





Nomophobia and Self-esteem: The Influence of Digital Media on the Leisure Activities of Peruvian Adolescents



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Abstract:

Background: Nomophobia is a public health problem of the digital age.

Objective: We aimed to assess the self-esteem and prevalence of nomophobia among high school students, and identify the factors and risks associated with them.

Materials and Methods: The study was a quantitative, descriptive, cross-sectional, and correlational study. A logistic regression model was used to assess the risk of nomophobia. The research was conducted in the northern area of the city of Lima, Peru, in 2023. High school students between the ages of 11 and 18 years participated. Nomophobia and self-esteem were assessed using the Nomophobia Questionnaire (NMP-Q) and the Rosenberg Self-Esteem Scale, respectively.

Results: A total of 630 students with a median age of 15 years (Q1 = 14, Q3 = 16, IQR = 2) participated. Regarding nomophobia, 65.4% (n = 412) presented a risk of nomophobia, and 20.6% (n = 130) had nomophobia. Regarding the level of self-esteem, 24.9% (n = 157) had a low level, 52.4% (n = 330) had a medium level, and only 22.7% (n = 143) showed a high level of self-esteem. The variables associated with a higher frequency of nomophobia were medium socioeconomic level ($p = 0.043$), navigating the internet and video games ($p = 0.010$), and low self-esteem ($p = 0.009$). Navigating the internet during leisure time had a significant association with an increased risk of nomophobia [Wald $\chi^2 = 6.093$, $p = 0.014$, OR = 2.281 (95%CI: 1.185 to 4.390)].

Conclusion: Nomophobia is a frequent problem among adolescents, and there is also a significant presence of low self-esteem. The consumption of digital media during leisure time, particularly navigating the internet, increases the risk of nomophobia among adolescents. Thus, the responsible use of digital media and activities that strengthen the self-esteem of adolescents must be promoted.

Keywords: Digital technology, Technology addiction, Mobile phone addiction, Self-concept, Adolescent, Digital media.

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1. INTRODUCTION

The number of cell phone subscriptions worldwide is

close to 9 billion. In addition, 96% of the world's digital population uses a mobile device to connect to the internet

[1]. In the population between 16 and 24 years of age, the main reasons for internet use are to contact friends and family and search for information [2].

The internet and devices, such as tablets and smartphones, along with social networking platforms and messaging applications, have become an integral part of the lives of young people around the world [3]. Teens use digital media to develop their sense of identity, purpose, and fulfillment, and contribute to their communities. On the other hand, formal and informal learning can be enhanced through digital media [4].

The term nomophobia is derived from the expression “no mobile phone phobia”, which describes a psychological state in which people are afraid of disconnecting from cell phone connectivity [5]. It is a type of contemporary phobia that has emerged in the digital era and negatively impacts mental and emotional health, especially in young people [6]. Nomophobia is a public health problem of the digital age, and has a direct and significant relationship with the use of the internet, dependence on social networks, and anxiety [6].

Nomophobia is related to both mental and physical problems. People with anxiety, stress, depression, self-esteem problems, personality disorders, and other psychosocial disorders are more likely to suffer from nomophobic behaviors [6, 7]. Nomophobia is also associated with physical health problems, such as musculoskeletal problems, headaches and fatigue, eye strain and tearing, and sleep problems [7]. The disorder can also have repercussions on studies, work, and personal relationships [6]. Women and young people seem to be more vulnerable to nomophobia [8].

Adolescence is the most critical stage to suffer from nomophobia, as well as other symptoms, such as internet and video game addiction [6]. The effects of Digital Technology (DT) use on adolescents are mostly ambivalent, although the negative effects are slightly emphasized. The active use of DT that aims to establish meaningful social connections may have positive effects, whereas passive use is likely to have negative effects [9]. DT consumption has positive effects on brain development, cognitive development, socioemotional development, and mental health and well-being in adolescents [10].

