

Nomophobia: A Mixed-Methods Study on Prevalence, Associated Factors, and Perception among College Students in Puducherry, India

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ABSTRACT

Background: As more people are utilizing smartphones, nomophobia is also on the rise. Several Indian studies have revealed nomophobia among young adults. The severity of nomophobia and related behaviors is underrated and often go unnoticed in India. **Methods:** The sociodemographic characteristics, smartphone usage pattern, and perceived ill-health related to smartphone usage of the participants were obtained using a semistructured questionnaire. Twenty-item Nomophobia questionnaire was used to assess nomophobia. In-depth interviews were conducted among students with moderate and severe nomophobia scores. **Results:** Among the 774 participants, 23.5% had severe nomophobia scores. Older age, male gender, duration and frequency of smartphone usage, use for social networking, checking without reason, and checking smartphone after waking up in the morning were significantly associated with nomophobia. The in-depth interview showed attributes of addiction among the students, like dependency and compulsive behavior. Students also experienced anxiety and frustration when they had to part with their smartphones. **Conclusion:** A sizable minority of the students had signs of severe nomophobia, distinct patterns of usage, and misperceptions regarding health and their usage pattern.

Key words: *In-depth Interview, nomophobia, smartphone addiction, young adult*

Key messages: *In collaboration with educational institutions, health professionals should take appropriate steps to find individuals with behaviors suggestive of smartphone addiction and nomophobia and ensure that they are given sufficient information and education about nomophobia and similar technology addictions.*


Nomophobia is thought to be a trend in only developed and technologically advanced countries; however, it is also identified in India by psychiatrists, particularly in adolescents and adults who are addicted

to smartphones.^[1,2] Nomophobia refers to discomfort, anxiety, nervousness, or anguish caused by being out

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of contact with a mobile phone.^[3] Studies conducted in various regions of India have shown addictive behaviors related to smartphone use among young adults.^[4-6] Even so, the severity of nomophobia and related behaviors is underrated and often goes unnoticed in India, because smartphone usage is widely considered an ordinary and necessary behavior. Smartphones can be used for a variety of purposes: call, texts, paying bills, making online transactions, etc. In such a scenario, identifying deviant behavior becomes an almost impossible task.

Ownership of a smartphone at an early age and increased hours of usage per day are identified as triggering factors for addictive behaviors.^[7] Young adults keep their smartphones nearby even when they are sleeping.^[8] Studies, done on students pursuing professional study courses, have found varying proportions of individuals affected with nomophobia.^[4,6-9] Social networking media such as WhatsApp and Facebook are promoting factors for spending more hours on smartphones.^[5,10] There are no awareness about nomophobia and its effects among the vulnerable population.^[11] Anxiety related to the inability to use a smartphone or constant checking of the phone for notifications is often ignored as symptoms of possible addiction.

Nomophobia, if not identified and corrected at the earliest phase possible, can emerge as a significant public health issue in the coming years. Even though some quantitative studies^[4,5,7,9,12] on such behavior are available in India, there is a lack of in-depth understanding of the perception and attitude that lead to nomophobia. More critical studies are required to gain more knowledge about the patterns and perception about nomophobia and, thus, fill the lacunae in the existing literature. In this context, the current study was carried out to estimate the prevalence and factors associated with nomophobia and to understand the perception of young adults about excessive smartphone usage, through qualitative methods.

SUBJECTS AND METHODS

This is a mixed-method study, with both a cross-sectional analytical and a qualitative descriptive component, conducted among undergraduate students aged 18 years and above.

Sample size

Assuming the prevalence of nomophobia among college students as 38%,^[13] an absolute precision of 4%, 95% confidence level, and a design effect of 1.2, the sample size was calculated as 679. After adding a non-response of 10%, the final sample size was estimated to be 754.

The actual sample achieved at the end of the data collection was 774.

Sampling technique

Puducherry has six government and four government-aided Arts and Science colleges. Two colleges from each category were randomly selected. Students from second and third year were selected for the study. To account for the difference in student strength of the colleges, 263 students from college A, 353 from college B, 65 from college C, and 73 from college D were required based on proportion. Cluster sampling was done, considering a class as a cluster in each college. The number of students in each class of the four colleges ranged from 33 to 64, and there were 10 to 20 classes in each college. Hence, for the sampling of students, a total of 19 classes were selected from all four colleges, with eight classes from college A, six from college B, two from college C, and three from college D. The classes to be studied were selected randomly (through lottery method) until the adequate sample of students were covered in each college. All students in each selected class were included in the study.

