone. The study found that almost 53% of the participants had a feeling of worry in case of phone loss, battery draining, or no internet coverage. Moreover, 58% of men and 48% of women suffered from mobile phone stress and an additional 9% felt tension when their phones were switched off. Of the study sample, 55% agreed that the main reason for their phobia was not being able to maintain contact with their loved ones.⁷ In a similar study in England, 4 years later, 66% of the participants stated that they felt anxious when their smartphone was out of order or without connection.⁸

The mobile phone offers many benefits such as social presence⁹, emotional security, and safety.¹⁰ Individuals appear to prefer indirect communication and be more revealing in virtual reality, because behind the screen makes them feel more sheltered. In numerous cases, seeking confirmation through communication with other

people leads to overuse of and dependence on the mobile phone.¹¹ This shift from real-life relations and interactions to "social media" in the current digital era has started to have an adverse impact on the progression of identity formation from adolescence through adulthood.¹² Such outcomes highlight the psychological involvement of followers of the social media environment.

Recent studies have been focused on the relationship between psychological characteristics and smartphone addiction.^{2,13} Psychological characteristics such as stress, extroversion (need for socialization and communication), sense of lack of self-responsibility (online communication takes place with no limitations and rules), emotional instability (indirect way of communication and exchanging of messages limits neurotic/stressful incidents), low self-esteem, and lack of discipline, and demographic characteristics such as age and sex have been associated with addiction.^{11,14,15}

Over the previous few years, there has been an increased scientific interest in the problematic^{16,17} and excessive use of mobile phones¹⁸ and their disadvantages.^{19,20} It has been highlighted that the existing levels of nomophobia and their relationship with health consequences can be defined as an epidemic outbreak.^{7,21} It seems that the excessive use of the smartphone is an emerging public health problem which demands effective public health strategies.⁹

In this light, the aim of the present review paper was to explore the most relevant literature on the prevalence of nomophobia and its relationship with psychosocial and physical health among young adults.

Methods

Search strategy: The present systematic review was developed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.²² All the relevant studies were identified through performing a search on the PubMed, Google Scholar, Scopus, and Web of Science databases. In addition, the present study was aimed at answering the following questions:

Q1: What is the prevalence and level of nomophobia in young adults?

Q2: What are the psychosocial effects of nomophobia in young adults?

Q3: What are the physical health consequences of nomophobia in young adults?

Keywords related to all aspects of the systematic review were used such as (“nomophobia” OR “smartphone addiction” OR “cell phone addiction” OR “mobile phone addiction”) AND (“young adults” OR “university students” OR “undergraduate students” OR “college students” AND “psychosocial effects”) AND (“health adverse” OR “physical health consequences”).

The search selection process is depicted in figure 1. Initially, 370 studies were retrieved and after removal of duplicates, 266 were selected for assessment. Subsequently, 105 manuscripts were removed on the basis of title/abstract as they were irrelevant to the aim of the current review. From among the full-text records assessed for eligibility (n = 161), 121 were excluded such as review papers (n = 19), papers with samples other than young adults (n = 26), papers not written in English (n = 10), validation studies (n = 21), citation reports (n = 7), and texts other than research articles (books, letters, commentaries, and short reports) (n = 38). Thus, 40 full-text records, which met the purpose of the present study, were included.

Eligible criteria: All the inclusion and exclusion criteria for the current systematic

review were applied to the retrieved articles. Only original full texts that used the Nomophobia Questionnaire (NMP-Q) as a measuring instrument for nomophobia were included in the review as it has been the most widely used questionnaire for determining nomophobia since 2015.⁶ The age of the participants ranged between 18 and 25 years. However, studies of a broader age range, but with high proportion of the determined age group, were also included. The research time frame was from April 2015 to August 2020, due to the construction and validation of the NMP-Q being in March 2015. The search was restricted to English language articles, but no limits were determined for geographic area. The inclusion and exclusion criteria of this review are presented in table 1.

Study selection: A systematic literature search, with the retrieved titles and abstracts, was conducted by 2 independent review authors in August 2020. A third author resolved any disagreements between the 2 review authors. Full texts were screened and reviewed using the same process. In the case of the papers that were not available in full, a copy of the full article was requested from the authors. The relevance of studies was assessed based on their title, abstract, and full manuscript using a hierarchical screening.

