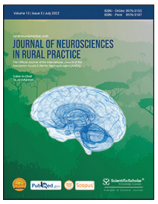
ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

https://ruralneuropractice.com

Journal of Neurosciences in Rural Practice



Original Article

Psychosocial characteristics of smartphone use behaviors – comparison between urban and rural school students in India

Limalemla Jamir[1], Mona Duggal[2], Sandeep Grover[3], Dinesh Kumar[4], Sharad Philip[5], Ritu Nehra[3]

[1]Department of Community and Family Medicine, All India Institute of Medical Sciences, Guwahati, Assam, [2]Advanced Eye Centre, Postgraduate Institute of Medical Education and Research, [3]Department of Psychiatry, Postgraduate Institute of Medical Education and Research, Chandigarh, Punjab, India, [4]Department of Biomedical Engineering, School of Engineering, RMIT University, Melbourne, Australia, [5]Department of Psychiatry, Clinical NeuroSciences, and Addiction Medicine, All India Institute of Medical Sciences, Guwahati, Assam, India.

ABSTRACT

Objective: To compare smartphone usage between urban and rural high school students in North India.

Materials and Methods: This cross-sectional study was conducted among high school smartphone users aged 13–18 years, from urban and rural settings in North India. Demographic data were collected, and a validated 45-item tool was used to assess problematic smartphone use (PSU). Data analysis was done using Stata version 12.0. Logistic regression was used to identify independent predictors of problematic use.

Results: A total of 578 students participated in the study, with a mean age of 14.8 years. PSU was identified in 38.9% of participants (urban: 43.7%; rural: 35.8%; $P = 0.06$). Among urban students, age emerged as a significant predictor, with older students displaying a greater likelihood of problematic use (adjusted odds ratio [aOR] = 3.16). In rural students, problematic use was significantly influenced by gender (higher in males, aOR = 2.80), type of school (private school students, aOR = 3.94), usage of multiple devices (aOR = 4.34), and engagement in social networking activities (aOR = 3.21). Furthermore, higher maternal education level was identified as a protective factor against problematic use among rural adolescents (aOR = 0.13). Notably, unsuccessful attempts to control or reduce smartphone use were significantly higher among rural students (42.7%) compared to urban students (32.6%) ($P = 0.02$).

Conclusion: PSU was comparable between urban students and rural students. Gender, maternal education, and economic access influenced smartphone use among school students in India. There is an urgent need to address the specific risk factors related to both urban and rural contexts.

Keywords: Adolescent, Digital technology, Psychosocial support systems, Rural health services, Smartphone

INTRODUCTION

Smartphone use among adolescents is significantly altering social interactions and has profound psychological implications.[1] Factors such as lack of parental supervision, insufficient social support during this critical developmental stage, and peer pressure significantly contribute to the risk of developing problematic smartphone use (PSU).[2]

In developing countries like India, where smartphone technology has a significant market, access to smartphones among adolescents is largely influenced by gender and residential background (urban or rural).[3,4] Urban adolescents have better access to mobile phones and the internet, enhancing communication, education, and social networking. Their increased mobile usage leads to both positive outcomes, like educational opportunities, and negative effects, such as exposure to harmful content. Rural adolescents face unique challenges in regulating their smartphone usage due to perceived social isolation, lower digital literacy among parents, lack of guidance, and erratic internet connectivity.[5] Despite the widespread use of smartphones in India, including rural areas where 68.8% of the population resides, there is a lack of research on PSU among urban and rural adolescents.[6] Most studies focus on internet addiction, although smartphones are the primary means of accessing the internet.[7]

With India having the largest adolescent population in the world, it is crucial to examine smartphone usage patterns and assess the risks of developing PSU among urban and rural adolescents. This demographic represents nearly 21% of the nation's population and is at a critical stage where their

***Corresponding author:** Dr. Mona Duggal, Advanced Eye Centre, Postgraduate Institute of Medical Education and Research, Chandigarh, Punjab, India. monaduggal2@gmail.com

Received: 02 October 2024 **Accepted:** 15 November 2024 **EPub Ahead of Print:** 28 December 2024 **Published:** 05 March 2025 **DOI:** 10.25259/JNRP_377_2024

habits can significantly impact their future health and well-being. Understanding the influence of smartphones on this age group is vital for safeguarding their mental health and promoting responsible digital behavior.

