Original Article

Smartphone Use and Its Addiction among Adolescents in the Age Group of 16–19 Years

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Abstract

Background: Smartphone use is escalating among adolescents, thereby increasing the risk of its addiction among them. **Objective:** The objective of this study was to estimate the prevalence of smartphone use and its addiction among adolescents in 16–19 years of age group. **Materials and Methods:** An observational cross-sectional study was conducted among 496 students in the age group of 16–19 years. Relevant information was collected using a self-administered questionnaire and the Smartphone Addiction (SA) Scale. Chi-square test and logistic regression were applied to study the association between independent and dependent variables. **Results:** Smartphone use was found to be 83.9%. It was associated with age, area of residence, discipline, use of hands-free kit, and parents' education and income. The smartphone addiction rate was reported to be 37%. It was found to be associated with age, area of residence, place of education, duration of smartphone use, daily hours of use, perception that cellphone use is harmful to health, and parents' education and income. **Conclusion:** A high rate of SA among adolescents warrants effective strategies at local, state, and national level to address this growing health problem in this population.

Keywords: Addiction, adolescents, smartphone

Introduction

Smartphones are the new generation of mobile phones that provide integrated communication and entertainment services. With a rapid rise in its use, a new kind of health disorder called "smartphone addiction (SA)/abuse/misuse" has now emerged as a challenging public health problem among adolescents. Research shows that abnormal users of smartphone in the adolescent age group are more at risk of severe psychopathological disorders such as problematic behaviors, somatic symptoms, attention deficits, depression, and aggression.[1]

In addition, adolescents with SA are more likely to access cyber-sexual content, to get involved in cyber-verbal violence, and to suffer from cyber-sexual delinquency.[2]

Easy availability and affordability of smartphone have not spared adolescents from its effects even from lower socioeconomic class worldwide.[3] Moreover, there is a paucity of research regarding smartphone use and its adverse consequences in adolescents belonging to developing countries. Considering the increasing smartphone engagement among Indian adolescents, it is important to measure and understand their addictive behavior. Hence, the present study was conducted with the objectives to estimate the prevalence of smartphone use among adolescents of age 16–19 years and to assess the extent of SA and the associated factors in this group.

Materials and Methods

Approval of the Institutional Ethics Committee was sought before the commencement of the present study. This observational cross-sectional study was conducted among the students in the age group of 16–19 years attending higher secondary schools and colleges located in Vallabh Vidyanagar. The sample size was calculated using the formula $N = Z^2_{\alpha/2} pq/L^2$, considering the prevalence of SA among Indian teenagers from a previous study[3] as 44%, and allowable error as 10% of p. The calculated N of 489 was rounded to 496.

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The participants were selected using a two-stage sampling procedure. First, stratified sampling was done to decide upon number of students from higher secondary schools and students from colleges of discipline of commerce, arts, science, and engineering. Second, after seeking permission from heads of the institutes, lists of students studying in 11th standard, 12th standard, 1st-year graduation, and 2nd-year graduation were obtained. A required number of students were selected randomly from the provided list. After taking written informed consent from selected students more than 18 years old and written informed assent from students up to 18 years old along with signature of teacher/principal, relevant information was collected from participants using a pretested self-administered questionnaire and the SA Scale-Short version (SAS-SV), which has been developed and validated for its use among adolescents.[4]

Operationally, smartphone was defined as a mobile phone that has features of personal computer operating system, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded apps. Smartphone use was considered when the participant is currently using it for any duration. SA was considered when SAS-SV score was higher than 31 in boys and 33 in girls. Both smartphone use and SA were examined against a set of relevant independent variables (individual, household, and community characteristics) in order to determine the factors associated with these two variables.