Data collection

Necessary scientific and Institutional Ethics Committee approvals were obtained for conducting the study. Prior permission was obtained from the Directorate of Higher and Technical Education, Puducherry and the Principals and the respective Heads of the Departments of each college, before commencing the study. A pretested, self-administered, semistructured questionnaire was used to collect the participants' sociodemographic characteristics and smartphone usage pattern. Socioeconomic status was assessed according to Modified BG Prasad's scale for socioeconomic class (2018).^[14] Nomophobia Questionnaire, a twenty-item validated scale, was used to assess nomophobia scores.^[15] It has questions under four main domains. The score obtained in each of the twenty items, measured with a Likert scale, is totaled to get a final score for each participant. These scores are divided into four categories, based on which the severity of nomophobia is determined. The scores below 20 are considered as the absence of nomophobia, 21 to 60 as mild, 61 to 100 as moderate, and 101 to 140 as severe nomophobia.

The questionnaire was forward-translated from English to Tamil independently by two bilingual translators. Discrepancies between the two versions of the questionnaire were resolved after discussion between the investigator and the translators. Then, the questionnaire was back-translated into English. Following that, changes were made by experts and the translators, after reviewing the translations, in

order to ensure clarity. Pilot testing was done among 30 respondents. They were asked to explain their understanding of the questionnaire and the answers they gave, to make sure that the original and the translated versions of the questionnaire had the same meaning. Cronbach's alpha of the translated version was found to be 0.87.

After class arrangement, the students were explained about the study procedure in Tamil, and written informed consent was obtained. Twenty-one students who did not own a smartphone were excluded. The questionnaire was distributed to all the students in the selected classroom at a single point of time. The questionnaires were identified by unique ID numbers. The filled questionnaires were collected back after 30 minutes.

For the qualitative component of the study, students with moderate or severe nomophobia were identified for conducting In-depth Interviews (IDI). The scores were totaled each day before the afternoon, and unique ID numbers with moderate and severe scores were traced on the same day. One unique ID among these was selected randomly. The interviews were conducted on the same day as the questionnaire was administered. Individuals with moderate nomophobia were also considered for the interview, as several selected students with severe nomophobia did not consent to participating in the interview. Out of a total of 15 students approached for the IDI, six consented to participate. The students were briefed about the procedures for the interview, and then, the willing participants were invited to participate in an IDI which was audio-recorded. Interviews were conducted until the information reached a saturation point.

Statistical analysis

The variables assessed were age, gender, and socioeconomic status of the participants, duration and frequency of smartphone usage, the purpose of maximum smartphone usage and its context, checking smartphone without any reason, perceived ill-health due to smartphone usage, and checking smartphone as soon as waking up in the morning. Prevalence of nomophobia was summarized as percentages with 95% confidence interval. Linear regression analysis was done to find the significant independent variables associated with nomophobia. A *p* value of less than 0.05 was considered statistically significant.

For the qualitative component of the study, audible data was transcribed verbatim on the same day of the interview. Thematic analysis of the interviews was done. This was followed by familiarizing ourselves with the data and generating initial codes. Themes were named

and defined. During the familiarizing phase, phrases and sentences were highlighted. Codes were generated under each theme. Themes were identified as the unit of analysis. Inferences were drawn, and meanings were derived from the data.

RESULTS

Thirty forms were found to be incomplete. Sociodemographic characteristics of the participants are depicted in Table 1. Duration of smartphone usage was found to be 3–6 hours in nearly half of the participants (52.1%), and 19% of the participants even reported using their smartphone for 7 hours and more per day. Nearly half of the participants (48.6%) checked their phones at least 4–6 times per hour. Social networking and music were found to be the most used utilities in smartphones, with an almost equal proportion of the participants reporting it as the purpose of maximum usage (20% and 22%, respectively). Smartphone use was found to be maximum during leisure time (46.6%), followed by the time before sleeping (31.7%). Around 65% of the students admitted that they sometimes check their smartphones without any particular reason. Half of the participants (51.5%) reported that others have told them that they were using their smartphones too much. Nearly 38% felt that their smartphone use was hampering their academic performance, and 55% said that they check their smartphones as soon as they get up in the morning. Out of 774 responses from participants, the highest proportion of perceived ill health effect due to smartphone use was reported for headache (23.6%), followed by eye strain (21.8%). No perceived ill health was reported by 106 respondents [Table 2].