The present study aims to fill this research gap by examining the demographic profile of high school smartphone users, patterns of usage, and independent predictors of PSU in urban and rural schools in North India. The findings will help identify the extent of the digital divide and specific risks in urban-rural settings and inform the development of targeted interventions to address PSU among adolescents in India. Such research is essential to promote healthy smartphone usage and mitigate the potential negative impacts on adolescent well-being.

MATERIALS AND METHODS

This cross-sectional study was conducted among schools located within the urban and rural field practice areas of the medical institute after obtaining approval from the Institutional Ethics Committee (IEC No. INT/IEC/2015/683) and permission from the District Education Officer and the respective school principals.

We studied school students aged 13–18 years who were recruited from grades 9 to 12. A sample size of 578 students was calculated using the formula for determining sample size for a single proportion, with prevalence data from a previous study.[8] Based on the distribution of schools at the study sites, two-thirds of the participants were enrolled from rural schools, while one-third were enrolled from urban schools.

A bilingual, semi-structured questionnaire was used. The questionnaire was translated from English into the local language (Hindi) and back-translated for consistency. It was co-designed with the target students, for which a pilot study was conducted among students of similar age in a non-study area. The questionnaire consisted of three parts: socio-demographic profile, mobile usage pattern, and assessment of problematic use. The socio-demographic variables included age, gender, type of school, parents' education level and occupation, family size, and academic performance in the last examination. In the context of the target population, the term "service" was used to describe parents' occupations, defined as an office job (government or private), while business was defined as any commercial activity (e.g., shop owner or assistant, painter, tailor, chef, tuition teacher, photographer, goldsmith, electrician). Seven mobile phone usage parameters were recorded: (i) mobile ownership, (ii) type of mobile phone (smartphone or non-smartphone), (iii) use of other gadgets (tablets, laptops, or desktops), (iv) use of the internet for any activity other than social networking sites (SNS), (v) use of SNS (Facebook, Twitter, WhatsApp, Instagram), (vi) hours of gadget use per day, (vii) parental and school restrictions, and (viii) self-perceived need for help regarding any mental problem or excessive phone use. A smartphone was defined as a mobile phone with computing functions, a touch-screen interface, and the capability to run downloaded software applications.

A previously validated 45-item instrument[9] assessing smartphone use was used to evaluate the characteristics of smartphone behavior among participating students, demonstrating high reliability with a Cronbach's alpha of 0.865 in the current study sample. Although the tool is based on the International Classification of Diseases-10 criteria for substance dependence syndrome, it has the advantage of evaluating PSU, including instances not involving the internet. This tool also has the added advantage of being bilingual, making it suitable for community-based research studies.

Data were collected from April to August 2016, during school hours from students present on the data collection day. After briefing about the study, participants were enrolled after obtaining voluntary, written informed assent. The confidentiality of their responses was maintained, as was their right to refuse or withdraw from participation. It took about 20–25 min to fill the study questionnaire. Team members were present to supervise data collection, answer queries, and ensure privacy. Forms were checked for completeness following submission, and participants were contacted once for any missing responses. There was no coercion throughout this process.

Data analysis was performed using Stata version 12.0 (StataCorp, College Station, TX). Categorical variables were summarized as percentages, and continuous variables were summarized as means (standard deviation). The Pearson Chi-square test (χ^2) was applied to study the association between PSU and the socio-demographic profile and gadget usage patterns by school setting (rural/urban). Logistic regression analysis was conducted with PSU as the outcome variable. Backward stepwise multiple logistic regression was used to identify factors independently associated with PSU. All variables with a $P < 0.2$ (for unadjusted odds ratios [ORs]) were entered into the model, and those with a $P < 0.05$ were retained. The results are reported as adjusted ORs (95% Confidence Interval [CI]) and *P*-values. The fit between the model and the data was assessed using a goodness-of-fit test. Statistical significance was set at a $P < 0.05$.

RESULTS

Demographic profile and smartphone use

A total of 578 students who used smartphones volunteered for this study, the details of their profile are presented in Table 1. About two-thirds (60.4%; $n = 349$) of the participants were from rural schools and 39.6% ($n = 229$) were from urban schools. The mean age of the participants

Table 1: Demographic profile and smartphone use pattern by school setting.

