

Research

Prevalence and determinants of no mobile phone phobia among university students: an Italian multicenter study

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Abstract

Objective As the Internet has undergone a significant increase, the smartphone has become the primary electronic device used for accessing it. However, several adverse effects on health and also psychological disorders, such as the fear of not being able to use a mobile phone and/or its services, called nomophobia, may be related to their use. This multicenter study was aimed at evaluating the prevalence, the correlates and the predictors of nomophobia in a large sample of university students recruited throughout the Italian territory.

Methods Students attending 12 Italian universities were asked to complete a web-based questionnaire investigating their sociodemographic and behavioral characteristics and including the Nomophobia-Questionnaire, items from the Generalized Anxiety Disorder and the Patient Health Questionnaire.

Results out of 1303 respondents (mean age 24.1 ± 4.4 , 69.5% females), 454 (34.8%) showed a medium/severe profile of nomophobia which seems to be related with attention to diet (PR 0.831, 95%CI 0.715–0.966, $p=0.016$), physical activity levels (PR 0.799, 95%CI 0.682–0.934, $p=0.005$), and alcohol consumption (PR 1.290, 95%CI 1.010–1.647, $p=0.042$). Furthermore, nomophobia was slightly related with a predisposition to anxiety ($\rho=0.2312$, $p<0.001$) and depression ($\rho=0.0699$, $p=0.0116$).

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Conclusions The results indicated that in the sample examined nomophobia profile is associated with unhealthy behaviors, and then this finding suggested that awareness and control of health risks related to the use of mobile phones should be increased in the population examined.

Keywords Addiction · Lifestyle · Nomophobia · Smartphone · Undergraduate

1 Introduction

In recent years, the use of the internet has significantly increased, and the smartphone has become the primary electronic device used for accessing to it [1]. The possibility to easily access to the internet through smartphones has changed the way people live, study, work, and communicate. The purposes for using internet and smartphones include in fact communication as well as educational activities, information, entertainment, gaming, social networking, online shopping, and, to a lesser extent, gambling and searching for sexual contents [1]. While this phenomenon affects all age groups, it is particularly prevalent among the younger generation, especially university students [1]. Notwithstanding the wide availability of internet access through smartphones and other devices comes with multiple advantages [2, 3], it also poses a serious problem for an increasing number of people. The fear of internet addiction dates back to the end of the previous century [4]. Currently, both the American Psychiatric Association [5] and the World Health Organization [6] recognize the impact that technology addictions can have on mental health. For example, social media addiction, internet gaming disorder or problematic use of online pornography may result in a disruption of personal relationships in the real world and affect psychological wellbeing [5, 6]. The excessive use of digital technologies has been acknowledged as a public health problem [7]. Due to its portability, the smartphone has the potential to create a high level of dependence and is a significant risk factor for problematic and addictive behaviors [8, 9]. In particular, a construct of growing interest and deserving further investigation is related to the so-called “Nomophobia”, which stands for “no-mobile-phone phobia”, an acronym coined by the authors of a study from the UK Post Office in 2008 [10]. Nomophobia refers to the fear of not being able to use a mobile phone and/or its services [11]. Over the years, its prevalence has grown, ranging from 6 to 73% among different populations [12]. Besides, the global COVID-19 pandemic has increased even more the usage time of these devices [13]. The phenomenon primarily affects teenagers and young adults [14], including university students, who generally show a not negligible prevalence of severe nomophobia [15–17]. The main problems related with nomophobia in this population are poor academic performance and sleep disturbances, as nomophobia can be associated with anxiety, stress, dependence, low self-esteem, social problems, and fear, followed by feelings of frustration and obsessive thoughts [18, 19]. In particular, it appears that smartphone use can play a role in dealing with stress and become an impulsive/compulsive behavior to relieve anxiety [20]. Additionally, excessive mobile phone use is associated with detrimental effects on physical health, such as repetitive motion injuries, pain in elbows, wrists, back, shoulders, thumbs, index, and middle fingers, as well as migraines and numbness due to constant use of the mobile phone [1].