Data analysis was performed using Stata-14.2 (StataCorp, LLC, Texas, USA) software. Chi-squared test was used to assess the significance of associations, considering $P \leq 0.05$ as statistically significant. Logistic regression was conducted

Table 1: Distribution of respondents according to smartphone use ($n=496$)

Variable	Smartphone use, *n* (%)	Total, *n* (%)	*P**
Age (completed years)			
16	57 (77.0)	74 (14.9)	0.200
17	120 (84.5)	142 (28.6)	
18	102 (82.3)	124 (25.0)	
19	137 (87.8)	156 (31.5)	
Gender			
Male	238 (86.2)	276 (55.6)	0.109
Female	178 (80.9)	220 (44.4)	
Area of residence			
Urban	269 (92.8)	290 (58.5)	0.000
Rural	147 (71.4)	206 (41.5)	
Discipline			
Arts/commerce/general	194 (78.2)	248 (50.0)	0.001
Science/engineering	222 (89.5)	248 (50.0)	
Use of hands-free kit			
Yes	161 (94.2)	171 (34.5)	0.000
No	267 (82.2)	325 (65.5)	
Father's education			
Illiterate	14 (41.2)	34 (6.9)	0.000
Just literate	12 (54.5)	22 (4.4)	
Primary	18 (60.0)	30 (6.0)	
Secondary	58 (82.9)	70 (14.1)	
Higher secondary	97 (87.4)	111 (22.4)	
Graduate and above	217 (94.8)	229 (46.2)	
Mother's education			
Illiterate	19 (35.8)	53 (10.7)	0.000
Just literate	14 (70.0)	20 (4.0)	
Primary	33 (60.0)	55 (11.1)	
Secondary	86 (93.5)	92 (18.5)	
Higher secondary	114 (95.0)	120 (24.2)	
Graduate and above	150 (96.2)	156 (31.5)	
Parents' monthly income (in Indian rupees)			
0-10000	10 (29.4)	34 (6.9)	0.000
10,000-20,000	40 (58.8)	68 (13.7)	
20,000-30,000	100 (86.2)	116 (23.4)	
30,000-40,000	158 (96.3)	164 (33.1)	
>40,000	108 (94.7)	114 (23.0)	

*Chi-square test

in order to determine the factors significantly associated with the rates of smartphone use as well as its addiction.

Results

A total of 496 adolescent students in the age group of 16–19 years participated in our study, having a mean age of 17.8 years ± 1.1. All were found to be using some kind of cellphone. Almost 56% were male, and 59% were living in an urban area [Table 1]. Out of 496 participants, 416 (83.9%) were using smartphone. As depicted in Table 1, smartphone use was significantly associated with area of residence (P = 0.000), discipline (P = 0.001), use of hands-free kit (P = 0.000), father's education (P = 0.000), mother's education (P = 0.000), and parents' income (P = 0.000). Multivariate analysis [Table 2] demonstrated that age (adjusted odds ratio [AOR] = 2.76, 95% confidence interval [CI]: 1.28–5.94), area of residence (AOR = 0.22, 95% CI: 0.09–0.56), place of education (AOR = 5.0, 95% CI: 1.07–23.42), father's education (AOR = 1.48, 95% CI: 1.01–2.15), perception that cellphone use is harmful to health (AOR = 4.89, 95% CI: 1.68–14.27), and use of hands-free kit (AOR = 0.08, 95% CI: 0.02–0.31) were independently associated with smartphone use. However, on multivariate analysis, gender, discipline, mother's education, and use of cellphone while driving a vehicle were not found to be associated with cellphone use.

In our study, SA rate was reported to be 37%. It was found to be associated with age (P = 0.004), area of residence (P = 0.027), place of education (P = 0.003), duration of smartphone use (P = 0.000), daily hours of use (P = 0.000), father's education (P = 0.000), mother's education (P = 0.000), and parents' income (P = 0.000), as shown in Tables 3 and 4. On multivariate analysis [Table 5], area of residence (AOR = 3.03, 95% CI: 1.37–6.69), discipline (AOR = 0.16, 95% CI: 0.06–0.42), parents' income (AOR = 0.4, 95% CI: 0.23–0.7), duration of smartphone use (AOR = 0.22, 95% CI: 0.12–0.39), daily hours of use (AOR = 0.13, 95% CI: 0.08–0.21), and perception that cellphone use is harmful to health (AOR = 0.4, 95% CI: 0.17–0.95) were found to be independently associated with SA. While, age, gender, place of education, parents' education, use of cellphone while driving, and use of hands-free kit were not found to be associated with SA on multivariate analysis.