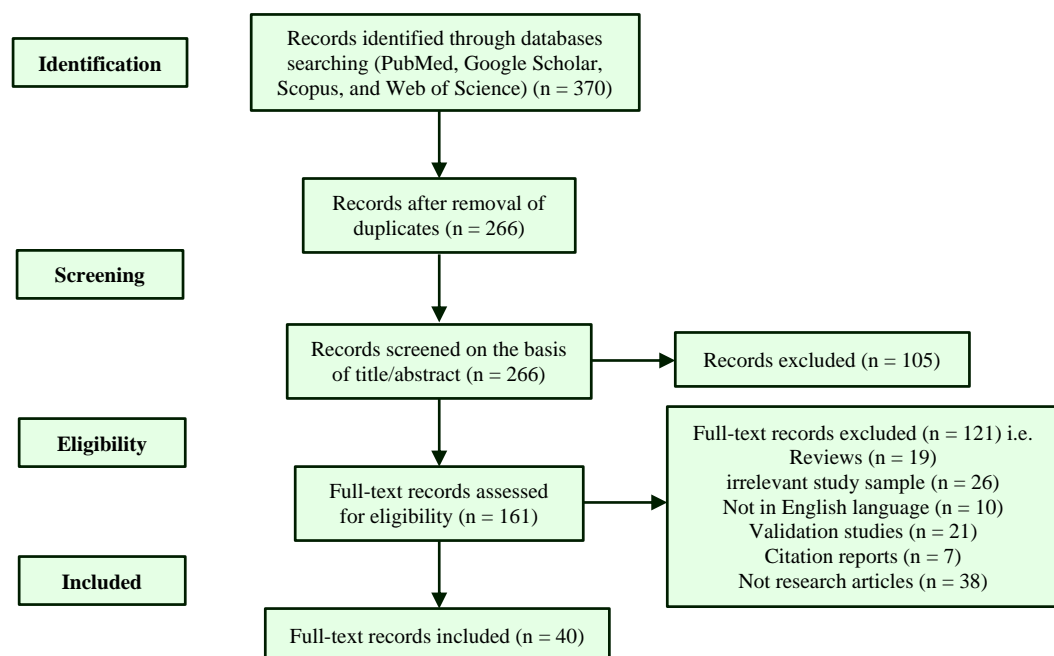


Figure 1. Flow diagram of the selection process

Review data: After data extraction, all the results were checked by a third author, and thematic analysis was carried out to explore the selected data. Data extraction was performed by 1 review author and repeated by a second author to check and verify the findings and accuracy of the results. Any disagreements in data selection were resolved through discussion between the authors until there was 100% agreement. Data extracted from the review articles included authors' name, publication year, place of study, type of study, targeted study population, and main findings, and are presented in tables 2-4, (1- Prevalence and level of Nomophobia; 2- Nomophobia and psychosocial health; 3- Nomophobia and physical health).

Results

The final literature corpus included 40 articles. These studies have been performed in India (n = 17), Turkey (n = 8), Saudi Arabia (n = 3), Spain (n = 2), Pakistan (n = 2), Oman (n = 1), Portugal, Egypt, Iran, Malaysia, and the USA. Furthermore, 1 was conducted in collaboration with Spain and Portugal and 1 between Turkey and Pakistan. The most used methods (n = 39) were cross-sectional, descriptive, and correlational studies, presenting a quantitative methodological design and using questionnaires as a data collection instrument. Only 1 study used a mixed methodological design, including qualitative techniques, and 2 studies used an experimental design (Tables 2-4).

Regarding the participants, studies have focused mostly on undergraduate students,^{28,31,35,38-41,43,45,47,52,53,55} university students,^{14,23,25,33,34,49-51,54,56} and college students.^{24,29,32,44,47,58,59} The other studies were focused on medical students,^{26,30,36} nursing students,^{27,37,60} young adults,^{42,46} postgraduate medical students,⁶¹ and higher education students.⁵⁷ The number of participants ranged from 95 to 1500. More specifically, the number of participants ranged between 95 and 500 individuals in 29 surveys,^{24,26,27-29,31,33,34,36-38,40,43,45-52,54-61} 501 and 1000 individuals in 10 studies,^{14,23,25,30,32,35,39,41,44,53} and between 1001 and 1500 individuals in only 1 study.⁴²

