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Internet addiction and nomophobia among medical undergraduates of a tertiary care teaching institute in Patna, Eastern India

Rajath Rao, Manisha Verma, CM Singh, Santosh K. Nirala, Bijaya N. Naik

Abstract:

BACKGROUND: Excess use of the internet and gadgets for learning, gaming, and socialization has resulted in addictive behavior and nomophobia, especially among college-going students. Thus, this study was designed to find out the proportion and predictors of internet addiction and nomophobia among medical undergraduates.

MATERIALS AND METHODS: This cross-sectional study conducted on 367 medical undergraduates of a teaching hospital was carried out using a standard tool: the Internet Addiction Test Short Form for screening internet addiction and the Nomophobia Questionnaire for nomophobia. Results were tabulated and multivariable binomial logistic regression analysis was performed to find out the predictors of internet addiction and nomophobia.

RESULTS: A total of 116 (31.6%, 95% CI: 27%–36.5%) students were addicted to the internet and 247 (67.3%, 95% CI: 62.3%–71.9%) were screened to have moderate-to-severe nomophobia. The age of the student (adjusted odds ratio (AOR): 0.83 [0.69–0.99]), male gender (AOR: 2.24 [1.33–3.79]), screen time (AOR: 1.24 [1.14–1.34]), checking the phone first in the morning (AOR: 1.98 [1.107–3.54]), non-leisure time usage of phone (AOR: 2.07 [1.25–3.4]), and altered reading habit (AOR: 2.51 [1.26–5.01]) were independent predictors of internet addiction. Increased screen time (AOR: 1.103 [1.016–1.23]), checking the phone first in the morning after waking up (AOR: 1.68 [1.05–2.81]), altered academic performance (AOR: 1.99 [1.079–3.68]), and presence of internet addiction (AOR: 8.17 [3.56–18.76]) were independent predictors of moderate-to-severe nomophobia among medical students.

CONCLUSION: One and two out of every three medical students were found to have internet addiction and moderate-to-severe nomophobia, respectively. Increased screen time, altered academic performance, and the presence of internet addiction were independent predictors of moderate-to-severe nomophobia.

Keywords:

Academic performance, internet addiction, medical students, mobile phone, nomophobia

Department of Community and Family Medicine, All India Institute of Medical Sciences, Patna, Bihar, India

Address for correspondence:

Dr. Bijaya N. Naik,
Department of Community and Family Medicine, Academic Block, All India Institute of Medical Sciences Patna, Bihar, India.

E-mail: dr.bijaya02@gmail.com

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Introduction

The most essential component of everyone's daily existence today is a mobile phone, which has transformed from a status symbol to a need.^[1] The usage of mobile phones has drastically increased because of its affordability and user-friendly

interface.^[2] Virtual communication and the fast development of software technologies involving the use of personal computers, cellphones, tablets, etc., are changing how individuals behave and engage in daily activities.^[3] Amidst the innumerable advantages, it has resulted in various physical and psychological problems including internet addiction and nomophobia.

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Nomophobia translates to the “fear of being without mobile contact” or the “fear of not having a mobile phone.” Nomophobia is impacting the teen brain and its alteration, according to psychologists, making it a big worry among medical graduates in recent years.^[2] It is included in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) and has been proposed to be included in the DSM-V.^[4,5] When they are not in contact with their phones, nomophobes experience a variety of symptoms such as anxiety, panic attacks, discomfort, anxiousness, loneliness, emotional instability, and so on.^[3,6,7] Excessive use of cell phones is related to headaches and blurred eyesight.^[8] It also creates a condition known as “phantom vibration syndrome,” which refers to a mistaken sense of the phone ringing.^[4]

Nomophobia has a variety of negative consequences, making it critical to review and assess the predictors among students, particularly those in the adolescent age group. As a result, psychologists and medics will be able to better comprehend it and develop the first steps of prevention.^[8] Also, nomophobia has been shown to have an impact on personality, self-esteem, anxiety, stress, academic performance, and other aspects of physical and mental health, as well as an impact on substantial behavioral changes.^[9] Internet penetration in India increased to 45% in 2021, up from around 4% in 2007, and India now ranks second among active internet users globally.^[10] Internet addiction (IA) was shown to be prevalent among medical students in a range of 28.55%–31.8%.^[11] Another meta-analysis done among college students of 19 states estimated the prevalence of IA and the overall prevalence of IA as 19.9% (95% CI: 19.3% to 20.5%) and 40.7% (95% CI: 38.7% to 42.8%), respectively.^[12] IA was associated with higher scores of depression, anxiety, and stress in Indian adolescents.^[13] Alcohol misuse, attention deficit hyperactivity disorder, anxiety, and depression are all linked to IA. Gender, the presence of any family-related stress, smoking, depression, anxiety, and stress were also attributed as independent factors of IA in Indian medical students.^[14] There is always a simultaneous diagnosis of IA and psychiatric illness.^[15] In a Nepalese study, medical students reported poor academic performance and a lack of concentration when studying, both as a result of IA.^[16]

After China, India has the world’s second-largest mobile phone market and the second-largest number of users. Medical students, with the recent trend of online classes, especially during this COVID-19 pandemic, spending the majority of their time in hostels for years at a time, and being away from their families, are more likely to use mobile phones than others, increasing the risk of addiction, depression, and fear of losing it.^[17]

So this study was designed to assess the prevalence of internet addiction and nomophobia among medical undergraduates with the specific objective to assess the level of IA, finding the proportion of nomophobia, and identifying the factors predicting IA and moderate to severe nomophobia among medical undergraduates of AIIMS Patna.

Materials and Methods

Study design and setting

This was a cross-sectional study carried out on online mode for a duration of three months (September to November 2021).