Table 2: Factors associated with smartphone use - multivariate logistic regression analysis (n=496)

Variable	Adjusted OR	95% CI	P
Age	2.76	1.28-5.94	0.01
Area of residence	0.22	0.09-0.56	0.001
Place of education	5.00	1.07-23.42	0.041
Father's education	1.48	1.01-2.15	0.042
Perception that cellphone use is harmful to health	4.89	1.68-14.27	0.004
Use of hands-free kit	0.08	0.02-0.31	0.000

OR: Odds ratio; CI: Confidence interval

Table 3: Distribution of smartphone users according to background characteristics (n=496)

Variable	Smartphone addiction, n (%)	Total, n (%)	P*
Age (completed years)			
16	18 (31.6)	57 (13.7)	0.004
17	34 (28.3)	120 (28.8)	
18	52 (51.0)	102 (24.5)	
19	50 (36.5)	137 (32.9)	
Gender			
Male	85 (35.7)	238 (57.2)	0.524
Female	69 (38.8)	178 (42.8)	
Area of residence			
Urban	110 (40.9)	269 (64.7)	0.027
Rural	44 (29.9)	147 (35.3)	
Place of education (school vs. college)			
School	60 (29.7)	202 (48.6)	0.003
College	94 (43.9)	214 (51.4)	
Duration of smartphone use (months)			
<3	3 (4.3)	70 (16.8)	0.000
3-6	3 (6.7)	45 (10.8)	
6-12	11 (11.7)	94 (22.6)	
>12	137 (66.2)	207 (49.8)	
Daily use of smartphone (h/day)			
<1/2	6 (4.4)	135 (32.5)	0.000
1/2-1	25 (20.2)	124 (29.8)	
1-2	49 (67.1)	73 (17.5)	
>2	74 (88.1)	84 (20.2)	

*Chi-square test

Discussion

In our study, about 84% of respondents were found to be using smartphone. The top three reasons for smartphone use were as follows: (1) for calling parents and friends (96%), (2) to use the Internet particularly for social networking (91%), and (3) to use it for studies (78%). The top three reasons for not using smartphone were as follows: (1) it is expensive, (2) one does not need it, and (3) parents do not allow to keep it. Our study detected a higher prevalence of SA among adolescents in the age group of 16–19 years than that reported among medical students of Central India[5] and among Polish[6] as well as British and Spanish adolescents.[7] However, SA prevalence in our study is similar to that reported among Korean adolescents by Lee and Lee[8] and lower than the rates reported among college students by Sethuraman *et al.* in their study done in Andaman and Nicobar islands,[9] Basu *et al.* in their Delhi-based study,[10] and Aljomaa *et al.* in their study done in Saudi Arabia.[11] A mixed-method study done by Davey and Davey using a systematic review and meta-analysis approach reported SA in the range of 39% to 44% among Indian adolescents.[3] A Turkish study found SA in 50.6% of adolescents who were referred to psychiatry clinics.[12]

Table 4: Distribution of smartphone users according to their parents' background characteristics (*n*=416)

Variable	Smartphone addiction, *n* (%)	Total, *n* (%)	*P**
Father's education			
Illiterate	0 (0.0)	14 (3.4)	0.000
Just literate	2 (16.7)	12 (2.9)	
Primary	2 (11.1)	18 (4.3)	
Secondary	10 (17.2)	58 (13.9)	
Higher secondary	34 (35.1)	97 (23.3)	
Graduate and above	58 (40.6)	143 (34.4)	
Mother's education			
Illiterate	0 (0.0)	19 (4.6)	0.000
Just literate	4 (28.6)	14 (3.4)	
Primary	2 (6.1)	33 (7.9)	
Secondary	20 (23.3)	86 (20.7)	
Higher secondary	44 (38.6)	114 (27.4)	
Graduate and above	60 (54.5)	110 (26.4)	
Parents' monthly income (in Indian rupees)			
0-10,000	0 (0.0)	10 (2.4)	0.000
10,000-20,000	4 (10.0)	40 (9.6)	
20,000-30,000	16 (16.0)	100 (24.0)	
30,000-40,000	62 (39.2)	158 (38.0)	
>40,000	72 (66.7)	108 (26.0)	