Prevalence and level of nomophobia

Most of the studies were focused on the prevalence and level of nomophobia. They described and associated nomophobia with factors such as age, gender, daily use time,

academic performance, type of housing, internet access, number of apps, and level of education.²³⁻⁴⁴ It has been documented that young adults are more vulnerable to nomophobia.³⁴ Several studies reported that nomophobia was more prevalent among women,^{23,27,29,32,33,41,42,44} compared to men,^{34,35} while others found no significant differences^{30,36,40} among sexes. Participants who spent more time talking on their smartphone and had owned a smartphone for several years demonstrated higher levels of nomophobia.^{24,28,32-35,39,41} In addition, it was shown that academic performance,^{23,33} and sleeping habits were negatively affected by high levels of nomophobia.^{23,25,33,36} The greatest anxiety among nomophobic individuals was related to lack of communication, inaccessibility of information,^{30,44} and fear of losing connection (Table 2).²⁹

Nomophobia and psychosocial health: Few studies have examined the association between nomophobia and psychological disorders such as anxiety,^{46,48,50,55,56} stress,⁵⁵ and depression,^{46,55} and extraversion,⁴⁷ interpersonal sensitivity,^{46,47} hostility, phobic anxiety, somatization, paranoid ideation and psychotism,⁴⁶ self-esteem,^{14,45} openness to experience,⁴⁷ obsession and compulsion,^{46,54} happiness,¹⁴ mindfulness,^{49,56} restlessness,⁵⁰ social phobia,^{51,57} and loneliness.⁴⁵ It has been observed that people with such psychosocial disorders are more likely to demonstrate nomophobic behaviors. Furthermore, the relationship between nomophobia and smartphone use, smartphone addiction, and internet addiction has been positively associated with social appearance anxiety and increased social media use levels (Table 3).^{52,53}

Nomophobia and physical health: Only a small number of studies have examined the level and existence of nomophobia and its relationship with adverse physical health effects mainly musculoskeletal problems. Neck pain was reported significantly more often among participants talking on their mobile phones for longer periods.⁵⁸⁻⁶¹ Pain in the thumb,⁵⁹ headaches and fatigue, straining and watering of the eye,⁶¹ back pain, shoulder and wrist pain,^{60,61} and trouble sleeping⁶¹ were also reported more frequently as a result of smartphone overuse. A significant positive correlation exists between nomophobia and adverse physical effects in smartphone users (Table 4).

Table 1. Inclusion and exclusion criteria for the researches utilized during this review

Domain	Inclusion criteria	Exclusion criteria	Cause
Publication year	Researches published after April 2015	Articles published before April 2015	The year was chosen based on the construction and validation of the NMP-Q in March 2015.
Research instruments	NMP-Q questionnaire to determine nomophobia	Not using the NMP-Q questionnaire to determine nomophobia	It is the most advanced and accurate form of determining nomophobia globally.
Publication type	Original full texts in the English language and peer-reviewed academic journals.	Original full texts that are not published in the English language and are not peer-reviewed in academic journals	To ensure the best academic quality of the review findings.
Target group	Young adults of 18-25 years of age	< 18 and > 25 years old	This review was primarily concerned with the impact of smartphones on young adults, who constitute the majority of smartphone users worldwide.
Location	Worldwide	Not applicable	Nomophobia appears to present cross-culturally and in both developed and developing countries; hence, studies were not excluded based on location.
Research scope	Nomophobia existence, Nomophobia and its psychological effects, Nomophobia and its physical health consequences	Non nomophobia existence, Nomophobia and its psychological effects, Nomophobia and its physical health consequences.	To make sure that the results of the research satisfy the aim of the present work.

Table 2. Review of studies that have evaluated the prevalence and level of nomophobia (n = 22)