There is a strong positive correlation between nomophobia and problematic cell phone use. People with scores corresponding to severe levels of nomophobia are 11.7 times more likely to be problematically dependent on their cell phones compared to those without nomophobia. Greater time spent on phone use is significantly associated with higher levels of nomophobia across all demographic groups [11].

In Peru, in a previous study among university students, the reported frequency of nomophobia and the risk of nomophobia were 19.6% and 65.6%, respectively [12]. College students appear to have the highest prevalence of all nomophobia symptoms compared to the general adult population and high school students [13]. Considering that

the vast majority of Peruvian households have telephone services and internet access, where 84.9% of the population between 12 and 17 years of age has access to the internet and 86.4% of children and adolescents access the internet *via* cell phone [14], it suggests the existence of nomophobia among high school students. Nomophobia and self-esteem in basic education are still phenomena that require more in-depth knowledge. Identifying the associated factors and the specific risks involved for students at this stage is fundamental to designing effective prevention strategies and promoting the healthy use of digital technologies. This study was carried out on high school students from the northern area of the city of Lima. It had the following objectives: 1) to assess the prevalence of nomophobia among and the self-esteem of high school students, and 2) to identify the risk factors associated with nomophobia and self-esteem among adolescents.

2. MATERIALS AND METHODS

2.1. Approach, Design, and Scope of the Study

This was a quantitative, descriptive, cross-sectional, and correlational study. The study was conducted in two districts (“Independencia” and “Comas”) located in the northern area of the city of Lima.

2.2. Study Population and Sample

The population consisted of students from two public high schools “Gran Bretaña” and “República de Cuba”, located in the districts of “Independencia” and “Comas”, respectively. These high schools were chosen due to the cooperation of their authorities in facilitating data collection. The population of both schools was 1500 students aged 11 to 18 years. The following formula was used to estimate the sample:

$$n = [EDFF * Np (1-p)] / [(d^2 / Z_{21-\alpha/2}^2 * (N-1) + p*(1-p)]$$

The following were considered: N = 1500, design effect (EDFF = 1), expected proportion (p) of 50%, precision (d) of 5%, and a certainty of 95% ($Z_{21-\alpha/2} = 1.96$). The minimum calculated sample was 384 participants. In the present study, 663 students were recruited.

2.3. Study Variables

Nomophobia: It is a psychological condition when people have a fear of being detached from mobile phone connectivity. The usual symptoms and signs of nomophobia include anxiety, respiratory alterations, trembling, perspiration, agitation, disorientation, and tachycardia [5]. The manifestations of nomophobia were measured with the Nomophobia Questionnaire (NMP-Q), an instrument widely used in both adolescents and adults [15]. Self-esteem: It is defined as a positive or negative attitude towards oneself [16]. The Rosenberg Self-esteem Scale [17] was used for its evaluation.

2.4. Measuring Instruments

The Nomophobia Scale (NMP-Q) [18] was used to assess nomophobia. This scale has a version adapted to Spanish [19], and also has validity and reliability studies in the Peruvian context [20]. The instrument consists of 20

items, distributed in 4 dimensions: inability to communicate (6 items), loss of connection (5 items), inability to access information (4 items), and relinquishment of comfort (5 items). Each item is scored using a 7-point Likert scale, from number 1 corresponding to “strongly disagree” to number 7 corresponding to “strongly agree”. Total scores are calculated by summing the responses to each item, and can range from a minimum of 20 (20x1 point) to a maximum of 140 (20x7 points), with higher scores corresponding to greater severity of nomophobia [18-20]. To classify nomophobia levels, cut-off points based on the 15th, 80th, and 95th percentiles were taken into account, establishing the following categories: absence of nomophobia (<p15), risk of nomophobia ($\geq p15 < p80$), and nomophobia ($\geq p80 < p95$ and $\geq p95$) [21].