The study was conducted at All India Institute of Medical Sciences, Patna, an institute of national importance under the Ministry of Health and Family Welfare, Government of India. This teaching hospital is engaged in providing medical and nursing education for about 700 (425 MBBS, 270 nursing) undergraduate students with an intake of about 100 MBBS students and 60 nursing students per year, and students from various parts of the country attend the aforementioned institution.

Study participants and sampling

The study population included all MBBS and nursing undergraduates who gave their consent to participate in the study. Students who did not own any electronic gadgets (cell phone/tablet/laptop) were excluded from the study.

Sample size and sampling technique

Considering the prevalence of nomophobia among undergraduates to be 19%,^[18] we estimated the minimum sample size to be 259 at 20% relative precision and 95% confidence interval (CI) and population adjustment for 700 students. The final sample size was calculated to be 288 after considering a 10% non-response rate using Statulator.^[19] But we included everybody who consented to participate in the study.

A list of the names and contact numbers of all undergraduate students studying in AIIMS Patna was collected from administrative sections and the study tool was shared with them in classes. The study tool in the form of “Google forms”^[20] was sent to all students via WhatsApp and email. Though we intended to include all students, 367 students participated.

Study tool and technique

The information was collected using a pre-designed semi-structured standard questionnaire in the form of “Google forms” and was sent to eligible students via WhatsApp and emails to fill. Digital consent was encrypted in the google form link in the very beginning.

The participant can only proceed further after giving consent.

The questionnaire consisted of three sections. All the items were in the English language. Section A included sociodemographic details of students like age, gender, place of stay, batch, course, duration of sleep, type of gadgets, and number of gadgets.

Section B included questions about details of cell phone usage like the age of buying a first cell phone, duration of using phone, screen time, frequency of checking phone, frequency of recharge/top-up recharge, perception of students regarding constant cell phone usage towards their reading (academic/non-academic) habit/any hobbies and their academic performance. Section C included questions about internet addiction using the Internet addiction scale-short form (IAT-SF)^[21] and nomophobia questions using the NMP-Q questionnaire.^[22]

IAT-SF consists of 12 items with a 5-point Likert scale ranging from 0 to 5 where 0 is not applicable, 1 is rarely, 2 is occasionally, 3 is frequently, 4 is often and 5 is always. The scores range from a minimum of 12 to a maximum of 60. A cut-off of 36 is taken to classify a participant as suffering from Internet addiction. The Cronbach's alpha of the IAT-SF is 0.87. This is a two-factor model which checks the lack of control/time management and Craving/social problems.^[21,23,24]

NMP-Q questionnaire elicits four dimensions of nomophobia namely: not being able to communicate, losing connectedness, not being able to access information, and giving up convenience. The questionnaire consists of 20 questions with a 7-point Likert scale with 1 being "strongly disagree" to 7 being "strongly agree". The total score ranges from a minimum of 20 to a maximum of 140 with good internal consistency (Cronbach's alpha 0.945). The scores are further graded as no nomophobia (score ≤ 20), mild nomophobia (score 21-59), moderate nomophobia (score 60-99), and severe nomophobia (score 100-140) and validated in the Indian setting.^[6,22]

Bio-statistical analysis

The obtained data were entered in MS Excel and statistical analysis was done using IBM SPSS V.22 (SPSS inc., Chicago, IL, USA) Descriptive analyses were conducted to describe the sociodemographic characteristics and cell phone usage-related data to students. The results were either tabulated or shown as figures where ever necessary. Continuous variables like age, duration of sleep, screen time, frequency of checking smartphone, frequency of recharge, IAT-SF scores, and NMP-Q Scores were expressed as Mean and SD or Median (IQR)

wherever necessary. The categorical variables like gender, the proportion of internet addiction, proportion and severity of nomophobia were expressed as proportions. The mean/median difference in the IAT-SF and NMP-Q scores across various groups were assessed by independent t-test/Mann Whitney U test or ANOVA/Kruskal walis test. The association between various factors of cell phone usage across varying severity of nomophobia was seen by Chi-square test/Fischer exact test. The correlation between the two scores was found by Pearson's correlation(r) and a scattered graph was plotted. A multivariable binary logistic regression analysis was done to find out the independent factors contributing to internet addiction and nomophobia. For ease of analysis, no and mild nomophobia was clubbed and moderate-severe nomophobia groups were clubbed. and statistical significance was attributed to P -value < 0.05 at 95% Confidence intervals.

For the ease of binominal regression analysis, the frequency of mobile recharge was clubbed into frequent (weekly and monthly) and less frequent (quarterly and yearly) groups; Time when the maximum phone is used into Leisure time and other than leisure time (before sleeping in the night, after waking up in the morning, at college or while eating). The perception of medical students as a result of cell phone usage towards their academic performance and reading habit (academic/non-academic)/any hobby was asked on a three-point Likert scale (no change, to some extent and very much).

Ethical consideration

This study has been approved by Institute Ethics Committee, AIIMS, Patna (AIIMS/Pat/IEC/2021/807). We adhered to the principles of ethics throughout the study and thereafter.

Results

Demographic details of students

Out of 367 medical students, 188 (51.2%) were males, 253 (68.9%) were from MBBS course, 168 (45.8%) belonged to batch 2020 (first year) and 360 (98.1%) stayed in hostels. The mean (SD) age of students was 20.5 (1.4) years. Around 143 (39%) used to sleep for more than 7 hours in the night with a mean (SD) sleep duration of 7.1 (1.1) hours. Around 295 (80.4%) possessed smartphones and almost 191 (52%) possessed more than one electronic gadget with them [Table 1].