King and Yildirim were the first researchers to investigate nomophobia [10, 17]. In particular, King et al. considered nomophobia as one of the disorders of the twenty-first century arising from information and communication technologies [10, 17, 21]. It was hypothesized that nomophobia stems from the fear of being unable to communicate with others and being separated from the cellphone or disconnected from the internet [10]. In another study, King et al. described nomophobia as a situational phobia characterized by the fear of becoming distressed and not receiving any assistance [21].

Some studies have investigated the relationships existing between nomophobia and sociodemographic characteristics, psychopathological symptoms, and lifestyle-related variables, showing so far positive associations with smartphone use, insomnia, panic disorder, anxiety and depression, a protective role of education, relationships with family and friends, and engagement in physical activity, no correlations with weight status, alcohol use or smoking, and an uncertain role of age and gender [12, 20, 22–24]. However, research aimed at identifying the predictors and correlates of nomophobia is still too scarce to definitely affirm these associations, especially among undergraduates from European countries, including Italy [9, 18, 25]. Therefore, the present study was aimed to provide an estimate of the prevalence of nomophobia among Italian university students. Furthermore, we aimed to assess in the same population a possible relationship between nomophobia, anxiety and depression and the possible role of sociodemographic and behavioral characteristics as predictors of nomophobia.

2 Materials and methods

2.1 Study design and participants

This was a cross-sectional study performed between December 2022 and May 2023 among undergraduate and post-graduate students from twelve Italian universities chosen by convenience. In the course of their classes, the researchers presented the aims of the study to the students and invited them to fill in a questionnaire, assuring them about the anonymity of data collection, storage, elaboration and publication in line with the privacy regulations. Informed consent was obtained from all participants before completing the questionnaire.

The study was performed in line with the principles of the Declaration of Helsinki. The Ethical Board of the University “Foro Italico” approved the protocol of the study (CAR 140/2022).

2.2 Questionnaire

A questionnaire was developed by the research team to assess demographic characteristics, nomophobia, and associated correlates among participants. The first part of the questionnaire was aimed to collect the general characteristics of the participants (age, gender, weight and height, university, and sentimental status) and to investigate their lifestyles: smoking cigarettes habit (no/yes, sometimes/yes, usually), consumption of alcoholic beverages (no/yes, sometimes/yes, usually), adoption of specific dietary regimens (no/yes), minutes dedicated to moderate physical activity during the week, and participation in sports (no/yes). The second section of the questionnaire was aimed to identify specific nomophobia symptoms. In particular, we used the Nomophobia Questionnaire (NMP-Q), an instrument developed by Yildirim and Correia who operationalized this theoretical construct into a research tool consisting of a self-reported measure which examines our relationship with smartphones [17]. NMP-Q is a 20-item scale that evaluate the following four dimensions of nomophobia: 1. not being able to communicate; 2 losing connectedness; 3. not being able to access information; 4. giving up convenience. All the items are rated on a seven-point Likert scale (1 = strongly disagree and 7 = strongly agree). At the end, it provides a score which can be indicative of the level of nomophobia (up to 20 absent, 21 to 59 mild, 60 to 99 medium, and 100 to 140 severe). This tool is the most commonly used instrument in prevalence studies [21–26] and the Italian version was validated in a previous study, showing a good internal consistency (Cronbach α coefficient = 0.95) [27]. Besides, the psychometric properties of the Italian version of the NMP-Q were further evaluated by Soraci et al. [25], that recovered a Cronbach's alpha equal to 0.85 and for 0.87, 0.86, 0.84, and 0.83 the four subscales, respectively. No troublesome univariate outlier was found observing interquartile ranges of four variables.