The assessment of self-esteem was performed using the Rosenberg Self-esteem Scale, an instrument widely used in various fields that can be used in multiple cultures [17]. In Peru, this instrument provides evidence of validity and internal consistency suitable for use in Peruvian adolescents [22]. The scale is composed of 10 items, with 5 expressed in positive statements (1, 3, 4, 6, 7) and 5 in negative statements (2, 5, 8, 9, 10), rated on a Likert scale (1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree). Negatively addressed statements are assigned the inverse score. The overall score ranges between 10 and 40 points, from which three levels of self-esteem are established: low (10-25), medium (26-29), and high (30-40) [16].

2.5. Data Collection Procedures

Data collection was conducted through the utilization of a survey in both physical and virtual formats. At the “Gran Bretaña” high school, a face-to-face survey using the physical questionnaire was used. The face-to-face survey was carried out together with the classroom teacher; the surveyors made a brief presentation indicating the objectives of the study, following the indications in the previous trainings. At the “República de Cuba” high school, the virtual survey was prepared using the Google form, the link to which was given to the classroom teachers for its subsequent distribution and development during the students' available time. The survey was conducted between November and December 2023.

2.6. Statistical Analysis

The database generated in Microsoft Excel was debugged and coded, and then exported to IBM SPSS, version 26, for its respective processing. For variables, such as age, nomophobia, and self-esteem scores, the normality test (Kolmogorov-Smirnov) was performed, and descriptive statistics were estimated. For the comparison of median values according to sex, the Mann-Whitney U test was used. Using qualitative variables and categorized numerical variables, the respective frequencies were estimated. The Chi-square statistic was used in the bivariate analysis, with a value of $p < 0.05$ considered significant. For the variables that were found to be

significant, binary logistic regression was performed, taking the presence or absence of nomophobia as the dependent variable with its respective dummy coding.

Table 1. General characteristics of the adolescents.

General Characteristics	n	%
Total	630	100.0
Sex	-	-
Female	300	47.6
Male	330	52.4
Age (years)	-	-
11 - 14	256	40.6
15 - 18	374	59.4
Education level	-	-
First	101	16.0
Second	116	18.4
Third	114	18.1
Fourth	157	24.9
Fifth	142	22.5
Type of family	-	-
Extended family	135	21.4
Single parent	129	20.5
Nuclear	307	48.7
Reconstituted	59	9.4
Socioeconomic level	-	-
Upper	35	5.6
Middle	462	73.3
Lower	133	21.1
Health Insurance	-	-
State (SIS)	359	57.0
Social Security (EsSalud)	152	24.1
Other	31	4.9
None	88	14.0
Smartphone ownership	-	-
No	113	17.9
Yes	517	82.1
Smartphone Internet access	-	-
No	281	44.6
Yes	349	55.4
Leisure activities	-	-
Reading	91	14.4
Sports	291	46.2
Internet navigation	156	24.8
Videogames	92	14.6

3. RESULTS

A total of 663 students aged 11 to 18 years participated, of whom 33 were excluded due to bad data or non-compliance with the study criteria. The analysis was conducted with 630 students with a median age of 15 years (Q1= 14, Q3= 16, IQR = 2), of whom 52.4% (n = 330) were male, 78.4% (n = 494) were between 14 and 17 years old, and most of them were in the fourth and fifth years of high school. Table 1 shows other characteristics of the participants, such as type of family, perceived socioeconomic level, access to health insurance, access to mobile telephony and the internet, and the main activities performed during leisure time.

Table 2. Descriptive statistics of the variables age, nomophobia, and self-esteem among adolescents.

Descriptive Statistics	Age			Nomophobia			Self-esteem		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
Min.	11	11	11	20	20	20	15	17	15
Median	15	15	15	71	71	70	27	27	28
Mean	14.92	14.92	14.93	68	68.92	67.17	27.33	27.11	27.54
Max.	18	18	18	125	125	118	36	36	36
p-value	-	0.805	-	-	0.346	-	-	0.022	-
* Mann-Whitney U test			-	-	-	-	-	-	-

Regarding nomophobia, a median score of 71 was obtained (Q1 = 58.25, Q3 = 79, IQR = 20.75, Min: 20, Max: 125). No significant differences were found between the median scores according to sex (Mann-Whitney U test, $p=0.346$) (Table 2).

