JCHR

Journal of Community Health Research 2024; 13(1): 172-179.

The Prevalence of Smartphone Addiction and Its Associated Risk Factors among School Students of a Metropolitan City: A Cross-Sectional Study

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ARTICLE INFO

Original Article

Received: 11 Jun 2023
Accepted: 30 Oct 2023

OPEN ACCESS

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ABSTRACT

Background: Smartphone is a term used to distinguish cell phones with advanced features from basic feature phones. Smartphone addiction is a phenomenon that pertains to uncontrollability of smartphone use. The increasing use of smartphones and easy availability of smartphones to school children after Covid-19 Pandemic were the reasons for conducting this study.

Aims - To estimate the prevalence of smartphone addiction among school children and its associated risk factors

Methods: This was a cross-sectional study conducted on English middle-school students of Mumbai, involving students from secondary section i.e.,6th to 10thgrade. Data were collected by interview using a pre-structured questionnaire, and all the students were asked to fill out smartphone addiction questionnaire i.e. Smartphone Application Based Addiction Scale (SABA). Then, data were entered into Microsoft EXCEL and analysed using SPSS.

Results: The mean age of 275 participants, was 13.1, and the prevalence of smartphone addiction in the present study was 45.5%. Addiction was significantly associated with age (*P value 0.000*), gender (*P value 0.004*), self-owned phone (*P value 0.03*), duration of time spent on phone on weekdays(*P value 0.000*) and weekends (*P value 0.000*), having social media accounts(*P value 0.000*),and the time spent on social media (*P value 0.042*). On applying logistic regression, female gender and the time spent on social media were the major risk factors.

Conclusions: The risk factors associated with addiction are age, female gender; owning a smartphone, increased time spent on phones on weekdays and weekends, having social media accounts and excessive time spent on social media applications.

Keywords: Students, Social media, Cell phones

How to cite this paper:

Qureshi K, Qureshi S, Chavhan S, Bishnoi D. The Prevalence of Smartphone Addiction and Its Associated Risk Factors among School Students of a Metropolitan City: A Cross-Sectional Study. J Community Health Research 2024; 13(1): 172-179.

[Downloaded from jhr.ssu.ac.ir on 2024-12-01]

[DOI: 10.18502/jchr.v13i19.16684]

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Introduction

The term "smartphone" was first used in 1997 when Ericson described its GS 88 "Penelope" concept as a smartphone (1, 2). These phones provided integrated services from communication, computing, and mobile sectors such as voice communication, messaging, personal information management applications, and wireless communication capacity (3). The Internet is useful for a variety of purposes, such as convenient electronic commerce, rapid sharing of information, contact with other cultures, emotional support, and entertainment (4). A smartphone combines the services of the Internet and cell phones. Modern smartphones currently include all the features of a laptop, including web browsing, Wi-Fi, 3rd-party apps, etc. In October 2022, the number of smartphone users in the world was 6.648 billion, which translates to 83.32% of the world's population owning a smartphone. In total, the number of people who own a smart and feature phone would be 7.26 billion, making up 91.00% of the world's population (5). Smartphone users increased globally by 49.89% in 2017-2022, and cell phone ownership is growing at an extremely rapid rate with almost half the planet owning a smartphone and two-thirds , a mobile device (6). Currently in India, 606.57Million people use a smartphone, second only to China in the number of users (7). Indian teens are driving smartphone market in India.

Smartphones offer several conveniences in our life, but we also need to be aware of their negative effects, the most concerning aspect being phone addiction. Smartphone addiction is the result of lack of control over smartphone use. People with this problem encounter social, psychological, and health problems (8). The terms 'smartphone addiction', 'problematic cell phone use', 'phone addiction', 'phone dependence', 'compulsive cell phone use', and 'cell phone overuse' have been used to describe more or less the same phenomenon. Griffiths defined technological addiction as human-machine interaction, a type of behavioural addiction which is non-chemical (9). Problematic smartphone use is characterised by the following: 1) individual is preoccupied with a specific behaviour (smartphone use), 2) the behaviour is the result of escaping reality or creating euphoria, 3) tolerance develops as the behaviour continues, 4) withdrawal symptoms occur when the behaviour is interrupted, 5) interpersonal problems occur as a consequence of continuous behaviour, and 6) experience of relapse against will (10).

At the start of COVID-19 lockdown, Gen Zers registered the largest increase in smartphone usage at 82%. They are followed by Millennials (72%), Gen X (66%), and Baby Boomers (43%).Global smartphone usage increased by 70% at the start of COVID-19 lockdowns (11). According to the findings of a meta-analysis, the smartphone addiction magnitude in India ranged from 39% to 44% (12). Even in rural India, 30.3% met the dependence criteria (13).