Authors	Country	Study Type	Targeted study population	Main research findings
Qutishat et al. ²³	Oman	Cross-sectional descriptive, correlational, and quantitative study	735 university students	Nomophobia prevalence among students was 99.33%, mostly with a moderate level. Students with severe nomophobia reported weak academic performance (P = 0.706), but this was not statistically significant.
Bajaj et al. ²⁴	India	Cross-sectional, descriptive, correlational, and quantitative study	300 college students	The research showed that 99.7% of the participating students had nomophobia. The majority of the participants had a moderate level of nomophobia (59.9%) while one-third had severe nomophobia (32.7%). Students with excessive smartphone use proved to be at high risk of developing nomophobia.
Moreno-Guerrero et al. ²⁵	Spain	Cross-sectional, descriptive, correlational, and quantitative study	849 university students of Early Childhood Education and Primary Education	Average levels of nomophobia were shown in the results for most of the participants. Nevertheless, the inability to communicate instantly created higher levels of fear, nervousness, or anxiety. Furthermore, a higher prevalence of the problem is evident in the participants who stated that their rest time is reduced due to the use of their mobile phone.
Marthandappa et al. ²⁶	India	Cross-sectional, descriptive, correlational, and quantitative study	419 medical students	The prevalence of nomophobia was high among medical students compared to other studies. The most important determinants of nomophobia were the availability of internet access, the number of apps used, and the time spent using the smartphone.
Gutierrez-Puertas et al. ²⁷	Spain-Portugal	Cross-sectional, descriptive, correlational, and quantitative study	258 nursing students; 130 from Spain and 128 from Portugal	The examined dimensions indicate significant levels of nomophobia in the two populations of nursing school students, with the highest percentages in the Portuguese students.
Bartwal and Nath ²⁸	India	Cross-sectional, descriptive, correlational, and quantitative study	451 undergraduate medical students	Two-thirds of the students had moderate nomophobia and less than 20% were suffering from severe nomophobia.
Shree et al. ²⁹	India	Cross-sectional, descriptive, correlational, and quantitative study	347 students in medical, dental, and engineering colleges	Almost half of the participants were either moderately nomophobic (33.2%) or severely nomophobic individuals (13.8%). The senior age group of > 20 years of age showed less moderate and severe nomophobic behaviors compared to the younger participants of < 20 years. In addition, it was observed that women were more affected by nomophobia. Many participating students did not know about nomophobia or its ill effects.
Sezer and Atilgan ³⁰	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	680 medical students	It was evident that students had moderate nomophobia and nomophobia was connected with academic achievement. The results implied that the prevalence of nomophobia does not vary by gender, class standing, or living arrangements. Furthermore, the nomophobia levels of students changed considerably with age, academic achievement, type of housing, and carrying a phone charger.

Table 2. Review of studies that have evaluated the prevalence and level of nomophobia (n = 22) (continue)

Authors	Country	Study type	Targeted study population	Main research findings
Mahgoub et al. ³¹	Egypt	Cross-sectional, descriptive, correlational, and quantitative study	95 undergraduate nursing students	A high prevalence of both nomophobia and Problematic Internet Use was observed among the studied students which revealed a high positive significant correlation at p-value < 0.0001.
Hassan et al. ³²	Saudi Arabia	Cross-sectional, descriptive, correlational, and quantitative study	625 health sciences colleges' students	The prevalence of nomophobia among students was 85.3%, among which 63.2% had mild nomophobia and 22.1% had severe nomophobia with increased prevalence to phones (P = 0.017) and also among those who spend more than 2 hours daily with their mobile phones (P < 0.001). The lowest percentage of severe nomophobia was amongst medical students (15.8%) while the highest percentage was amongst students of applied medical sciences (35.1%).
Demir ³³	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	429 university students	The study concluded that nomophobic behaviors of the students were affected by gender, education department, general arithmetic grade point average, daily and instant use time, pre-sleep use of mobile phone, and the availability of a bedside telephone during the sleep process. Female students' nomophobia scores were much higher than that of male students.
Daei et al. ³⁴	Iran	Cross-sectional, descriptive, correlational, and quantitative study	320 university students	Most university students had moderate nomophobia and 73.0% of the students were moderate smartphone users. Nomophobia was closely related with gender, age group, and level of education. The frequency of smartphone use had a significant relationship with age group and level of education. There was a positive correlation coefficient between nomophobia and the frequency of using smartphones.
Jilisha et al. ³⁵	India	A mixed-method, cross-sectional and qualitative, descriptive study	774 undergraduate students	The prevalence of severe nomophobia in the present study was 23.5%. Duration, frequency, and reason for use of smartphones and checking smartphones after waking up in the morning were significantly associated with nomophobia.
Farooqui et al. ³⁶	India	Cross-sectional, descriptive, correlational, and quantitative study	145 medical students	All the participants were found to have nomophobia. Most of them had severe nomophobia (82.1%), without gender differences.
Aguilera-Manrique et al. ³⁷	Spain	Cross-sectional, descriptive, correlational, and quantitative study	304 nursing students	Nursing students who used their smartphones during their clinical practice also showed high levels of nomophobia. The authors believed that it is necessary to establish policies to restrict the use of smartphones during working hours.
Sethia et al. ³⁸	India	Cross-sectional, descriptive, correlational, and quantitative study	473 undergraduate medical students	The results showed that only 1 out of 473 was not suffering from nomophobia. Moderate nomophobia was observed among 61.4% of participants. The participants who started using smartphones at the age of 15-18 years constituted a large percentage of the moderate nomophobia group.