Of the total participants, 14% (n = 88) showed the absence of nomophobia, 65.4% (n = 412) showed a risk of nomophobia, and 20.6% (n = 130) had nomophobia (Fig. 1).

In relation to the level of self-esteem, participants obtained a median score of 27 (Q1 = 26, Q3 = 29, IQR = 3, Min: 15, Max: 36). A significant difference was found between the median scores according to sex (Mann-Whitney U test, $p = 0.022$) (Table 2). Of the sample, 24.9% (n = 157) showed a low level, 52.4% (n = 330) had a medium level, and only 22.7% (n = 143) presented a high level of self-esteem (Fig. 2). No significant differences were found with respect to the level of self-esteem, sociodemographic variables, access to cell phones,

availability of the internet, or leisure activities of the adolescents.

Students who reported belonging to the middle socioeconomic level had a higher proportion of nomophobia ($p = 0.043$). Adolescents who spent their free time navigating the internet and playing video games had a higher frequency of nomophobia or the risk of presenting it ($p = 0.010$). Students with low self-esteem showed a higher proportion of nomophobia or risk of nomophobia ($p = 0.009$) (Table 3).

Among the predictor variables (socioeconomic status, use of leisure time, and level of self-esteem), the one that was significant with nomophobia was navigating the internet during leisure time (Wald $\chi^2 = 6.093$, $p = 0.014$). The Odds Ratio (OR) for internet navigation was 2.281 (95%CI: 1.185 to 4.390). The OR was also higher for the variables video games (OR = 1.987, 95%CI: 0.895 to 4.411) and low self-esteem (OR = 1.963, 95%CI: 0.896 to 4.302) (Table 4).