Table 1: Sociodemographic characteristics of college students (n=774)

Variables	Frequency (%)
Age (in years)	
18	368 (47.5)
19	278 (35.9)
20	106 (13.7)
More than 20	22 (2.9)
Gender	
Male	319 (41.2)
Female	455 (58.8)
Residence	
Urban	482 (62.3)
Rural	292 (37.7)
Socioeconomic Class ^{*,*}	
Class I (INR 6574 and above)	402 (70.1)
Class II (INR 3287-INR 6573)	130 (22.6)
Class III (INR 1972-INR 3286)	35 (6.1)
Class IV (INR 986-INR1971)	7 (1.2)

*Some data missing, #Modified B G Prasad's scale for socioeconomic class (2018)

Table 2: Smartphone usage characteristics of the college students (n=753)

Variables	Frequency (%)
Duration of smartphone use per day (hours)*	
2 and less	210 (28.9)
3-6	379 (52.1)
7 and more	138 (19.0)
The frequency of checking smartphone per hour*	
Three times and less	220 (31.0)
4-6 times	345 (48.6)
Seven times and more	145 (20.4)
Purpose of maximum usage	
Calls	170 (22.6)
Social Networking	165 (21.9)
Music	152 (20.2)
Texting	107 (14.2)
Video	81 (10.8)
Browsing the Internet	54 (7.2)
Camera	24 (3.1)
The context of maximum usage	
Leisure time	351 (46.6)
Before sleeping	239 (31.7)
On the bus	55 (7.3)
At college	51 (6.8)
While walking	48 (6.4)
While eating	9 (1.2)
Checking the phone without any reason*	
Never	175 (23.3)
Sometimes	488 (64.9)
Always	89 (11.8)
Perception of ill health due to smartphone usage	
Headache	183 (23.6)
Eyestrain	169 (21.8)
Neck pain	139 (18.0)
Disturbed sleep	129 (16.7)
No perceived ill health	106 (13.7)
Fatigue	48 (6.2)
Perception of overuse by others*	387 (51.5)
Perception of phone use hampering academic performance*	286 (38.1)
Checking smartphone first thing in the morning*	418 (55.7)

*Some data missing

Out of 774 respondents, nine had no nomophobia, 161 (20.8%) had mild nomophobia, 422 (54.5%) had moderate nomophobia, and 182 (23.5%) had severe nomophobia.

Linear regression [Table 3] showed that older age, male gender, increased daily duration of smartphone usage, frequency of checking smartphone, using a smartphone for social networking and texting, checking smartphone without reason, and checking smartphone immediately after waking were significantly associated with nomophobia. The adjusted R-square of the model was 0.26, implying that these variables predicted 26% of the variance in the nomophobia score, which was significant ($F = 26.68, P < 0.001$).

In-depth interviews

Four main themes were drawn from the interviews: Perception about smartphone usage, facilitating factors for smartphone usage, controlling factors for smartphone usage, and nomophobia and addiction. The codes corresponding to each theme are mentioned along with the statements in Table 4.

Perception about smartphone usage

The participants considered smartphones to be an absolute necessity and an escape route from boredom or stressful situations. They also found a sense of belonging from its use.

Two participants admitted that they were ashamed to take an old phone (button phone) with them when their smartphone was undergoing repairs. This showed a tendency to be accepted as normal among others because the participants felt inferior when others had a smartphone and they did not. This was included under the code of social desirability. They also associated having a smartphone with a sense of independence.

Some participants expressed the view that a gadget like a smartphone was very important to stay up-to-date with the current trends and changes and technology. They perceived smartphone use as something very normal and habitual because it is used for almost everything in their daily lives, even checking the time.