Table 2. Review of studies that have evaluated the prevalence and level of nomophobia (n = 22) (continue)

Authors	Country	Study type	Targeted study population	Main research findings
Alahmari et al. ³⁹	Saudi Arabia	Cross-sectional, descriptive, correlational, and quantitative study	622 undergraduate health sciences students	Students who used their smartphones for 4 hours or more daily had severe nomophobia (22.2%). Female students had a higher prevalence of severe nomophobia than male students. Risk factors include older age, internet access, and immense daily use of mobile phones.
Harish and Bharath ⁴⁰	India	Cross-sectional, descriptive, correlational, and quantitative study	405 undergraduate medical students	Prevalence of nomophobia in the study population was 99.0%. Half of the population had moderate nomophobia. The main reason for smartphone use was to communicate with their family. There was no association between nomophobia and gender.
Dasgupta et al. ⁴¹	India	Cross-sectional, descriptive, correlational, and quantitative study	608 undergraduate students, 303 medical and 305 engineering students	Nomophobia has emerged as a semantic cause for concern, while engineering students showed a higher rate than medical students. Nomophobia was also higher among women, who owned a smartphone for more than 2 years with high monthly bills, and those who used the smartphone more than 4 hours a day.
Kanmani et al. ⁴²	India	Cross-sectional, descriptive, correlational, and quantitative study	1500 young adults	The study concluded that the level of nomophobia is currently not to such an extent that necessitates digital detox. Nomophobia is gradually increasing in the student population with texting as the main use. Furthermore, women appear to be more nomophobic than the men.
Madhusudan et al. ⁴³	India	Cross-sectional, descriptive, correlational, and quantitative study	429 undergraduate medical students	According to the study, 97% of the students were nomophobic. The most common reasons for smartphone use were calling family members, calling friends, and listening to music. Nomophobia scores of the participants showed a statistically significant association with the phase of study, with the highest prevalence of nomophobia in phase II.
Yildirim et al. ⁴⁴	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	537 college students	42.6% of young adults had nomophobia, and their greatest fears were related to communication and information access. Gender and duration of smartphone ownership affected young adults' nomophobic behaviors, but age and the duration of mobile phone ownership did not.

Table 3. Review of studies that have evaluated nomophobia and psychosocial health (n = 14)

Authors	Country	Study type	Targeted study population	Main research findings
Chethana et al. ⁴⁵	India	Cross-sectional, descriptive, correlational, and quantitative study	228 undergraduate students	The study highlights the high prevalence of nomophobia amongst undergraduate medical students. Nomophobia was found to be positively correlated with perceived loneliness and negatively correlated with happiness and self-esteem. Furthermore, the correlation between nomophobia and self-esteem showed statistical significance. The results reflect that nomophobia is closely related with psychological well-being.
Goncalves et al. ⁴⁶	Portugal	Cross-sectional, descriptive, correlational, and quantitative study	495 young adults	A positive and moderate correlation was found between nomophobia and psychopathological symptoms. Interpersonal sensitivity, OCD, and the number of hours of smartphone use per day were recognized as strong indicators of nomophobia. Individuals with higher levels of education and better relationships with family and friends tended to have less nomophobic symptoms.
Chhabra and Pal ⁴⁷	India	Cross-sectional, descriptive, correlational, and quantitative study	100 college students	The research showed a significantly low level of association between nomophobia and social phobia disorder. Extraversion had a positive and significant correlation with nomophobia severity. Openness to experience had a negative and significant correlation with nomophobia severity.
Veerapu et al. ⁴⁸	India	Cross-sectional, descriptive, correlational, and quantitative study	364 undergraduate medical students	All the undergraduate medical students had some degree of nomophobia. The results showed a weak positive correlation between nomophobia, and sleeping difficulty and anxiety.
Arpaci et al. ⁴⁹	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	491 university students	A significant negative correlation was observed between mindfulness and nomophobia in both men and women. Students with low scores in attention, showed greater anxiety when they were not capable of communicating.
Batool and Zahid ⁵⁰	Pakistan	Cross-sectional and quantitative study with experimental design	300 university students	68.0% of the participants appeared to have moderate nomophobia. The study results proved that excessive use of and dependence on smartphones are factors that generate anxiety and a feeling of restlessness when the smartphone is absent.
Apak and Yaman ⁵¹	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	307 university students	According to the results of the study, 41% of the participants were nomophobic. A low positive correlation was found between nomophobia and social phobia.
Yin et al. ⁵²	Malaysia	Cross-sectional, descriptive, correlational, and quantitative study	98 undergraduate students	The results of the study showed a strong significant relationship among nomophobia and smartphone usage, internet addiction, and smartphone addiction. High levels of nomophobia also indicated high rates of all the associated factors.
Ayar et al. ⁵³	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	755 undergraduate nursing students	Nomophobia severity had a strong, positive, and significant relationship with the variables of problematic internet use, social appearance anxiety, and social media dependence.