Rationale - The increasing use of smartphones among students and the easy availability of smartphones to school children especially post-COVID-19 pandemic was the rationale behind this study. Moreover, the study included students from the younger age group as there was only limited research available in this age group.

Methods

Study area

An epidemiological cross-sectional study was carried out on school students of a metropolitan city.

Study Population

All students from secondary section i.e., 6^{th} to 10^{th} grade aged between 10 to 16 years were included in the study.

Study design

This was a cross-sectional study to estimate the prevalence and associated risk factors of smartphone addiction.

A) Sample size

The prevalence of smartphone addiction in India by meta-analysis ranged from 39% to 44% (12).

The formula used to calculate sample size is

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[DOI: 10.18502/jchr.v13i19.16684]

given below:

$n = 4pq/L^2$

n - Sample size. p - Prevalence rate

q = 100-p L - absolute error taken as 6%

Therefore,

n = 4x39x61/6X6

= 264.34~ 265.

B) Eligibility criteria

Inclusion criteria:

• Students in the age group of 10 to 16.

• Students owning/having access to smartphones.

Exclusion criteria:

• Students suffering/on treatment for any mental disorder/addictions

• Students who took similar screening tests before.

C) Sampling methods

The study was conducted among English medium students from a private school in Mumbai. The minimum sample size for the study was 265 people. Universal sampling procedure was followed .All the students from 6th to 10th grade who were present on the interview day and met the inclusion criteria were enrolled in the study. A total of 275 students were interviewed during the study.

D) Methodology

The minimum sample size of the study consisted of 265 male and female students aged 10 to 16. After obtaining approval from the Institutional Ethics Committee, required permissions from school authorities and parental consent were taken. The study was conducted over a period of 4 days. Following Helsinki Declaration, all the students were explained the purpose of the study, and those willing to participate in the study were enrolled. Data were collected by interview using a pre-structured questionnaire, and participants were asked to fill out the smartphone addiction questionnaire, Smartphone Application Based Addiction Scale (SABAS)(14). The questionnaire included questions about socio-demographic profile, use of smartphone by the students along with use of internet and games on the phone. The reliability and validity of the questionnaire was confirmed by independent subject specialists. (Cronbach's alpha is often used in assessing the reliability of tests. Cronbach's alpha was r = 0.63 which was considered reliable). At the end, a health education session regarding the advantages, disadvantages, and judicious use of smartphone was conducted for all the students.

Data analysis

The data were entered into Microsoft EXCEL and analysed using SPSS VERSION 22.0. The qualitative data were presented in the form of frequency and percentage, and quantitative data were presented in the form of mean and standard deviation. The comparison between the two groups for various factors was done using Chi square test. Addiction was estimated on the basis of score in the SABAS scale (maximum – 36, minimum – 6).

Results

275 students participated in the study, and were equally distributed among both sexes. The majority i.e., 236 (85.8%) subjects belonged to Hindu religion, and their mean age was 13.1.

Table 1. Socio-demographic profile of study articipants (n = 275)

Variables	Number	Percentage
Age		
10 -13	160	58.2%
14 - 16	115	41.8%
Gender		
Male	136	49.5%
Female	139	50.5%
Religion		
Hindu	236	85.8%
Others	039	14.2%
Grade#		
6^{th}	51	18.5%
7^{th}	49	17.8%
8^{th}	59	21.5%
9^{th}	58	21.1%
10^{th}	58	21.1%

The secondary school grade in which the students are currently studying

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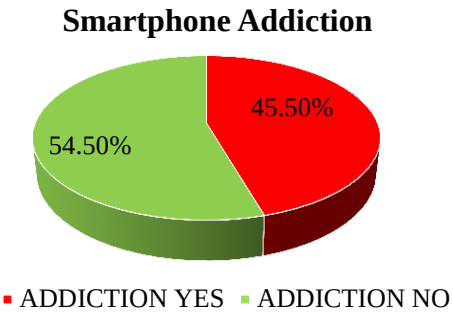

Figure 1. The prevalence of smartphone addiction

In the current study, 152 (55.3%) students had their own smartphone, 160 (58.2%) were using smartphone since the past 1 to 3 years , and the average time spent on phone was between 1 to 3 hours for most (n = 152, (55.3%)) of the students.

155 (56.4%) participants had accounts on social media applications like Instagram, Snapchat, Facebook, etc, whereas 141 (51.2%) students played games on their phones like PUBG, Firefighter, Candy crush, etc.