Facilitating factors for smartphone usage

Participants were motivated to increase their usage due to unlimited access to information, user-friendliness, convenience, Internet availability, and a sense of connectedness to others while using a smartphone.

There was also an urge to reply back when others text as it was considered a common courtesy (communication etiquette).

Participants expressed that they were eager to check their smartphones for any message or call notifications if they were not able to access their smartphones for a while (Anticipation of calls/texts). They also believed that talking through a smartphone can be equivalent to face-to-face interactions.

Controlling factors for smartphone usage

Participants reported restrictions from family, security concerns while using social media, health problems attributed to long hours of smartphone usage, missing out on family time, and conditional access (specified data limit or talk time in the given package which cannot be exceeded by the user) by the service providers as limiting aspects of their smartphone usage.

Table 3: Linear regression analysis of the factors associated with nomophobia

Variables	Beta coefficient	95% CI for Beta	p value
Constant	-19.08	-56.55-18.40	0.318
Age	3.98	1.98-5.97	<0.001
Gender (male)	3.58	0.27-6.89	0.03
Frequency of checking smartphone per hour	0.59	0.16-1.03	0.008
Duration of smartphone use per day (h)	0.84	0.42-1.26	<0.001
Purpose of maximum usage*			
Texting	5.68	1.05-10.30	0.02
Social Networking	5.56	1.66-9.45	0.005
Checking smartphone without reason**			
Always	18.65	12.82-24.49	<0.001
Sometimes	11.72	7.74-15.69	<0.001
Checking the smartphone immediately after waking up in the morning	8.78	5.29-12.26	<0.001

Adjusted R - 0.26 *Reference-Watching videos **Reference-Never CI-Confidence Interval P significant at <0.05

Nomophobia and addiction

When the participants were not able to use their smartphones for even a short time, they would feel the urge to check it for any notification. Another participant expressed concern that once they start using, they will scroll through their smartphone even though they are not looking/working for anything specific (loss of control).

The participants conveyed that they felt sad when they forgot their smartphone at home or when they had to give it for repairs. They said that parting with their smartphones was impossible.

They reported experiencing an irrational fear when they forgot their phones at home or when they were waiting for their friends to reply back to them. This factor is an important aspect of nomophobia.

Smartphone use among participants was so rampant and pervasive that they felt the necessity to have it with them at all times, even while having food. This could be considered a characteristic of addiction because some of them are even going back home from college just to get their smartphone. Even though they realize that it will be safe at home, they had difficulty in adjusting to an environment without their smartphones. In the absence of their smartphones, they also had trouble finding alternate sources to look for information.

DISCUSSION

Prevalence of Nomophobia

The prevalence of severe nomophobia in the present study was 23.5%. Similar proportion has been reported from Kerala (23%)^[16] and Odisha (21%).^[17] Alahmari *et al.*^[18] found a prevalence of 22% for severe nomophobia among undergraduate students in Saudi Arabia. These similar findings might have been due to the cultural similarities in the study settings where

parental supervision and social etiquette play a major role. The low proportion of severe nomophobia found in the current study may be attributed to parental control over the students' smartphone use because prevalence as high as 73% has been reported by other studies.^[19] Many such studies were conducted among medical and health science undergraduates while this study represents Arts and Science undergraduates. This might be due to an increased probability of staying away from home for education, which results in loss of parental control and also contributes to the increased use of social networking and the need to make calls in order to stay connected to friends and family.^[8]

Factors associated with nomophobia

We found a significant association between male gender and nomophobia. This is in accordance with studies conducted by Farooqui *et al.*^[6] among undergraduate and postgraduate degree students, and by Pooja *et al.*^[10] among medical undergraduates. This similarity in the findings may be attributed to the increased freedom males have in their homes and society and females experiencing more parental control in parts of developing countries like India. Significant association was also noted between increasing age and nomophobia scores. This finding is similar to other studies that reported an increased proportion of young adults in the age group of 18–25 being more susceptible to nomophobia.^[5,13] This could be attributed to the increased need of young adults to stay connected with friends and family and to access information.