Table 3. Review of studies that have evaluated nomophobia and psychosocial health (n = 14) (continue)

Authors	Country	Study type	Targeted study population	Main research findings
Ozdemir et al. ¹⁴	Turkey, and Pakistan	Cross-sectional, descriptive, correlational, and quantitative study	729 university students from Turkey and Pakistan	According to multivariate effects results, the main effect that was statistically significant was that of gender on self-esteem and nomophobia. The findings indicate that the differences were significant between male and female students in relation to self-esteem and nomophobia. The study established that the differences between Turkish and Pakistani students' nomophobia, loneliness, and self-happiness scores were significant, while differences in self-esteem were not statistically significant across countries.
Lee et al. ⁵⁴	USA	Cross-sectional, descriptive, correlational, and quantitative study	397 university students	The study revealed a more distinctive relationship between obsessiveness and nomophobia. The higher scores of obsessiveness corresponded to higher severity levels of nomophobia, which might contribute to growing clinical symptoms based on new technological developments.
Kateb ⁵⁵	Saudi Arabia	Cross-sectional, descriptive, correlational, and quantitative study	335 undergraduate university students	The research showed that there was a high level of mobile phone involvement and high levels of the nomophobia dimensions, and that women were significantly more involved than men. Furthermore, a "mild" level of depression, a "normal" level of anxiety, and a "normal" level of stress were observed. Based on the findings, it can be established that the duration of use was related to both mobile phone involvement and psychological health factors.
Arpaci et al. ⁵⁶	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	450 university students	Those who are emotionally dependent and desire greater closeness and attention on a daily basis are more likely to show high levels of fear or anxiety when they do not have access to their smartphones.
Uysal et al. ⁵⁷	Turkey	Cross-sectional, descriptive, correlational, and quantitative study	265 higher education students	The research concluded that nomophobic tendencies of young adults predict their social phobia levels to a small extent. When nomophobia severity increases, their social phobia level is predictable with the related increase.

OCD: Obsessive-compulsive disorder

Table 4. Review of studies that have evaluated nomophobia and physical health (n = 4)

Authors	Country	Study type	Targeted study population	Main research findings
Khan et al. ⁵⁸	Pakistan	Cross-sectional, descriptive, correlational, and quantitative study	120 medical and dental college students	The NMP-Q was positively correlated with the NDI. 2 out of 5 students had neck pain and 1 in 3 had mild NDI scores due to prolonged mobile phone use.
Ahmed et al. ⁵⁹	India	Cross-sectional, descriptive, correlational, and quantitative study	113 college students	The results showed that text neck syndrome and SMS thumb are seen in nomophobic students. These musculoskeletal problems may be short term at first, but can build up into long-term disabilities if caution is not taken.
Ahmed et al. ⁶⁰	India	Cross-sectional, descriptive, correlational, and quantitative study	157 nursing students	Nursing students are influenced by nomophobia. 54% of the participants in this study reported symptoms such as neck pain, shoulder pain, and wrist pain. The extended use of smartphones may have an impact on everyday activities.
Chandak et al. ⁶¹	India	Cross-sectional, descriptive, correlational, and quantitative study	100 postgraduate medical students	Most of the participants had complaints of straining and watering of the eye, fatigue/headache, trouble sleeping, wrist pain, shoulder/neck/back pain, etc. 37% of participants developed physical symptoms; however, physical symptoms were seen considerably more in students with nomophobia as compared to those without nomophobia.