Details of mobile phone usage among students

The mean (SD) age when the students first brought cell phones was 16.9 (2.3) years while the mean (SD) duration of keeping cell phones with themselves was 15.4 (6.3) hours in a typical calendar day. The median (IQR) screen

time of students in 24 hours was around 5 (4-8) hours and students checked their cell phones almost 20 (10-40) times in a typical calendar day. A total of 174 (47.4%) students recharged their phones frequently (monthly and quarterly) and 161 (43.9%) were required to top-up internet recharge apart from regular recharge. Nearly half, 191 (52%) used their cell phones maximum during their leisure time [Table 2].

Around 153 (41.7%) used their phones mainly for social networking-related purposes while 123 (33.5%) used them mainly for academics and 91 (24.8%) for gaming and other purposes.

Internet addiction among students

The Internet addiction test-short form (IAT-SF) scores of students are given in Table 1. The mean (SD)

Table 1: Socio-demographic details of students (n=367)

Sociodemographic variables	Category	n (%) ^a	Mean (SD)	
			Internet addiction Scores ^b	Nomophobia Scores ^c
Age in years [Mean (SD)]		20.46 (1.4)	29.1 (11.3) [®]	72.5 (26.8) [®]
Gender*. [#]	Male	188 (51.2)	31.8 (10.8)	77.2 (25.7)
	Female	179 (48.8)	26.3 (11.1)	67.5 (27.03)
Course*. [#]	MBBS	253 (68.9)	31.3 (10.5)	76.3 (25.2)
	Nursing	114 (31.1)	24.4 (11.5)	64.2 (28.4)
Batch	2017	11 (3)	26.8 (12)	59 (22.5)
	2018	64 (17.4)	29.4 (10)	70 (28.9)
	2019	124 (33.8)	29.2 (11.1)	73.3 (27)
	2020	168 (45.8)	29.9 (11.1)	73.7 (25.9)
Place of stay	Hostel	360 (98.1)	29.1 (11.2)	72.5 (26.7)
	Day scholar	7 (1.9)	30.1 (14)	71.7 (34.1)
Sleep duration (in hours)	≤7	224 (61)	29.1 (11)	72.1 (25.9)
	>7	143 (39)	29.3 (11.7)	73.2 (28.1)
Type of Gadgets possessed	Smartphone	295 (80.4)	29.1 (11.4)	72.3 (26.9)
	Laptop	77 (21)	30.2 (11.5)	76.8 (25.8)
	Basic phone	72 (19.6)	29.1 (10.8)	73.5 (26.5)
	Tablet*. [#]	49 (13.4)	32.3 (11)	71.3 (26.9)
	All of them	69 (18.8)	28.7 (10.8)	73.1 (26.7)
Number of Gadgets possessed [#]	Single	176 (48)	28.2 (11.4)	68.8 (27.3)
	Multiple	191 (52)	30.1 (11.2)	75.9 (25.9)

^{*}Statistically significant (P<0.05) for mean (SD) Global IAS-SF scores (by Independent t-test)-Gender, Course, Tablet use. [#]Statistically significant (P<0.05) for mean (SD) Global NMP-Q scores (by independent t-test)-gender, course and tablet use, and the number of gadgets possessed. ^aThis column represents n and percentage distribution of study participants, ^bMean (SD) Internet addiction scores calculated using Internet addiction scale-Short form (IAS-SF), ^cMean (SD) Nomophobia scores calculated using the NMP-Q scale, [®]Overall mean (SD) Global IAS-SF and NMP-Q scores

Table 2: Details regarding mobile phone usage among students (n=367)

Factors	Categories	Total (n=367)	Nomophobia			
			No (n=9)	Mild (n=111)	Moderate (n=190)	Severe (n=57)
Age (in years) when first bought Smartphone [#]	Mean (SD)	16.93 (2.3)	18.6 (0.8)	17.5 (1.8)	16.7 (2.5)	16.4 (2.3)
Duration (in hours) of keeping a Smartphone with oneself (in a day)	Mean (SD)	15.4 (6.3)	16 (7)	14.7 (6.1)	15.4 (6.5)	16.5 (6.3)
Duration (in hours) of Smartphone usage in 24 h (Screen time) [§]	Median (IQR)	5 (4-8)	4 (3-6.5)	5 (3-6)	6 (4-8)	7 (5-9)
Frequency (No. of times/day) of checking Smartphone [§]	Median (IQR)	20 (10-40)	12 (7.5-20)	15 (10-30)	20 (10-40)	40 (40-100)
Frequency of phone recharge*	Frequent	174 (47.4)	5 (2.9)	55 (31.6)	88 (50.6)	26 (14.9)
	Less frequent	193 (52.6)	4 (2.1)	56 (29)	102 (52.8)	31 (16.1)
Internet Package Top up in a month (apart from regular recharge)	No	206 (56.1)	7 (3.4)	65 (31.6)	103 (50)	31 (15)
	Yes	161 (43.9)	2 (1.2)	46 (28.6)	87 (54)	26 (16.1)
Time of day when Maximum smartphone used	Leisure time	191 (52)	7 (3.7)	61 (31.9)	99 (51.8)	24 (12.6)
	Other than Leisure time**	176 (48)	2 (1.1)	50 (28.4)	91 (51.7)	33 (18.8)
Checking the Smartphone first after waking up in the Morning ^{##}	No	125 (34.1)	6 (4.8)	53 (42.4)	61 (48.8)	5 (4)
	Yes	242 (65.9)	3 (1.2)	58 (24)	129 (53.3)	52 (21.5)

*Frequent-Weekly, Monthly recharge, Less frequent-Quarterly and yearly recharge IQR-Interquartile range. **Other than Leisure time includes-Before sleeping in the night, after waking up in the morning, at college, or while eating. [§]Statistically significant difference by ANOVA. [§]Statistically significant difference by Kruskal wallis test. ^{##}Statistically significant association by Fisher exact test

global IAT-SF was found to be 29.11 (11.3). There was a significant difference in the IAS-SF scores between males compared to females [mean (SD): 31.8 (10.8) vs 26.3 (11.1)] and between MBBS and nursing students [[mean (SD):31.3 (10.5) vs 24.4 (11.5)] [Table 1].