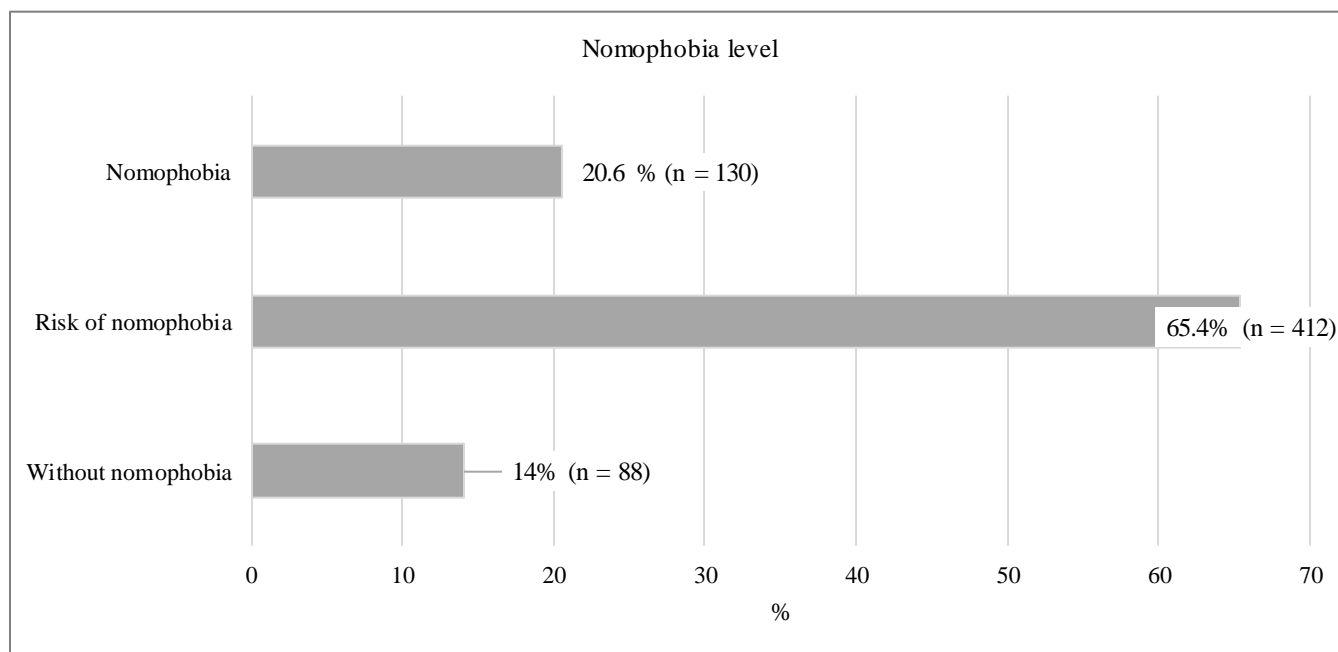


Fig. (1). Level of nomophobia among adolescents.

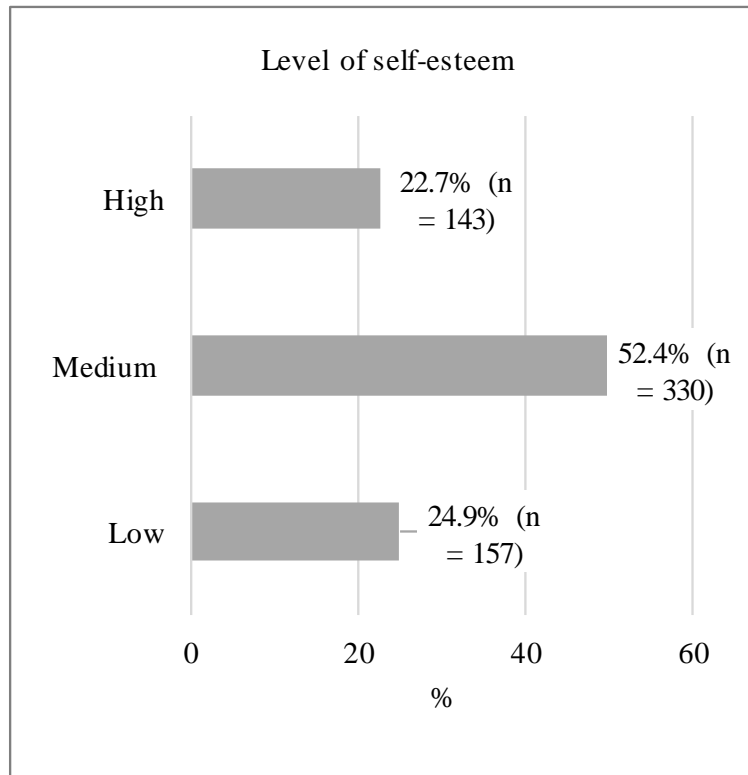


Fig. (2). Level of self-esteem among adolescents.

Table 3. Factors associated with nomophobia in adolescents.

Variables	Without Nomophobia		Nomophobia		p-value
	n	%	n	%	
Total	88	100	542	100	-
Sex	-	-	-	-	-
Female	36	40.9	264	48.7	0.174
Male	52	59.1	278	51.3	-
Age (years)	-	-	-	-	-
11-14	39	44.3	217	40.0	0.448
15-18	49	55.7	325	60.0	-
Education level	-	-	-	-	-
First	15	17	86	15.9	0.606
Second	19	21.6	97	17.9	-
Third	12	13.6	102	18.8	-
Fourth	25	28.4	132	24.4	-
Fifth	17	19.3	125	23.1	-
Type of family	-	-	-	-	-
Extended	18	20.5	117	21.6	0.755
Single parent	15	17	114	21	-
Nuclear	45	51.1	262	48.3	-
Reconstituted	10	11.4	49	9	-
Socioeconomic level	-	-	-	-	-
Upper	2	2.3	33	6.1	0.043
Middle	74	84.1	388	71.6	-
Lower	12	13.6	121	22.3	-

Table 4. Associated variables and risk of developing nomophobia in adolescents.