In order to highlight possible association between nomophobia, anxiety and depression among respondents, two items for the calculation of the Generalized Anxiety Disorder 2-item (GAD-2) and two for the computation of the Patient Health Questionnaire-2 (PHQ-2) have also been included in the questionnaire [28, 29]. Both these scales allow to assign an overall score from 0 to 6 points to each answer; a score of 3 points is the cut-off for identifying potential cases in whom additional diagnostic examination for generalized anxiety disorder or major depressive disorder is indicated. The psychometric properties of GAD-2 and PHQ-2 were assessed by Bisby et al. [30] which demonstrated appropriate reliability (Cronbach's α = 0.79–0.84), validity (significant higher scores in individuals with a diagnosis), responsiveness to treatment change and favored value of specificity over sensitivity.

The Google modules platform was used to administer the questionnaire. All responses were coded and incorporated into a database to perform statistical analysis.

2.3 Statistical analysis

Continuous variables were represented by mean and standard deviation (SD), whilst categorical variables were represented by number and percentage of respondents for each category. Height and weight of participants were used to calculate their body mass index (BMI) as a measure of their nutritional status. BMI was used to categorize participants as underweight, normal weight, overweight and obese on the basis of the WHO recommendations [31].

Univariate analyses were performed using the chi-squared test and the Wilcoxon rank sum test to investigate possible differences in the characteristics of the respondents grouped by level of nomophobia: absent/mild (NMP-Q score from 0 to 59) and medium/severe (NMP-Q score \geq 60). This dichotomization was preferred to that considering absence versus

presence of nomophobia, following the recommendation by León-Mejía et al. [20]. BMI values were dichotomized in two categories: lower than the median value and equal or higher than the median value; weekly time spent in physical activity was categorized by referring to the WHO guidelines, which recommend the achievement of at least 150 min per week of moderate physical activity [32]. The association between nomophobia, anxiety and depression scores was also investigated through Spearman's correlation analysis (weighted for age and gender) and by Wilcoxon rank-sum (Mann–Whitney) test. The possible effect of gender in determining predisposition to anxiety and depression was assessed through the chi-squared test. In order to identify possible predictors of nomophobia, a robust Poisson regression model was built by considering having NMP-Q score ≥ 60 as dependent variable and those socio-demographic and lifestyle-related variables that showed significant differences between nomophobia level groups in the univariate analyses as independent variables. The analysis was performed controlling for age and gender. Results were expressed as Prevalence Ratio (PR) and related 95% Confidence Intervals (95%CI). The $p = 0.05$ significance threshold was assumed. The statistical software STATA, version 17.0, was used for the analyses (StataCorp LLC, College Station, Texas USA).

3 Results

On a total of 1325 questionnaires collected, 1303 were included in the study based on complete data. Table 1 shows the main characteristics of the sample.

The sample had a mean age of 24.1 ± 4.4 years and was composed mainly by females and normal weight students. Northern and southern Italian universities were more represented. In total, 87.0% of participants used electronic devices more than two hours daily and 83.8% of them declared to use these devices almost every night or every night.

Table 1 Characteristics of participants

| Variable | Value |
|---|----------------|
| <i>Age (years)</i> | |
| Mean value \pm SD | 24.1 \pm 4.4 |
| Median value (interquartile range) | 23 (4) |
| Range | 18–40 |
| <i>Gender n (%)</i> | |
| Females | 906 (69.5) |
| Males | 386 (29.6) |
| Not specified | 11 (0.8) |
| <i>BMI (kg/m²)</i> | |
| Mean value \pm SD | 22.7 \pm 3.7 |
| Median value (interquartile range) | 22.1 (4.1) |
| Range | 16–43 |
| <i>Category n (%)[†]</i> | |
| Underweight | 91 (6.98) |
| Normal weight | 952 (73.06) |
| Overweight | 202 (15.50) |
| Obese | 58 (4.45) |
| <i>Area n (%)[†]</i> | |
| North | 486 (37.7) |
| Center | 291 (22.6) |
| South | 512 (39.7) |
| <i>Daily use of electronic devices</i> | |
| ≤ 2 h | 169 (13.0) |
| > 2 h | 1134 (87.0) |
| <i>Night-time use of electronic devices</i> | |
| Never/sometimes | 211 (16.2) |
| Almost every night/every night | 1092 (83.8) |