Overall, A total of 116 [31.6%, 95% CI: 27-36.5%] students were internet addicted.

A few specific items of IAT-SF are shown in Figure 1. Almost 81 (22.1%) students frequently felt that they become defensive or secretive when anyone asks what they do online and 92 (25.1%) frequently felt that their grades or school work suffer because of the amount of time spent online [Figure 1].

Nomophobia among students

The NMP-Q scores of students are given in Table 1. The mean (SD) global NMP-Q scores were found to be 72.5 (26.8). There was a significant difference in the nomophobia scores between males and females [mean (SD): 77.2 (25.7) vs 67.5 (27.03)], MBBS and nursing students [mean (SD): 76.3 (25.2) vs 64.2 (28.4)] and between single gadget user and multiple gadget users. [mean (SD): 68.8 (27.3) vs 75.9 (25.9)] [Table 1].

Medical students scored a mean (SD) score of 24.9 (9.7), 15.2 (7.9), 15.1 (6), 17.4 (7.5) in factors not being able to access information, giving up convenience, not being able to communicate, losing connectedness domains of nomophobia respectively.

A total of 111 [30.2%, 95% CI: 25.7-35.1%] students were screened to have mild, 190 [51.8%, 95% CI: 46.7-56.9%] moderate and 57 [15.5%, 95% CI: 12.1-19.5%] severe nomophobia.

Participants in 'No nomophobia' and 'severe nomophobia' differs significantly concerning the age when the first mobile phone was bought [Mean (SD): 18.6 (0.8) vs 16.4 (2.3) years], screen time in 24 hours [Median (IQR): 4 (3-6.5) vs 7 (5-9) hours], frequency of checking mobile phone [Median (IQR): 12 (7.5-20) vs 40 (40-100) times/day] and checking mobile phone first in the morning after waking up [1.2% vs 21.5%] [Table 2].

Specific items of the NMP-Q questionnaire are shown in Table 3. Almost 73 (19.9%) students somewhat agreed that they would feel uncomfortable without constant access to information through their smartphone, 49 (13.4%) strongly agreed that they would feel nervous because they would not be able to receive text messages and calls while 76 (20.7%) strongly disagreed that

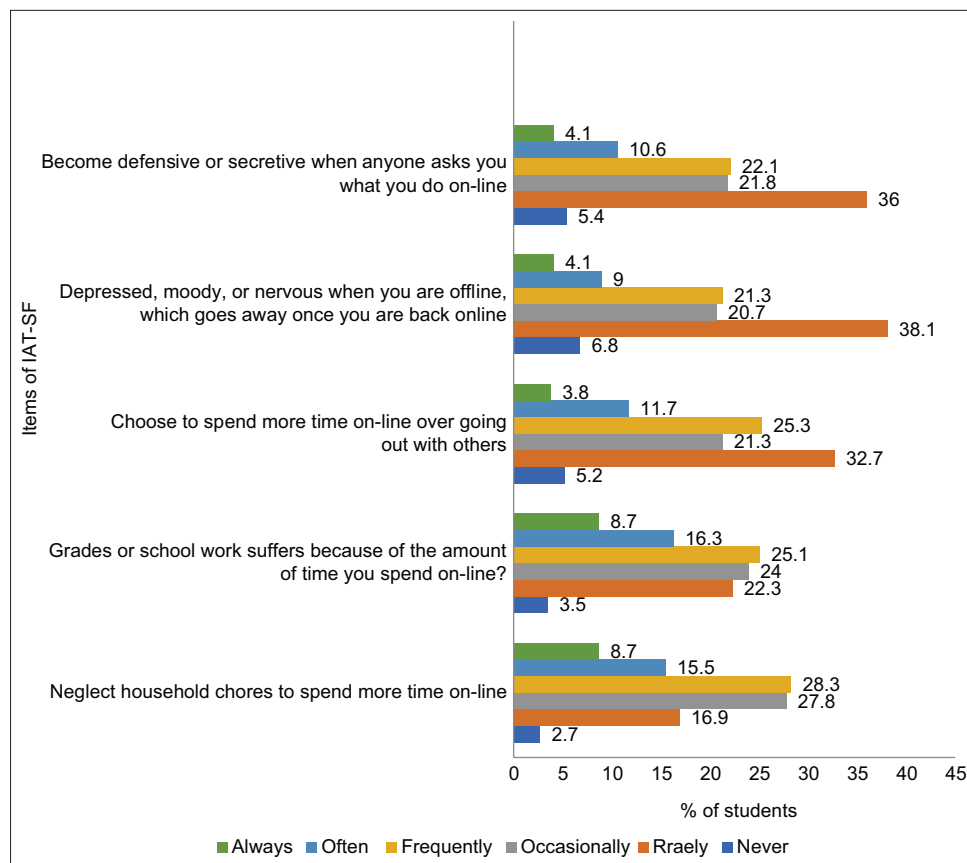


Figure 1: Specific item responses of the IAT-SF scale among the students (N = 367)

Table 3: Frequency distribution of specific items of the NMP-Q questionnaire among students (n=367)