*Chi-square test

Table 5: Factors associated with smartphone addiction - multivariate logistic regression analysis (*n*=416)

Variable	Adjusted OR	95% CI	*P*
Area of residence	3.03	1.37-6.69	0.006
Discipline	0.16	0.06-0.42	0.000
Parents' monthly income	0.40	0.23-0.70	0.001
Duration of smartphone use	0.22	0.12-0.39	0.000
Daily use of smartphone	0.13	0.08-0.21	0.000
Perception that cellphone use is harmful to health	0.40	0.17-0.95	0.037

OR: Odds ratio, CI: Confidence interval

In our study, Chi-square analysis showed a higher SA in older adolescents compared to younger ones. This finding is in congruence with the finding from studies done among South Korean,[13] Turkish,[12] and Spanish and British adolescents.[14] However, it is in contrast to the finding from studies done in Switzerland[15] which reported a higher prevalence of SA in younger adolescents.

Most of the earlier studies have found female gender as a significant predictor for SA.[5-8,14,16,17] However, gender was not associated with SA in our study which corroborates the finding from other studies conducted in India[9,10] and abroad.[7,12,13,18,19] We also studied area of residence and found that SA was significantly higher in urban adolescents, which contradicts the finding from a study conducted among Spanish adolescents.[17] Although, in our study, discipline was not related to SA, place of education, whether school or college, was significantly associated with SA, college students being more likely to get smartphone addicted. We suppose that restriction on the use of mobile phones in schools may be the reason for less SA among school students. A Lebanese study, as well, did not demonstrate association between type of discipline and SA score.[18]

Our study revealed that longer the duration and higher the number of daily hours of smartphone use, more is the likelihood of SA. It can be a vicious cycle of SA and more time spent on smartphone, one perpetuating the other. Duration[19] and daily use[3,5,11,15] of smartphone were reported to be predictors of SA by some studies conducted in Central India and other parts of the world.

A strong association between parents' education and SA reported in our study corroborates the finding obtained in the study by Lopez-Fernández *et al*.[14] However, Cha and Seo[19] did not find the effect of parents' education level on SA, while Firat and Gul[12] found only maternal education as a predictor of SA. Similarly, finding in our study that adolescents from higher economic class are more likely to be addicted to smartphone replicates the finding from the Spanish study by Sánchez-Martínez and Otero[17] but not that reported by other researchers.[11,12,19]

In our study, multivariate logistic regression analysis showed that significantly less proportion of adolescents addicted to smartphone perceived that excessive cellphone use is harmful to health. However, the practice of using cellphone while driving and using hands-free kit was similar in the two groups: those who have SA and those who have not. In addition, arts, commerce, and general stream students were more likely to have SA compared to science and engineering students. Less academic burden and more leisure time for former group may be the reason for this difference.

Our study has few limitations. As it has used a cross-sectional design, causality cannot be inferred. Further longitudinal or experimental studies need to be conducted for establishing causal associations. Moreover, there is possibility of reporting bias as the questionnaire used was self-administered. In addition, the results of our study may have limited external validity as we have not included adolescents who are not enrolled in an educational institute and other age groups who are at risk of SA.

Conclusion

The present study detected a high rate of SA among adolescents in the age group of 16–19 years. It was found to be significantly higher in urban college students belonging to well-educated and affluent families. Consequently, effective strategies at local, state, and national level should aim at addressing this growing health problem in adolescent population.

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Conflicts of interest

There are no conflicts of interest.

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