[†]Percentages are calculated on the number of respondents to each question

Fig. 1 Percentages of participants included in the different nomophobia levels as defined by NMP-Q score

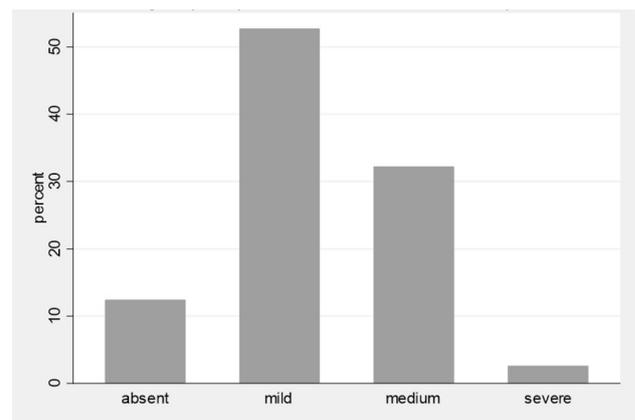


Figure 1 shows the distribution of participants by nomophobia level, as defined by the NMP-Q score.

A total of 454 respondents (34.8% of the total sample) showed a medium/severe profile of nomophobia.

Table 2 reports the differences in general characteristics and lifestyles of participants between absent/mild and medium/severe nomophobia groups.

The participants' predisposition to anxiety or depression according to gender is reported in Table 3.

No significant differences related to these variables were found.

Students that present a medium/severe grade of nomophobia have a higher mean age than students with an absent/mild grade.

The group with medium/severe nomophobia showed significantly higher proportion of students coming from northern universities, with no particular dietary habits, lower engagement in physical activity and higher alcohol consumption than the group with lower NMP-Q score.

Nomophobia scores were higher among participants with higher predisposition to anxiety and depression (Fig. 2a, b).

The Spearman's correlation analyses showed slight, although significant, positive associations between NMP-Q and GAD-2 score (Spearman's $\rho = 0.2192$, $p < 0.001$) and between NMP-Q and PHQ-2 scores (Spearman's $\rho = 0.112$, $p = 0.0116$). The Wilcoxon rank sum tests confirmed the higher level of nomophobia score among participants with higher level of anxiety and depression scores ($z = -6.887$, $p < 0.001$ for GAD-2 score, $z = -5.628$, $p < 0.001$ for PHQ-2 score, respectively).

In the regression analysis, having a higher level of nomophobia was negatively related with following a particular diet regimen and spending at least 150 min/week in moderate/vigorous physical activity, and positively associated with habitual alcohol consumption (Table 4).

4 Discussion

As the popularity of the smartphone considerably increased in the last decades, it became a concern for public health because physical and psychological negative health outcomes, including nomophobia, can be associated with its use [20]. Thus, our study was aimed to evaluate the prevalence of nomophobia and possible correlates and predictors of this condition among Italian university students. To our knowledge, this is the first study in a European country on nomophobia among a large sample of students attending different degree courses from Northern, Central, and Southern Italy universities.

The first interesting finding is that more than 80% of the studied subjects had a mild/medium grade of nomophobia. This result is in line with data reported by Vagka et al. [33], that studied a sample of Greek university students and recovered about 81% of mild/moderate level of nomophobia. Another study carried out by Tavalacci et al. [34] on French college students reported that almost one third of the samples suffered from nomophobia. Differences of the results found in France respect to those recovered in the present study and in Greece can be attributed to some reasons: first of all, Tavalacci et al. [34] used another tool for evaluating nomophobia and, furthermore, they reported the overall nomophobia data. Besides, French study was performed in 2013–14 when the use of mobile phone was more limited, as demonstrated also by the percentage of students having a smartphone equal to 79.6% [34] and not 100% as found in the Greek study [33] and in the present one.