Specific items from NMP-Q questionnaire*	n (%)							
	0*	1	2	3	4	5	6	7
I would feel uncomfortable without constant access to information through my smartphone	3 (0.8)	38 (10.4)	45 (12.3)	53 (14.4)	85 (23.2)	73 (19.9)	36 (9.8)	34 (9.3)
I would be annoyed if I could not look information up on my smartphone when I wanted to do so	8 (2.2)	33 (9)	42 (11.4)	55 (15)	74 (20.2)	64 (17.4)	52 (14.2)	39 (10.6)
Running out of battery in my smartphone would scare me	12 (3.3)	76 (20.7)	54 (14.7)	49 (13.4)	61 (16.6)	58 (15.8)	29 (7.9)	28 (7.6)
If I were to run out of credits or hit my monthly data limit, I would panic	15 (4.1)	100 (27.2)	63 (17.2)	56 (15.3)	55 (15)	33 (9)	27 (7.4)	18 (4.9)
If I could not check my smartphone for a while, I would feel the desire to check it	2 (0.8)	38 (10.4)	50 (13.6)	55 (15)	74 (20.2)	63 (17.2)	43 (11.7)	42 (11.4)
I would feel nervous because I would not be able to receive text messages and calls	8 (2.2)	37 (10.1)	48 (13.1)	42 (11.4)	72 (19.6)	69 (18.8)	42 (11.4)	49 (13.4)
I would be anxious because I could not keep in touch with my family and/or friends	4 (1.1)	36 (9.8)	47 (12.8)	45 (12.3)	71 (19.3)	66 (18)	46 (12.5)	52 (14.2)
I would be nervous because I would be disconnected from my online identity	20 (5.4)	93 (25.3)	66 (18)	57 (15.5)	62 (16.9)	32 (8.7)	20 (5.4)	17 (4.6)
I would be uncomfortable because I could not stay up-to-date with social media and online networks	19 (5.2)	83 (22.6)	64 (17.4)	50 (13.6)	67 (18.3)	49 (13.4)	16 (4.4)	19 (5.2)
I would feel anxious because I could not check my email messages	20 (5.4)	77 (21)	63 (17.2)	50 (13.6)	65 (17.7)	45 (12.3)	26 (7.1)	21 (5.7)

1=Strongly disagree, 2=Disagree, 3=Somewhat disagree, 4=Neutral, 5=Somewhat agree, 6=Agree, 7=Strongly agree

running out of battery in their smartphone would scare them [Table 3].

Effects of phone usage

Around 131 (35.7%) perceived no symptoms as a result of using cell phones while. The most common symptoms experienced as a result of eye pain [94, 25.6%] followed by sleeplessness [56, 15.3%] perceived eye strain, fatigue [41 (11.2%)], headache [33 (9%)] as a result of using cell phones over time.

A total of 216 (58.9%) students perceived that their reading habit (whether academic or non-academic) or any hobby and 182 (49.6%) students perceived that their academic performance has been affected to some extent due to their cell phone usage over time.

Predictors of internet addiction among students

On univariate analysis, male gender, course of the students, duration of cell phone usage (per day), frequency of checking cell phone (in a day), frequency of changing cell phone, time of the day when maximum use the phone, checking cell phone first in the morning, reading habit affected due to cell phone usage and hampered academic performance were found to be significant predictors of internet addiction. However, the age of the students, and the frequency of cell phone recharge were also considered for the multivariable binary logistic regression model. Age of student [adjusted odds: 0.832, 95% CI: 0.69-0.98, $P = 0.04$], male gender [adjusted odds: 2.25, 95% CI: 1.33-3.79, $P = 0.002$], duration of using a cell phone (screen time/24 hrs) [adjusted odds: 1.24, 95% CI: 1.14-1.34, $P < 0.001$], checking cell phone first in the morning [adjusted odds: 1.98, 95%

CI: 1.107-3.544, $P = 0.02$], non-leisure time of maximum cell phone usage [adjusted odds: 2.07, 95% CI: 1.25-3.4, $P = 0.004$], hampered reading habit (either academic or non-academic) or any hobbies due to cell phone usage [adjusted odds: 2.52, 95% CI: 1.26-5.01, $P = 0.009$] were found to be independent predictors of internet addiction [Table 4].

Predictors of nomophobia among students

On univariate analysis, gender, course, age of first buying a cell phone, duration of using a cell phone (screen time/24 hours), checking phone first in the morning after waking up, affected academic performance, altered reading habit (academic or non-academic) or any hobby affected and presence of internet addiction were found to be significant predictors of moderate-severe nomophobia.

However, the age of the student and frequency of phone recharge were also considered for adjustment in multivariable binary logistic regression. Duration of using the mobile phone (screen time/24 hours) [adjusted odds (95% CI): 1.103 (1.016-1.233), $P = 0.04$], checking phone first in the morning [adjusted odds (95% CI): 1.68 (1.05-2.81), $P = 0.04$], affected academic performance due to use of cell phone [adjusted odds (95% CI): 1.99 (1.079-3.68), $P = 0.02$], presence of internet addiction [adjusted odds (95% CI): 8.17 (3.56-18.76), $P < 0.001$] were identified to be independent predictors of moderate-severe nomophobia among students [Table 5].