Table 2. Smartphone usage pattern among study participants (n = 275)

Variables	Number	Percentage
Smartphone belongs to		
oneself	152	55.3%
parents/siblings/others	123	45.7%
Duration of use (in years)		
< 1 year	58	21.1%
1 to 3 years	160	58.2%
> 3 years	57	20.7%
Hours spent on weekdays		
< 1 hour	92	33.5%
1 to 3 hours	152	55.3%
> 3 hours	31	11.2%
Hours spent on weekends		
< 1 hour	69	25.1%
1 to 3 hours	132	48.0%
> 3 hours	74	26.9%

Table 3. Social media accounts and games usage on smartphones among participants (n = 275)

Variables	Number	Percentage
Social media account		
Yes	155	56.4%
No	120	43.6%
Time spent on social media (n = 155)		
< 1 Hour	94	60.6%
1 to 3 hours	53	34.2%
> 3 hours	08	05.2%
Games on phone		
Yes	141	51.2%
No	134	48.8%
Time spent on games (n = 141)		
< 1 hour	94	66.7%
1 to 3 hours	44	31.2%
> 3 hours	03	02.1%

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The prevalence of smartphone addiction in the present study was 45.5% according to SABAS scale.

The association between smartphone addiction and age (*P-value 0.000*), gender (*P-value 0.004*), and grade in which the student is studying (*P-value 0.000*) was statistically significant. Similarly, statistically significant association was observed between smartphone addiction and the smartphone belonging to oneself/others (*P-value 0.03*), duration of use on weekdays (*P-value 0.000*), duration of use on weekends (*P-value 0.000*), having social media accounts (*P-value 0.000*), and the time spent on social media accounts (*P-value 0.042*).

Table 4. The association between smartphone addiction and various risk factors among the participants (n = 275)

Variables	Smartphone addiction		Chi square, Degree of freedom, P value, significance
	Yes	No	
Age			
10-13 Years	54 (43.2%)	106 (70.7%)	21.144, 1, 0.000
14–16 Years	71 (56.8%)	044 (29.3%)	**Significant**
Gender			
Male	50(40%)	86 (57.3%)	8.195, 1, 0.004
Female	75(60%)	64 (42.7%)	**Significant**
Grade			
6^{th}	09 (07.2%)	42 (28.0%)	
7^{th}	14 (11.2%)	35 (23.3%)	37.926, 4, 0.000
8^{th}	28 (22.4%)	31 (20.7%)	**Significant**
9^{th}	29 (31.2%)	19 (12.7%)	
10^{th}	35 (28.0%)	23 (15.3%)	
Smartphone belongs to oneself	78 (62.4%)	74 (49.3%)	4.708, 1, 0.03
parents/siblings/others	47 (37.6%)	76 (51.7%)	**Significant**
Duration of use (in years)			
< 1	23 (18.4%)	35 (23.3%)	1.984, 2, 0.371
1 To 3	72 (57.6%)	88 (58.7%)	Not significant
> 3	30 (24.0%)	27 (18.0%)	
Duration of use (Weekday)			
< 1 hour	26 (20.8%)	66 (44.0%)	18.118, 2, 0.000,
1 to 3 hours	79 (63.2%)	73 (48.7%)	**Significant**
> 3 hours	20 (16.0%)	11 (07.3%)	
Duration of use(weekend)			
< 1 hour	18 (14.4%)	51 (34.0%)	18.801, 2, 0.000,
1 to 3 hours	61 (48.8%)	71 (47.3%)	**Significant**
> 3 hours	46 (36.8%)	28 (18.7%)	
Social media account			
Yes	92 (73.6%)	63 (42%)	27.682, 1, 0.000,
No	33 (26.4%)	87 (58%)	**Significant**
Time spent on Social media (n=155)			
< 1 hour	49 (53.3%)	45 (66.6%)	6.3375, 2, 0.042,
1 to 3 hours	36 (39.1%)	17 (26.9%)	**Significant**
> 3 hours	07 (07.6%)	01 (01.5%)	
Games on phone			
Yes	64 (51.2%)	77 (51.3%)	0.000, 1, 0.982
No	61 (48.8%)	73 (48.7%)	Not Significant

P value significant at < 0.05

In Table 5, logistic regression is used to control confounding factors such as age, gender, accessories of smartphone, hours spent on the smartphone, having social media accounts ,and hours spent on social media accounts; this suggests the odds of smartphone addiction among females

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were 1.94 times more compared to males. Similarly, participants using social media applications on their smartphones for more than 3 hours daily were almost 3 times more at risk of smartphone addiction, compared to those using phone less than 1 hour.