Table 2 Differences in characteristics and behaviors of participants grouped by level of nomophobia

| Variable | Absent/mild nomophobia | Medium/severe nomophobia | <i>p</i> value [†] |
|----------------------------|------------------------|--------------------------|-----------------------------|
| Age | 23.9 (±4.3) | 24.4 (±4.5) | 0.018 |
| <i>Gender</i> | | | |
| Female | 590 (69.91) | 316 (70.54) | 0.814 |
| Male | 254 (30.09) | 132 (29.46) | |
| <i>Area</i> | | | |
| North | 290 (34.56) | 196 (43.56) | 0.001 |
| Center | 186 (22.17) | 105 (23.33) | |
| South | 363 (43.27) | 149 (33.11) | |
| <i>Sentimental status</i> | | | |
| Engaged | 349 (41.11) | 192 (42.29) | 0.680 |
| Not engaged | 500 (58.89) | 262 (57.71) | |
| <i>BMI</i> | | | |
| < 22.1 kg/m ² | 424 (49.94) | 215 (47.36) | 0.374 |
| ≥ 22.1 kg/m ² | 425 (50.06) | 239 (52.64) | |
| <i>Dietary habit</i> | | | |
| No particular regimen | 365 (42.99) | 234 (51.54) | 0.003 |
| Particular regimen | 484 (57.01) | 220 (48.46) | |
| <i>Physical activity</i> | | | |
| < 150 min/week | 443 (52.18) | 406 (47.82) | 0.001 |
| ≥ 150 min/week | 281 (61.89) | 173 (38.11) | |
| <i>Sport</i> | | | |
| No | 392 (46.17) | 225 (49.56) | 0.243 |
| Yes | 457 (53.83) | 229 (50.44) | |
| <i>Smoking habit</i> | | | |
| No | 540 (63.60) | 287 (63.22) | 0.316 |
| Yes, sometimes | 115 (13.55) | 74 (16.30) | |
| Yes, usually | 194 (22.85) | 93 (20.48) | |
| <i>Alcohol consumption</i> | | | |
| No | 138 (16.25) | 71 (15.64) | 0.006 |
| Yes, sometimes | 593 (69.85) | 289 (63.66) | |
| Yes, usually | 118 (13.90) | 94 (20.70) | |
| <i>Anxiety</i> | | | |
| No | 458 (53.95) | 172 (37.89) | <0.001 |
| Yes | 391 (46.05) | 282 (62.11) | |
| <i>Depression</i> | | | |
| No | 597 (70.32) | 269 (59.25) | <0.001 |
| Yes | 252 (29.68) | 185 (40.75) | |

[†] Chi-squared test.

p values <0.05 are reported in bold

Table 3 Differences in predisposition to anxiety or depression according to gender

| Variable | Predisposition to anxiety | | Predisposition to depression | | |
|----------------|---------------------------|------------|------------------------------|------------|------------|
| | No | Yes | No | Yes | |
| Gender n (%) | Male | 198 (51.3) | 188 (48.7) | 261 (67.6) | 125 (32.4) |
| | Female | 429 (47.3) | 477 (52.7) | 600 (66.2) | 306 (33.8) |
| Total | 627 | 665 | 861 | 431 | |
| <i>p</i> value | 0.194 | | 0.627 | | |