We found that the duration of smartphone usage was significantly related to nomophobia. Chandak *et al.*^[13] also found a similar significant association among 35% of the medical postgraduates who used their smartphones for more than 3 hours compared to those who used less than 3 hours. A study conducted in Saudi Arabia among health science undergraduates also found an association between nomophobia and

Table 4: Results of in-depth interviews regarding the perception of smartphone usage

Codes	Statements
Theme 1: Perception About Smartphone Usage	
Necessity	“It is not possible to be without a smartphone.”- 18-year-old male with severe nomophobia.
Escape Route	“People use it as an escape route when they are under a lot of pressure, such as during exams.”- 19-year-old male with moderate nomophobia.
Sense of belonging	“Friends and family are not spending enough time with them. So, they might be lonely and hence spend more time with their phones.”- 18-year-old female with moderate nomophobia.
Staying Updated	“If we don’t use the phone, we will be outdated about everything. So, a technology like phone is very important.” -20-year-old male with severe nomophobia.
Social Desirability	“When my phone was sent for repairs, I had a button phone. I could never take it to college as my friends would have teased me. It was too embarrassing to be seen with a button phone.” -23-year-old male with severe nomophobia.
Independence	“We can google anything by ourselves and get the answer. There is no need to depend on anyone.” -18- year-old female with moderate nomophobia.
Routine Habit	“I sleep with my phone next to me. When I wake up, it’s the first thing that I see. Even for checking the time, I use only my phone.”- 20-year-old male with severe nomophobia.
Theme 2: Facilitating Factors for Smartphone Usage	
Access to Information	“If there is something I don’t know about, the first thing I do is to Google it.”- 23-year-old male with severe nomophobia.
User-Friendly	“Not just the educated people, even the uneducated can handle it because it is very easy to use.” -19-year-old male with moderate nomophobia.
Convenience	“Things which required a lot of paperwork can be done easily over the phone now.”- 18-year-old female with moderate nomophobia.
Internet Availability	“When Internet is there, I always would want to watch some videos because I have data left.”18-year-old female with moderate nomophobia.
Communication Etiquette	“If I go online and see any messages, I always reply immediately.”- 18-year-old female with moderate nomophobia.
Connectedness	“If I want to keep in touch with everyone, I need a phone. I was left out when my phone was under repairs.”20-year-old male with severe nomophobia.
Anticipation of Calls/ Texts	“As soon as I finish the work, I’ll be very eager to check the phone to see whether I got any calls or messages.” -23-year-old male with severe nomophobia.
Replacement for Face-to-Face Interaction	“I think that even though there is no face to face interaction, we are still connected to everyone through the phone. We talk through video calls because it is similar to talking face-to-face”19-year-old male with moderate nomophobia.
Theme 3: Controlling Factors For Smartphone Usage	
Restriction from Family	“My parents scold me saying that I’m always on the phone.”-23-year-old male with severe nomophobia.
Security Concerns	“If someone gets my number, it could be used in wrong ways.”19-year-old female with severe nomophobia.
Adverse Health Effects	“If I keep staring at the phone for a long time, my eyes start paining and then a headache will start.”19-year-old male with moderate nomophobia.
Feeling of Missing Out	I feel like I’m missing something when I’m on the phone. I meant interactions with my family.”19-year-old female with severe nomophobia.
Conditional Access by Providers	“We can recharge the phone for specific amounts only. But the users might not even need the amount of data or talk time they get through a plan.”20-year-old male with severe nomophobia.
Theme 4: Nomophobia and Addiction	
Loss of Control	“Even if I’m doing some important work, if I hear a message ringtone, I stop the work and check out the messages.”19-year-old male with moderate nomophobia.
Sadness	“I feel bad about leaving my phone at home.”- 23- year-old male with severe nomophobia.
Anxiety	“I get tensed when my friends have seen my message and don’t reply back.”-18- year-old female with moderate nomophobia.
Dependency	“If I forget my phone back at home, I get my friend’s vehicle and go back to get it.”19-year-old female with severe nomophobia.
Frustration	“It is very frustrating whenever I forget my phone at home.”19-year-old male with moderate nomophobia.

increase in smartphone usage.^[18] The reason for the similarity among the findings of our study, other studies conducted in India, and studies from developed countries might be the facts that the smartphone is a technology having multiple utilities and is considered an essential tool for day-to-day activities all over the world. This may lead to increased hours of usage and nomophobia.