Variable	B	SE B	Wald X ²	df	p- value	Exp(B)	95% CI
Constant	2.817	0.788	12.796	1	0.000	16.733	-
Socioeconomic level	-	-	-	-	-	-	-
Low	-0.616	0.797	0.599	1	0.439	0.54	(0.113 - 2.573)
Medium	-1.293	0.748	2.993	1	0.084	0.274	(0.063 - 1.188)
High*	-	-	6.659	2	0.036	-	-
Leisure activities	-	-	-	-	-	-	-
Internet navigation	0.825	0.334	6.093	1	0.014	2.281	(1.185 - 4.390)
Video games	0.687	0.407	2.845	1	0.092	1.987	(0.895 - 4.411)
Reading	-0.265	0.309	0.738	1	0.390	0.767	(0.419 - 1.405)
Sports*	-	-	10.730	3	0.013	-	-
Level of self-esteem	-	-	-	-	-	-	-
Low	0.674	0.400	2.838	1	0.092	1.963	(0.896 - 4.302)
Medium	-0.364	0.288	1.601	1	0.206	0.695	(0.395 - 1.221)
High*	-	-	9.248	2	0.010	-	-

Note: (*) Reference category

(**) B= Non-standardized coefficient; SE B= Standard error of the coefficient; Wald X² = Wald's statistic; df= Degrees of freedom;

Exp (B) = Odds Ratio (OR); 95% CI: 95% confidence interval.

4. DISCUSSION

From the results of this study, it can be inferred that nomophobia is a common problem, and that 86% of adolescents have nomophobia or are at risk of having it. The presence of nomophobia among adolescents is significantly associated with various factors, such as the perception of belonging to the middle socioeconomic level, navigating the internet and video games during leisure time, and a low level of self-esteem. Adolescents who engage in internet navigation during their leisure time are 2.28 times more likely to develop nomophobia.

The frequency of nomophobia (86%) in the present study was similar to the findings found in the study by Sosa-Delgado *et al.*, where 85.2% of university students presented nomophobia or were at risk of having it [12]. In the systematic review study conducted by Haitham Jahrami *et al.*, university students were indicated to have the highest prevalence of nomophobia with a rate of 97.38% (95%CI: 96.72%; 98.04%), while in high school students and adolescents, the rate was reported to be 84.17% (95%CI: 82.11%; 86.22%) [13]. However, both in our study and in the indicated review, similar percentages were observed. Nomophobia levels are more closely associated with cell phone use than with the age of the students [23]. Likewise, internet addiction prevails more likely in adolescents who spend time on the internet using smartphones and people who live in large cities. The risk of developing internet addiction is higher if an adolescent spends between 1 and 3 hours per day [OR = 2.8 (1.706-4.512)] and more than 3 hours [OR = 8.2 (4.962-13.568)] navigating the internet, compared to adolescents who spend 1 hour or less [24].

In Peru, socioeconomic level is not an impediment to access to telephony and internet connections. The vast majority of households have telephone services and internet access [14]. According to socioeconomic level, access to fixed mobile internet exhibited higher growth in

socioeconomic level C, which went from 94.5% to 97.7% between 2021 and 2022; in the D/E sector, access went from 81.5% to 84.6%. In the AB sector, internet access remained above 99% [25]. In our study, internet navigation and video game access were significantly associated with nomophobia. Among adolescents, access to the internet from cell phones not only allowed them to obtain academic information, but also to link to social networks, make use of messaging applications, and play video games.

Loss of connectivity implies loss of multiple internet-dependent applications, which may contribute to the emergence of nomophobia. Nomophobia is the pathological anxiety linked to a person's momentary detachment from a cell phone or smartphone, either due to having no mobile networks or signal coverage, losing cell phone contacts, or running out of battery [26]. In Peruvian households, although the percentage of cell phone access and internet connection is high, even in the lower socioeconomic strata, there may be a loss of connectivity due to low signal coverage or type of plan, mobile data exhaustion, and limits imposed by the head of household.