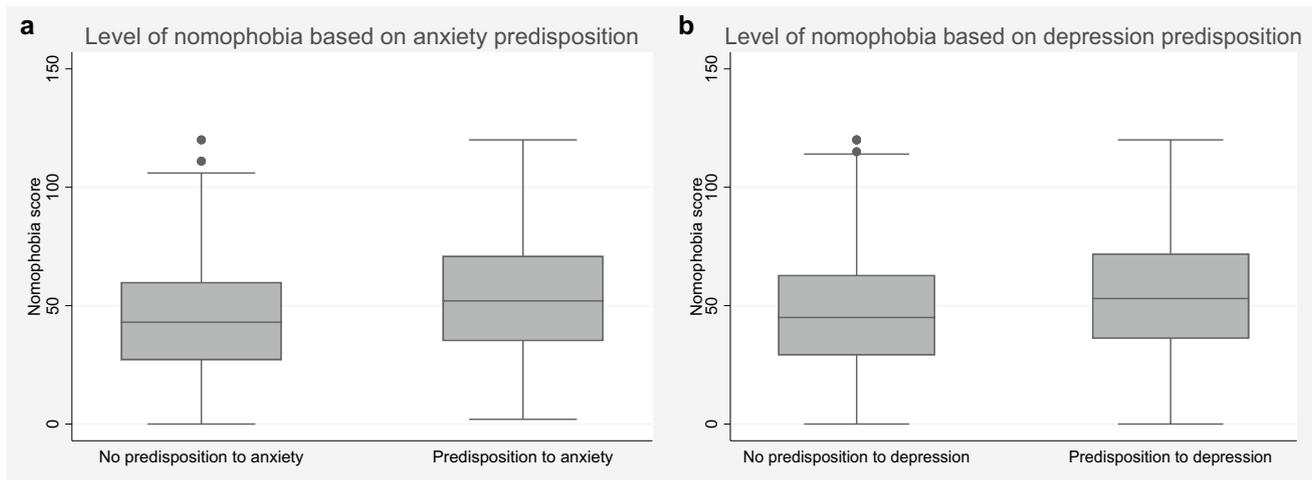


Fig. 2 **a, b** Differences in NMP-Q scores between participants predisposed or not to anxiety ($p < 0.001$) and depression ($p < 0.001$). Statistical significance was assessed using Wilcoxon rank sum test

Table 4 Results from the robust Poisson regression analysis performed considering the medium/severe level of nomophobia as dependent variable

| Variable | PR (95%CI) | <i>p</i> value |
|-----------------------|----------------------------------|----------------|
| Age | Reference 1.010 (0.995–1.026) | 0.197 |
| Gender | | |
| Female | Reference | |
| Male | 1.027 (0.870–1.211) | 0.756 |
| Dietary habit | | |
| No particular regimen | Reference | |
| Particular regimen | 0.831 (0.715–0.966) | 0.016 |
| Physical activity | | |
| < 150 min/week | Reference | |
| ≥ 150 min/week | 0.799 (0.682–0.934) | 0.005 |
| Alcohol consumption | | |
| No | Reference | |
| Yes, sometimes | 0.085 (0.795–1.220) | 0.889 |
| Yes, usually | 1.290 (1.010–1.647) | 0.042 |

p values <0.05 are reported in bold

The second relevant finding is that 2.5% of participants had a severe form of nomophobia. This value is lower than that reported in a recent systematic review and meta-analysis which reported a prevalence of university students affected by severe nomophobia of approximately 25% [15] and that reported in another review considering adult populations [20]. This inconsistency can be determined by differences in social and cultural features of the populations examined, but mainly by the different methodological approaches used for assessing nomophobia, which make it difficult to draw conclusive evidence [20]. Furthermore, it should be considered that even those studies which used NMP-Q to assess nomophobia chose to report their results in different ways such as mean or total scores, prevalence or severity level groups [20].

Besides, our sample showed no significant differences in nomophobia level according to gender. This is in line with the results reported by previous studies [14, 35–37]. Conversely, other researchers reported that females have higher rates of nomophobia than males [38–40], while other studies recovered a higher prevalence of nomophobia in the male population compared to the female one [41, 42]. Likely, gender differences are linked to other additional predictors in a complex interaction that overall leads to the development of nomophobia. Similar complex interactions can explain the finding related to age, that was significantly associated to nomophobia in the univariate analysis, but not in the regression model. With reference to this, although the age range of our sample was probably not wide enough to show

age-related differences, it was argued that specific cut-off points for nomophobia should be defined by gender and age, and also within different countries and cultural settings, in order to address the heterogeneity of findings coming from different studies [20].