Correlation between Internet addiction and Nomophobia

There was a statistically significant positive strong correlation between IAS-SF and NMP-Q

Table 4: Correlates of Internet addiction among students (n=367)

Factors	Categories	Internet addiction		Crude OR (95% CI)	Adjusted OR (95% CI)
		Absent [n (%)]	Present [n (%)]		
Age (in Years) [#]	Mean (SD)	20.5 (1.4)	20.3 (1.5)	0.893 ((0.76-1.046)	0.832 (0.69-0.99)*(P=0.04)
Gender [#]	Female	136 (76)	43 (24)	1	1
	Male	115 (61.2)	73 (38.8)	2.008 (1.28-3.15)*	2.246 (1.33-3.79)*(P=0.002)
Course	Nursing	88 (77.2)	26 (22.8)	1	
	MBBS	163 (64.4)	90 (35.6)	1.87 (1.12-3.105)*	
Duration (in Hours) of sleep	≤7	154 (68.8)	70 (31.2)	0.96 (0.62-1.5)	
	>7	97 (67.8)	46 (32.2)	1	
Number of gadgets used	Single	117 (66.5)	59 (33.5)	1	
	Multiple	134 (70.2)	57 (29.8)	0.85 (0.54-1.3)	
Age (in years) of buying the first smartphone	Mean (SD)	17.2 (2.03)	16.4 (2.6)	0.851 (0.770-0.939)	
Duration (in hours) of keeping phone with oneself	Mean (SD)	15.2 (6.3)	15.9 (6.4)	1.019 (0.98-1.055)	
Duration (in hours) of using phone (Screen time) [#]	Median (IQR)	5 (3-7)	7 (5-9)	1.244 (1.15-1.34)*	1.24 (1.14-1.34)*(P<0.001)
Frequency (No. of times/day) of checking cell phone	Median (IQR)	18 (10-30)	25 (11-50)	1.009 (1.003-1.014)*	
Frequency of Phone recharge ^{@#}	Frequent	113 (64.9)	61 (35.1)	1.354 (0.87-2.106)	0.648 (0.3-1.075)
	Less frequent	138 (71.5)	55 (28.5)	1	1
Frequency of internet Top-ups apart from an existing package	No	147 (71.4)	59 (28.6)	1	
	Yes	104 (64.6)	57 (35.4)	1.37 (0.88-2.13)	
Frequency (No. of times/year) of changing phone [#]	Median (IQR)	0	0	1.203 (1.027-1.409)*	1.17 (0.984-1.39)
Checking phone first in the morning [#]	No	103 (82.4)	22 (17.6)	1	1
	Yes	148 (61.2)	94 (38.8)	2.95 (1.75-5.04)*	1.98 (1.107-3.544)*(P=0.021)
Time of day when Maximum smartphone used [#]	Leisure time	145 (75.9)	46 (24.1)	1	1
	Non Leisure time**	106 (60.2)	70 (39.8)	2.082 (1.33-3.26)*	2.07 (1.25-3.4)*(P=0.004)
Reading habit [#]	No change	74 (82.2)	16 (17.8)	1	1
	Changed	177 (63.9)	100 (36.1)	2.613 (1.44-4.73)*	2.513 (1.26-5.01)*(P=0.009)
Academic performance	No change	97 (79.5)	25 (20.5)	1	
	Changed	154 (62.9)	91 (37.1)	2.29 (1.38-3.82)*	

*P<0.05 is statistically significant. #Taken for adjustment. @Frequent-Weekly, Monthly recharge, less frequent-Quarterly & yearly recharge. **Non-Leisure time includes-Before sleeping in the night, after waking up in the morning, at college, or while eating. Nagelkerke R²=0.284

scores. [correlation coefficient r = 0.604, P < 0.001] [Figure 2].

Discussion

In the Internet era with the increased gadget use, the ease of virtual communication and networking has led to various physical and psychological morbidities. The development of internet technology and resulting dependency have resulted in psychological health problems like internet addiction and nomophobia. This psycho-behavioral problem is evident in the form of the feeling of various somatic symptoms, especially among adolescents and young adults.^[5]

Our study showed that nearly one-third (31.6%) of medical students were Internet-addicted (IA). A meta-analysis also showed a pooled prevalence of IA of around 30.1%.^[11] Studies from western Maharashtra and Chandigarh showed more than half of the students (58.8-62.24%) were IA.^[25,26] A

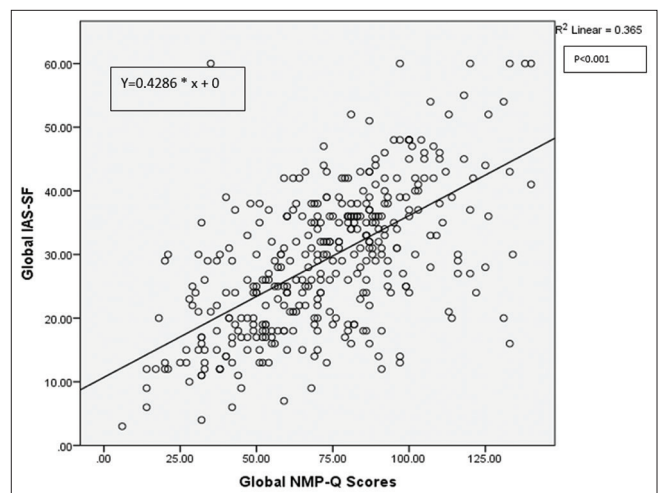


Figure 2: Scattered plot showing the correlation between Internet addiction scores and nomophobia scores among students (N = 367)

study from Nepal reported as low as 13.3% among adolescents.^[27] This high level of IA would affect sleep quality, mood (including depression), low self-esteem,

Table 5: Correlates of Nomophobia among students (n=367)