Adolescents are more likely to use technology, such as social networks, digital games, the internet, and smartphones, which may increase their susceptibility to developing technological addictions and may consequently lead to nomophobia [27]. High levels of nomophobia are associated with high participation in social networks. Those with severe nomophobia report high rates of phone use to check social networks (91.7%) compared to those with moderate and mild levels (81.1% and 71.1%, respectively) ($p < 0.001$) [28].

It is possible that the COVID-19 pandemic has had an influence on the increased use of digital technology. The practice of online learning and limited socialization opportunities for adolescents lead to a substantial increase

in digital gaming behaviors and addictive use of social networking tools *via* smartphones [27]. Levels of nomophobia have a strong positive relationship with problematic internet use, social appearance anxiety, and dependence on social networks [29]. Due to their easy portability, smartphones are the devices most used by students [30]. Adolescents use digital games for the purpose of engaging in enjoyable activities that provide entertainment, pleasure, and mental stimulation [27].

A significant association ($p = 0.009$) between nomophobia and self-esteem was also found in the present study. The highest proportion of nomophobia was found in students with low self-esteem. Likewise, low self-esteem exhibited an increased risk for the development of nomophobia (OR = 1.96); however, it was not significant (95% CI: 0.896 to 4.302). Studies highlight the existence of a close relationship between self-esteem and nomophobia, as those with low self-esteem are twice as likely to have a high level of nomophobia compared to those with normal/high self-esteem (adjusted cumulative OR = 1.99, $p < 0.001$) [31]. Low self-esteem, related to addictive behaviors, can lead to excessive use of smartphones as a form of temporary relief. Individuals with low self-esteem appear to favor technology-mediated communication compared to those with high self-esteem [32]. Similarly, users who have a preference for online interactions exhibit the lowest levels of self-esteem [33].

The present study has shown nomophobia to be a frequent problem among adolescents. Conditions, such as internet navigation, access to video games, and low self-esteem, are related to nomophobia, which is consistent with several studies. However, adolescents who engage in internet navigation during their leisure time are at a greater risk of developing nomophobia. It is crucial to promote responsible mobile device use within the educational community and encourage alternative, screen-free activities during students' leisure time.

The results of this study should be interpreted with caution, considering the following limitations: although the sample size was large, only two educational institutions were included, which may not necessarily represent all adolescents in the northern part of Lima. The cross-sectional design and self-reported data were also limitations of this study. On the other hand, the lack of seriousness in the survey, the participants' reading comprehension, and the need to complete the survey promptly may have influenced the choice of answers. For their part, the surveyors complied with the respective orientation and sensitivity, as well as the request for authorization in the respective classrooms. Despite these limitations, the findings shown are significant and reflect a problem derived from the consumption of new technologies.

CONCLUSION

Nomophobia is a frequent problem among high school adolescents, and there is also an important presence of a low level of self-esteem in the aforementioned population. There is a significant association between nomophobia and

the consumption of digital media during adolescents' leisure time; particularly, internet navigation increases the risk of developing this condition. It is important to promote the responsible use of digital media and carry out activities that contribute to strengthening the self-esteem of adolescents.

AUTHORS' CONTRIBUTION

F.A.A.E., M.N.A., L.T.G., L.V.A., and G.M.V.A.: Contributed to the study conception and design, data collection, analysis, and interpretation of results; J.M.: Interpreted the results and drafted the manuscript. All authors have reviewed the results and approved the final version of the manuscript.

LIST OF ABBREVIATIONS

DT	= Digital technology
NMP-Q	= Nomophobia questionnaire
OR	= Odds ratio
95%CI	= 95% confidence interval
UCH	= University of Sciences and Humanities

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The protocol was evaluated and approved by the ethics committee of the University of Sciences and Humanities, Peru (CEI Act No. 137-2023).

HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

The study was conducted with the knowledge of the institution's authorities, the consent of the students, and the participation of the classroom teacher during the survey.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author [J.M.] on special request. The database is also available at: 0.5281/zenodo.14583772.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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