This study found a significant risk for nomophobia in students whose purpose of maximum use was social networking and texting. Studies by Kanmani *et al.* and

Pavithra and Suwarna Madhukumar have also found social networking having the highest proportion of users among medical undergraduates, ranging from 56% to 77%.^[5,7] Studies from Turkey and Spain also had reported social networking as the most frequent activity among smartphone users.^[20,21] Many people consider a smartphone as an essential tool which can link different people, especially family and friends. This becomes more evident when young adults have to stay away from home for higher education or work. Young adults also consider it very important to have a well-established online identity, leading to increased use

of social networking apps.^[22] These factors may have contributed to our results.

Checking the smartphone without any reason was found to be significantly contributing to nomophobia on linear regression. More than 65% of the students checked their smartphones without any reason. The proportion of respondents checking their smartphones soon after waking up was 55% in this study, whereas Kanmani *et al.*^[5] found this proportion to be 69%. As smartphone usage is becoming necessary, it is also establishing a routine among its users which over time becomes habitual. Hence, users might subconsciously feel the need to browse through their phone or check for notifications, which may explain the high proportion, in both the studies, of participants with nomophobia who checked their phones without any need or as soon as they woke up.

Some participants in our study (38%) also felt that smartphone use hampered their academic performance. A similar result was recorded by Pavithra and Suwarna Madhukumar.^[7] where 43% of medical undergraduates expressed concerns regarding their academics due to uncontrolled smartphone usage. Both these findings might mean that some students know the ill effects of overuse but might be in need of help to reduce their smartphone usage.

Around one-fourth of the participants in our study perceived that they have health effects as a result of using a smartphone. A similar proportion of physical symptoms was seen among medical postgraduates by Chandak *et al.*^[13] also (37%). Khan's study, conducted among undergraduates in Saudi Arabia, also showed a significant relationship between health problems and the duration of use.^[23] The similarity of results obtained in the present study and other studies maybe because of the rampant use of smartphones by participants. A person with nomophobia is anxious about parting from their smartphone, hence considerably increasing the screen time. This, in turn, can lead to health problems, mainly headache and eye strain, which were the highest reported symptoms in the current study. Fatigue may also result due to the constant access to a smartphone.

Perception of nomophobic behavior

The factors derived in the present study, i.e., connectedness, access to information, staying updated, relieving boredom, convenience, etc., also correlate with the themes of a Turkish study by Caglar Yildirim, such as the inability to communicate, inconvenience, and information accessibility.^[15] Lidia *et al.*^[24] found the personality trait self-esteem having an important impact on nomophobia. In accordance

with this, the present study also found that participants felt a smartphone as an essential technology, a status symbol, and a tool for social acceptability. This may indirectly imply a need to have respect among others in the society. Lapointe *et al.*^[22] described attributes of addiction such as withdrawal, preoccupation, etc., which were in accordance with the codes dependency and loss of control found in our study. Fullwood *et al.*^[25] categorized users based on their perception of use. There were mentions of participants thinking that smartphone is very important for accessing information and for staying in touch with their friends and family, which were similar to the results obtained in the current study. The similarity in these findings shows a constant pattern of nomophobia all over the world.

Because the present study had a comparatively large sample size, the behavior of young adults was explored in detail and with more representative data. The presence of a qualitative component was also one of the strengths of the study. Participants were recruited from different colleges based on the proportion for representativeness of the sample.

However, because the study assessed deviant behavior, there might have been a chance of the social desirability bias. Students might not have wanted to reveal their original smartphone usage pattern to the investigator and could have written what was ideally expected from them. In addition, some missing data in the study could not be addressed properly due to time restrictions from the institutions. Completeness of the forms could not be ensured for all the participants. Telemetric methods for quantifying smartphone usage were not used in the study.

CONCLUSION

The line between normal use and addictive behavior is becoming more blurred among young adults. There is a need for the medical community and educational institutes to coordinate and take necessary measures to ensure that this vulnerable group is given sufficient information and education about nomophobia and to change the prevalent misperceptions. Creating awareness and providing proper counseling methods by trained health professionals can play a crucial role in curbing nomophobia. There is also a need for more studies focusing on the behavior and perception of the population regarding nomophobia.

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Conflicts of interest

There are no conflicts of interest.

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