Variable	Total *n* (%)	Rural *n* (%)	Urban *n* (%)
Age (years) (Mean±SD)*	14.8±1.4	15.0±1.4	14.3±1.4
Gender			
Male	350 (60.6)	227 (65.0)	123 (53.7)
Female	228 (39.5)	122 (35.0)	106 (46.3)
Type of school			
Government	212 (36.7)	110 (31.5)	102 (44.5)
Private	366 (63.3)	239 (68.5)	127 (55.5)
Score in the last examination (Mean±SD)*	74.5±13.8	72.7±14.3	77.0±12.6
Education of father			
Illiterate	50 (8.6)	32 (9.2)	18 (7.9)
Up to high school	354 (61.3)	228 (65.3)	126 (55.0)
Secondary school and above	174 (30.1)	89 (25.5)	85 (37.1)
Education of mother			
Illiterate	21 (3.6)	15 (4.3)	6 (2.6)
Up to high school	308 (53.3)	203 (58.2)	105 (45.9)
Secondary school and above	249 (43.1)	131 (37.5)	118 (51.5)
Occupation of father			
Laborer	86 (15.1)	81 (23.8)	5 (2.2)
Farmer	66 (11.6)	58 (17.0)	8 (3.5)
Service	219 (38.4)	109 (32.0)	110 (48.0)
Business	199 (34.9)	93 (27.3)	106 (46.3)
Occupation of mother			
Homemaker	469 (81.7)	300 (87.0)	169 (73.9)
Laborer	10 (1.7)	6 (1.7)	4 (1.8)
Service	67 (11.7)	28 (8.1)	39 (17.0)
Business	28 (4.9)	11 (3.2)	17 (7.4)
Family size (Mean±SD)*	5.6±2.8	5.7±3.0	5.5±2.4
Whose smartphone do you use?			
Own	254 (43.9)	163 (46.7)	91 (39.7)
Siblings	53 (9.2)	35 (10.0)	18 (7.9)
Parents	252 (43.6)	148 (42.4)	104 (45.4)
Friends	19 (3.3)	3 (0.9)	16 (7.0)
Use of other gadgets			
None	260 (45.0)	191 (54.7)	69 (30.1)
Use of one other gadget	232 (40.1)	122 (35.0)	110 (48.0)
Use two or more other gadgets	86 (14.9)	36 (10.3)	50 (21.8)
Use of Internet and social networking sites (SNS)			
None	51 (8.8)	38 (10.9)	13 (5.7)
Internet	191 (33.0)	125 (35.8)	66 (28.8)
SNS	190 (32.9)	108 (31.0)	82 (35.8)
Internet and SNS	146 (25.3)	78 (22.4)	68 (29.7)
Total hours of gadget use per day			
Up to 2 h	459 (82.6)	275 (83.1)	184 (81.8)
Up to 3–4 h	62 (11.2)	33 (10.0)	29 (12.9)

(Contd...)

Table 1: (*Continued*).

Variable	Total *n* (%)	Rural *n* (%)	Urban *n* (%)
More than 4 h	35 (6.3)	23 (7.0)	12 (5.3)
Gadget used for school work per day			
Up to 2 h	452 (85.8)	277 (89.1)	175 (81.0)
Up to 3–4 h	56 (10.6)	23 (7.4)	33 (15.3)
More than 4 h	19 (3.6)	11 (3.5)	8 (3.7)
Parents restrict phone/gadget use.			
Yes	352 (60.9)	222 (63.6)	130 (56.8)
No	226 (39.1)	127 (36.4)	99 (43.2)
School restricts phone use during school hours.			
Yes	518 (89.6)	325 (93.1)	193 (84.3)
No	60 (10.4)	24 (6.9)	36 (15.7)
Self-perceived need for help for excessive use of smartphone			
Yes	177 (33.1)	128 (39.3)	49 (23.4)
No	358 (66.9)	198 (60.7)	160 (76.6)

*SD: Standard deviation.

was 14.3 ± 1.4 years, with 60.3% male participants and 39.7% female participants. The proportion of female students was more in the urban schools (46.3%) as compared to rural schools (35.0%). Academic performance in the last examination was comparable between rural and urban school students. The parental education level of urban school students was higher compared with rural schools.

Less than half of the students (43.9%) had a personal smartphone. More urban school students used additional gadgets, as compared to their rural counterparts. Urban school students spent more hours using gadgets in general and for schoolwork compared to rural school students. Parental and school restrictions on phone usage were more among rural school students than urban school students [Table 1].