Table 5. Association between smartphone addiction and various risk factors among the study population by logistic regression analysis (n = 275)

Variables	Adjusted		
	OR	95% CI	P value
Age			
10-13 Years (reference)	1	-	-
14 - 16 years	1.114	0.651-1.906	0.694
Smartphone use			
Others (reference)	1	-	-
Self	1.345	0.744-2.43	0.327
Gender			
Male (reference)	1	-	-
Female	1.94	1.137-3.311	0.015
Hours spent on phoneon weekdays			
< 1 hour (reference)	1	-	-
1 to 3 hours	1.93	0.985-3.779	0.055
> 3 hours	1.9	0.636-5.681	0.25
Hours spent on phoneon Weekends			
< 1 hour (reference)	1	-	-
1 to 3 hours	1.09	0.507-2.351	0.822
> 3 hours	1.5	0.577-3.901	0.405
Social media use			
No (reference)	1	-	-
Yes	1.143	0.067-19.482	0.926
Hours spent on social media			
< 1 hour (reference)	1	-	-
1 to 3 hours	1.241	0.578-2.664	0.58
> 3 hours	2.959	0.326-26.883	0.335

Discussion

The present study was conducted to estimate the prevalence of smartphone addiction among adolescents attending secondary school in a private school of a metropolitan city. The prevalence of smartphone addiction was 45.5%. Results were similar to multinational meta-analysis done by Ying Zhong et al. in Asian students (15) and meta-analysis done on Indian adolescents by Davey et al., (12) the prevalence was higher compared to the study done in rural India ; the reason can be the easy availability of smartphones in urban settings and the urban-rural divide in the country (13).

The association of smartphone addiction with age was statistically significant, and the prevalence was higher with older students. Findings were similar to the study done in Bangalore by Pradeep et al. (16) Females were twice at risk of smartphone addiction, compared to males and the results were similar to the study by Pradeep et al. (16) and Nayak et al. (17); this was because of increased use of phones among females which may be attributed to the higher amount of time spent at home by females compared to males. In this study, addiction was significantly associated with the standard of the student, suggesting increased use with aging. Other reasons could be easier access to phones as students get older and peer pressure. The association between addiction and phone belonging to oneself/others was significant with students owning phones at 1.3 times risk, compared with others indicating that the children owning phones at an early age are more at risk for addiction. This was similar to the study conducted by Qureshi et al. in Mumbai (18). In this study, the association between the years of phone use and addiction was not significant ,which was in line with

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[DOI: 10.18502/jchr.v13i19.16684]

the study done by Lee et al. However, it was in contrast to most of the available literature (19). The fact is that the study sample in the current study was small as compared to the other studies. The association between addiction and hours of use on weekdays and weekends were significant with regard to the students' use for more than 1 hour who were almost twice at risk compared to those using for less than 1n hour. Results were in line with the study done by Haug et al. in Switzerland (20). The finding was self-explanatory as the time spent on phone increases; the chances of addiction also increase simultaneously. The association between addiction , having social media accounts , and the time spent on social media were significant and in agreement with the studies done by Haug et al. and Abbasi et al (21). The students using social media applications for more than 3 hours were 3 times more at risk of addiction, compared to those using phone for less than 1 hour. The reasons for this were the addictive nature of social media applications and the desire of the subjects to have a constant presence on digital platforms. Furthermore, since the study population consisted of young kids, new experience, puberty, peer pressure, and social media trends could be other contributing factors. The association between addiction and playing games on phone was not significant in the current study. This was in contrast to most of the studies (22, 23, 24); this might be because of the smaller number of participants playing games in this study population.

Limitations of the study – In this study, only a few risk factors were analysed for smartphone addiction. Future studies can be planned with students from multiple schools and various mediums to get a better insight about smartphone addiction among school children. The effect of addiction on academics and physical and mental health of the child can be evaluated in further studies.

Conclusion

The prevalence of smartphone addiction among school children was 45.5% in this study. The risk factors associated with addiction are age, female gender, owning a smartphone, increased time spent on phones on weekdays and weekends, having social media accounts and excessive time spent on social media applications. Based on the findings, it can be suggested that the initial access of phones to students should be delayed and judicious use of phones should be taught to them. Similarly, students should be given limited and time bound access to phones, especially for social media applications and games.

Acknowledgments

The authors would like to thank the participants and staff of Goregaon Education Society High School, and interns from HBT Medical College and Dr. R. N. Cooper Hospital, Mumbai for their contribution in data collection.

Conflicts of interest

Authors declared no conflict of interest.

Funding

None

Ethical considerations

The study was carried out in accordance with the institutional ethical standards and the Helsinki Declaration. Informed consent was taken and the data was de -identified.The study was approved by the Institutional Ethics Committee.

Code of Ethics

CM/168/21

Author Contributions

K. Q, S. Q and D. B, participated in the writing and designing of the study, data collection, literature search, performed the statistical analysis, and drafted the manuscript; S. C, contributed to the design of the study, and revision of the manuscript. All authors contributed to the preparation of the final manuscript and jointly approved the final version for submission.

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