Factors	Categories	Presence of Nomophobia		Crude OR (95% CI)	Adjusted OR (95% CI)
		No-mild nomophobia [n (%)]	Moderate-severe nomophobia present [n (%)]		
Age (in Years) [#]	Mean (SD)	20.6 (1.4)	20.4 (1.5)	0.93 (0.79-1.08)	
Gender [#]	Female	73 (40.8)	106 (59.2)	1	1
	Male	47 (25)	141 (75)	2.066 (1.32-3.22)*	1.29 (0.65-2.57)
Course [#]	Nursing	52 (45.6)	62 (54.4)	1	1
	MBBS	68 (26.9)	185 (73.1)	2.282 (1.43-3.62)*	1.302 (0.643-2.76)
Duration (in Hours) of sleep	≤7	76 (33.9)	148 (66.1)	1.16 (0.74-1.8)	
	>7	44 (30.8)	99 (69.2)	1	
Number of gadgets used	Single	66 (37.5)	11 (62.5)	1	
	Multiple	54 (28.3)	137 (71.7)	1.52 (0.98-2.36)	
Age (in years) of buying first smartphone [#]	Mean (SD)	17.53 (1.8)	16.65 (2.4)	0.818 (0.72-0.91)*	0.897 (0.78-1.024)
Duration (in hours) of keeping phone with oneself	Mean (SD)	14.9 (6.2)	15.7 (6.4)	1.023 (0.988-1.05)	
Duration (in hours) of using phone (Screen time) [#]	Median (IQR)	4.5 (3-6)	6 (4-8)	1.226 (1.12-1.34)*	1.103 (1.016-1.233)* (P=0.04)
Frequency (No. of times/day) of checking cell phone	Median (IQR)	15 (15-50)	22 (22-100)	1.013 (1.004-1.021)	
Frequency of Phone recharge [®]	Frequent	60 (34.5)	114 (65.5)	1	
	Less frequent	60 (31.3)	133 (68.9)	1.17 (0.74-1.8)	
Frequency of internet Top-ups apart from an existing package	No	72 (35)	134 (65)	1	
	Yes	48 (29.8)	113 (70.2)	1.26 (0.81-1.97)	
Checking phone first in the morning [#]	No	68 (35.6)	123 (64.4)	1	1
	Yes	52 (29.5)	124 (70.5)	2.65 (1.68-4.18)*	1.68 (1.05-2.81)* (P=0.04)
Time of day when Maximum smartphone used [#]	Leisure time	59 (47.2)	66 (52.8)	1	
	Other than Leisure time**	61 (25.2)	181 (74.8)	1.318 (0.8-2.045)	
Reading habit [#]	No change	40 (44.4)	50 (55.6)	1	1
	Changed	80 (28.9)	197 (71.1)	1.97 (1.2-3.217)*	0.886 (0.455-1.72)
Academic performance [#]	No change	57 (46.7)	65 (53.3)	1	1
	Changed	63 (25.7)	182 (74.3)	2.53 (1.6-4)*	1.992 (1.079-3.676)* (P=0.02)
Internet addiction [#]	Absent	113 (45)	138 (55)	1	1
	Present	7 (6)	109 (94)	12.75 (5.7-28.5)*	8.17 (3.56-18.76)* (P<0.001)

*P<0.05 is statistically significant. [#]Taken for adjustment. [®]Frequent-Weekly, Monthly recharge, Less frequent-Quarterly and yearly recharge. ^{**}Other than Leisure time includes-Before sleeping in the night, after waking up in the morning, at college, or while eating (Nagelkerke R²=0.315)

and tendency to suicide.^[27-29] Though technology has been a boon for medical students, the ungraded access and use have been a boomerang. Further, studies need to explore the impact of IA on the intellectual development of medical students in the long run.

Age, male gender, screen time, checking the smartphone first in the morning, non-leisure time of cell phone usage, hampered reading habits, and/or any hobbies due to cell phone usage are independent predictors of IA among medical students in our study. More screen time was linked to lower psychological well-being, including decreased curiosity, low self-control, increased distractibility, trouble establishing friends, decreased emotional stability, difficulty being taken care of, and inability to complete activities.^[30] Students who engage in any form of physical activity or keep any hobbies during non-leisure hours prefer to avoid using internet-using

devices and are more likely to engage in healthful activities than using the internet. Due to their physical exhaustion, they also tend to go to bed early, making it uncommon for these students to utilize the internet until late at night.^[31] Similar predictors were reported in a study done among university students in south India.^[32] Another study from India also reported male gender, lesser age of internet usage, staying in private accommodation, mobile phone usage, and using the internet for social networking and pornography were predictors of IA among medical students.^[25] A study from Chandigarh, Northern India reported every use of alcohol and watching pornography as also predictors of problematic IA.^[26] Chen and Gau^[33] in their longitudinal study showed that dyssomnias sequentially predicted IA and IA predicted the disturbed circadian rhythm among children and adolescents. Ho *et al.*^[15] showed a positive association between IA and alcohol abuse,

attention deficit and hyperactivity disorder, depression, and anxiety. Another study from India showed students in hostel dormitories are more addicted to the internet than those staying with families which is the reverse in our study.^[34]

Maximum, 97.5% of medical students were nomophobic in our study. A systematic review reported the prevalence of nomophobia between 15.2-99.7% among young adults.^[35] Another study from India reported that almost three fourth of medical students are nomophobic (73%).^[4] Other studies from Brazil and Iran also showed that nomophobia is very much prevalent among undergraduate students.^[6,36] This may be because most students in our study were hostel dwellers and cell phone possession become a necessity to get connected with family. In our study, almost one-third (30.2%) had mild nomophobia, nearly half of medical students had moderate nomophobia (51.8%) and nearly one-sixth were severe nomophobics (15.5%). A study among nursing students revealed that 7.1%, 59.6%, and 32.7% were mild, moderate, and severe nomophobics respectively.^[1] A study by Kar *et al.*^[37] reported that 70.1% and 21.7% of medical students were moderate and severe nomophobic while Sethia *et al.*^[38] reported around 61% of students had moderate nomophobia and 6.15% had severe nomophobia. A study from Puducherry reported as high as 23.5% of severe nomophobia students.^[6] This high prevalence of severe nomophobia among medical students is a grave concern. Nomophobia being a habitual behavioral disorder hampers intellectual and skill development, personality development, communication, and correct decision-making.^[9] Communication and leadership are two of the important attribute of Indian medical graduates. Hence, nomophobia also hampers the clinical decision-making process.^[39]