NMP-Q: Nomophobia Questionnaire; NDI: Neck Disability Index

Discussion

Smartphone's abundance and provision of several functions allow their users to achieve their personal needs. Smartphones allow users to perform a wide range of daily tasks using a single device. Some of the most common uses include calling and texting other people, checking and sending emails, planning appointments, surfing the internet, online shopping, social networking, reading, video watching, and gaming.²³

It seems that the availability of smartphones helps users gain many benefits and satisfy their basic needs,⁶² but it may also lead to many problems associated with uncontrolled use. Studies have shown increased levels of psychological distress among young users.⁴⁶

Nomophobia was observed among 15.2%-99.7% of the participants depending on age, gender, daily use time, and years of owning a smartphone, and affected their academic performance and sleeping habits. According to the results of the present study, young adults seem to be more prone to nomophobia compared to other age groups.^{14,34} This might be explained by the fact that young people are more familiar with modern technologies and tools than other age groups. Several studies have documented gender differences in relation to nomophobia. The findings were heterogeneous. Gender differences might be due to the fact that men believe that the technology of mobile phones increases their independence level, while women use the mobile phone mainly for communication and social networking, and in order to stay connected with friends and family.⁶⁴ Nomophobic people may never turn off their mobile phones or tend to keep them nearby even during bedtime, and some of them tend to carry an extra phone, battery, or charger as a safety measure in case they lose their phone or run out of battery life.⁶⁵

Moreover, in some cases nomophobia is considered as a "situational phobia" like agoraphobia or the fear of becoming ill and not receiving immediate assistance,^{66,67} whereas, in other cases, it is considered as a "behavioral addiction" towards mobile phones, manifested by symptoms of psychosocial and physical dependency.⁶⁸ A recent study in 270 young business professionals during their work reported that nomophobia leads to stress by generating

feelings of being socially-threatened. Social threat was proposed as the causal pathway through which nomophobia might lead to negative psychological states or consequences, mainly stress.⁶⁹ A study on a group of Turkish university students reported a significant relationship between mobile phone use and loneliness.⁷⁰ Other studies have demonstrated that maladaptive perfectionism⁷¹, depression, aggressiveness, impulsiveness, and other psychological factors also influence the development of nomophobia due to mobile phone overuse.⁷² Low self-esteem has been documented as a strong predictor of problematic mobile phone use.⁷³ In addition, extraversion and neuroticism have been studied as possible risk factors leading to inappropriate mobile phone use.⁷⁴

Several studies have attempted to identify the risk factors associated with nomophobia, and have emphasized on psychosocial and demographic factors. However, nomophobia also has many adverse effects on physical health.⁵⁸⁻⁶¹ For example, musculoskeletal problems arise as a result of the excessive and intensive use of smartphones.⁷⁵ Nomophobia and its effects on the physical health of smartphone users showed a significant positive correlation.

Conclusion

Nomophobia is a significant issue among young smartphone users and an evolving behavioral problem that needs multifaceted interventions. Its varying grades of severity are of great concern. Increasing awareness about the harmful effects of smartphone addiction is necessary. Excessive mobile phone use and dependence might lead to social withdrawal, anxiety, impaired sleep patterns, and poor academic performance. Hitherto, a limited number of studies have indicated nomophobia as a deteriorating factor in physical health and stress. The need to further explore the impact of nomophobia is evident, as it is evolving into an epidemic and should be the priority in the public health agenda.

Limitations: Even though, this systematic review was based on a thorough and extensive search to explore as many relevant studies as possible, results from grey literature and non-English written articles were not included. Moreover, there may have been some bias regarding the design of the retrieved studies, such as the

selection of the study sample. Additionally, the retrieved studies were performed on university students and young adults that might affect the generalizability to other age groups. However, the present review underlined a major public health issue which requires attention and action.

Conflict of Interests

The Authors have no conflict of interest.

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Authors' Contribution

made the conception and the design of the work, collected the data and drafted the article: VN and EV; critically revised the article and approved the final version to be published: CG and AL.

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