Another relevant result is related to the relationship between the investigated lifestyle behaviours and nomophobia. First of all, we found that practicing physical activity and following a particular dietary regimen were negatively associated with nomophobia. These results agree with those reported by previous studies [20, 40]. Secondly, we found that smoking was not associated to the studied condition, while drinking alcohol is a significant risk factor for it. Even for these variables, the results reported by scientific literature in this field are partially in contrast, because some studies did not find significant differences in students' nomophobia based on smoking and drinking alcohol [22, 43], while others found that these lifestyles behaviours were significant risk factors for nomophobia [42].

According to Gonçalves et al., who underline that individuals with higher levels of education and better relationships with family and friends tend to have less nomophobic symptoms, we recovered that healthy lifestyle behaviours, for example physical activity, was a protective factor for nomophobia [20]. This last finding could be explained by the fact that individuals who generally are more motivated in maintaining their health adopt healthy lifestyle behaviours. Although more research is needed, according to Nawi et al., people who desire a healthy lifestyle are more likely to be protected from involvement in addictive behaviours [44].

According to literature, individuals who show some psychopathological symptoms are at higher risk to look for new experiences and to develop compulsory behaviours or, in the worst case, addiction [45]. For example, a previous European study reported that college students with severe grade of nomophobia also significantly exhibit severe levels of negative emotional states, such as depression, anxiety, and stress [46]. In the present study, nomophobia score resulted significantly positively associated to anxiety and depression scores. Although the strength of these associations was not high than that found in other studies [16], they are worth of concern since excessive mobile phone use may contribute to the development of symptoms of anxiety and depression and, at the same time, subjects with a tendency to suffer from anxious and depressive disorders may be at higher risk to develop a dependence on mobile phone technologies than others [42]. Therefore, in a public health perspective, this aspect increases the need to pay attention to the high prevalence of nomophobia in this population group.

This study presents some limitations. First of all, the universities were chosen by convenience and not randomly; thus, the sample cannot be considered representative of the whole Italian undergraduate population. Moreover, female gender was the most represented in the sample. Although it was shown that this did not affect the predisposition to anxiety and depression, it is possible that some other variable was influenced by gender differences. Besides, the data collected were self-reported and it is possible that some responses were not completely accurate. In addition, the survey was carried out throughout the 2022/2023 academic year, that is immediately after the more strictly COVID-19 pandemic period. In that period, the isolation measures related to the pandemic had remarkable consequences on people's health and behaviors [44–49]; consequently, it is possible that the prevalence of nomophobia and the related predictors changed during that period. Indeed, some evidence highlights that the incidence of nomophobia increased during the COVID-19 home confinement [50, 51]. Nevertheless, the present study was not aimed to investigate changes occurring in prevalence of nomophobia during the COVID-19 pandemic. This represents an interesting topic and should be further explored. Finally, we did not collect information about some possible predictors affecting nomophobia because of the length of the questionnaire. Since literature shows that a too long questionnaire can desensitize participants to answer personal questions and they can lose attention, we choose to limit the number of the questions [52]. However, many other factors could represent predictors of nomophobia and they should be investigated in further studies.

5 Conclusions

Our results suggest that nomophobia is a phenomenon notably represented among Italian university students and it seems to be related with unhealthy attitudes and behaviors, such as low attention to diet, low physical activity level, and high alcohol consumption. Furthermore, a slight correlation with a predisposition to anxiety and depression was also found. These findings confirm evidence coming from other countries and should encourage public health operators, especially those with a specific expertise in public mental health, to implement preventive strategies in order to control nomophobia. However, some inconsistencies with existing literature have been met. The reasons for these differences may lie in cultural and societal characteristics of the populations investigated. In order to counteract nomophobia,

further research involving representative samples should be focused on the clear identification of its predictors, maybe through the use of setting-specific tools.

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Declarations

Competing interests The authors have no relevant financial or non-financial interests to disclose.

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