In our study, the majority of the students reported varying somatic and psychological symptoms like fatigue, eye strain, headache, and sleeplessness as a result of mobile phone usage while Chandak *et al.*^[40] reported a comparatively less proportion of physical symptoms (37%). A systematic review showed symptoms of depression, increased anxiety and higher perceived stress, and poor sleep quality among problematic smartphone users.^[41] Bian and Leung^[42] in their article reported that psychological attributes like shyness and loneliness and different addiction symptoms like preoccupation, feeling anxiety, and loss are more evident with smartphone usage.

Our study reported duration of mobile phone usage, checking the phone first in the morning, an altered academic performance due to cell phone usage, and the presence of internet addiction were independent

predictors of moderate-severe nomophobia among medical students. Also, around two-thirds of medical students felt that academic performance is hampered due to cell phone usage and three fourth felt that their reading habits and hobbies are affected which is a good sign. These findings are in agreement with other studies^[43-45] which reported poor academic performance due to cell phone usage. Studies have reported a significantly longer duration of cell phone usage among nomophobics.^[36,40] Kaviani *et al.*^[46] reported younger age, more time spent on mobile phones per day significantly increased problematic dependency, prohibited use, and dangerous usage. The nomophobics are anxious about separation from their mobile phones and so there is an increase in screen time/duration of using the mobile phones. Mengi *et al.*^[47] reported altered academic performances, reduced concentration, and poor sleep quality predicted nomophobia and a study from Pakistan found only hours of usage of mobile phones per day significantly predicted nomophobia among undergraduate students.^[8] A study from urban Puducherry predicted older age, male gender, duration and frequency of mobile phone usage, checking without reason, and checking mobile phone after waking up in the morning as significant predictors of nomophobia among undergraduates.^[6] This similarity may be because the mobile phone is such a technology with increasing advancements with multiple utilities that have become an essential tool for youth and students for most day-to-day life activities. Checking the mobile phone first after waking up in the morning had 1.68 times the odds of having moderate to severe nomophobia among medical undergraduates. The proportion of students checking mobile phones first after waking up was around 65% compared to 55% as reported by Jilisha *et al.*^[6] As mobile phone usage grows, it becomes habitual among its users over time. As a result, users may unconsciously feel compelled to look through their phones or check for new messages, and notifications, which may account for the high percentage of users who checked their phones when they woke up.

In our study, nomophobia scores had a strong positive correlation with internet addiction scores ($r = 0.604$). A study from Iran showed a moderate positive correlation between nomophobia and mobile phone usage ($r = 0.402$).^[36] Sharma *et al.*^[48] showed a significant positive correlation between nomophobia and anxiety, depression, and poor quality of life. Kuscu *et al.*^[49] showed a positive correlation between nomophobia and separation anxiety, social phobia, total anxiety, depression, hyperactivity, and oppositional problems.

The patterns of IA and nomophobia remain the same all over the world. Identifying the correlates, early

detection of IA, and nomophobia among such youths and undergraduate students would become most important in the ages of rising penetration of the internet and advancement in technologies. As a primary level of prevention, it becomes important to educate medical students regarding IA and nomophobia, encourage them to appropriate use of the internet and gadgets and the harms of excessive usage, and make strategies to reduce the screen time spent on mobile phones.

Limitation and recommendation

This study is one among the very few studies conducted among medical students of India and probably the first among the eastern India region. This study has tried to correlate both IA and nomophobia and shown that they go hand in hand carrying the dual burden. Also, this study was done during the COVID-19 pandemic when all educational institutes had an online mode of classes. This study is not without limitations. Since this study was conducted in an online mode and was self-administered, we can't exclude the reporting bias. Also, this being a single-center study, we can't generalize the results. A mixed-method study design would have been a better approach to finding out the reasons for IA and nomophobia which weren't feasible to conduct. Also, the students who were found to be moderate-severe nomophobic and IA couldn't be given an intervention by trained clinical professionals as it was out of the scope of the study. Also, we couldn't correlate nomophobia with academic performance.

This study highlights that internet addiction and nomophobia go hand in hand. considering the sample group of medical students and the sensitivity of their future work, IA and nomophobia can have irreparable consequences on the work performance of this group of individuals. Medical and other educational schools should make their students aware of IA and nomophobia when they initially join educational institutes so that the primary level of prevention is achieved. Since IA and nomophobia are easily screened using screening tools, the students can be screened routinely and those detected to have moderate to severe nomophobia and IA should be given an appropriate intervention by trained medical persons to prevent the adverse effects on their mental health and academics.

Conclusion

One and two out of every three medical students were found to have internet addiction and moderate-severe nomophobia respectively. The young age of buying a cell phone, male gender, increased screen time, checking

the phone first in the morning after waking up, using the phone other than leisure time, and altered reading habits were independent predictors of internet addiction and increased screen time, altered academic performance and internet addiction were independent predictors of moderate-severe nomophobia. There is a very thin line between cell phone usage, addiction, and nomophobia. The educational institutes, peers, and parents ensure that the vulnerable groups should be educated regarding nomophobia and made aware of the harmful effects of this gadget addiction on mental health and personal progress. Giving adequate information regarding nomophobia and internet addiction along with proper counseling of the students by trained professionals will help to overcome and prevent further hike of nomophobia.

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Conflicts of interest

There are no conflicts of interest.

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