Smartphone use and associated symptoms

The most common concerns regarding smartphone use included the belief that excessive use of mobile phones or tablets is detrimental to health (77.5%), losing track of time when engaging with these devices (70.9%), and the tendency to return missed calls (66.6%). Notably, unsuccessful attempts to control, reduce, or cease smartphone use were significantly higher among rural school students (42.7%) compared to their urban counterparts (32.6%) ($P = 0.02$). As compared to urban school students, rural school students were more likely to report losing friends due to their smartphone use (0.03) and return most missed calls ($P < 0.001$). A greater number of rural school students also felt guilty about their spending on smartphones ($P = 0.01$), frequently checked their devices in anticipation of calls or messages during study hours ($P = 0.02$), reported a decline in grades attributed to smartphone use ($P < 0.001$) and felt incomplete if unable to access the smartphone daily ($P = 0.005$). Urban school students were significantly more engaged in sending text messages and conversing with unknown individuals of the same or opposite sex ($P = 0.01$) and reported a rise in device usage over the years without any logical explanation ($P = 0.02$).

There were no significant differences between rural and urban school students regarding declines in socialization overall, spending less time with family members, or the exchange and viewing of pornography. Overall, 38.9% of the participants had PSU. It was higher among urban school students (43.7%) as compared to rural school students (35.8%). However, the associations were not significant.

PSU by socio-demographic profile and smartphone usage pattern

Age was significantly associated with PSU among urban school students ($P = 0.003$). Gender was significantly associated with PSU among both rural and urban school students ($P < 0.001$). Academic performance was also significantly associated with PSU among rural ($P < 0.001$) and urban school students ($P = 0.03$). There was no significant association between the education and occupation of parents and PSU in either group. Having a personal phone and the use of the internet and/or social media were significantly associated with PSU in both groups. The use of additional gadgets was significantly associated with PSU among rural school students ($P = 0.001$).

Total hours of gadget use per day were significantly associated with PSU in both groups, whereas a significant association

Table 2: Covariates of problematic smartphone use.

Variable	Rural		Urban	
	Adjusted OR (95% CI)	*P*-value	Adjusted OR (95% CI)	*P*-value
Age (years)				
12–14	1		1	
15–17	-	-	3.16 (1.43–6.97)	0.004
≥18	-	-		
Gender				
Female	1		1	
Male	2.80 (1.31–6.01)	0.01	-	
Type of school				
Government	1		1	
Private	3.94 (1.50–10.35)	0.01		
Percentage score in last exam (%)				
≤59.9	1		1	
60–79.9	-	-	-	
≥80	-	-	-	
Education of father				
Illiterate	1		1	
Up to high school	-	-	-	
Secondary school and above	-	-	0.43 (0.16–1.16)	0.09
Education of mother				
Illiterate	1		1	
Up to high school	0.14 (0.03–0.72)	0.02	3.64 (0.62–21.31)	0.15
Secondary school and above	0.13 (0.02–0.85)	0.03	3.79 (0.52–27.38)	0.19
Occupation of father				
Laborer	1		1	
Farmer	-		-	
Service	-		-	
Business	-		-	
Occupation of mother				
Homemaker	1		1	
Laborer	-		-	
Service	-		-	
Business	-		-	
Family Size				
Up to 4	1		1	
5–7	-		-	
8 and above	-		2.88 (0.90–9.17)	0.07
Whose mobile do you use?				
Share with friends	1		1	
Share with siblings	0.36 (0.11–1.17)	0.09	0.15 (0.02–1.00)	0.05
Share with parents	-		0.59 (0.27–1.29)	0.19
Own	-		-	
Use of other gadgets				
None	1		1	

(Contd...)

Table 2: *(Continued).*

Variable	Rural		Urban	
	Adjusted OR (95% CI)	*P*-value	Adjusted OR (95% CI)	*P*-value
Use of one other gadget	1.63 (0.83–3.21)	0.16	0.43 (0.18–1.07)	0.07
Use two or more other gadgets	4.34 (1.40–13.42)	0.01	0.34 (0.11–1.06)	0.06
Use of Internet and SNS				
None	1		1	
Internet	1.84 (0.81–4.18)	0.15	-	
SNS	3.21 (1.38–7.46)	0.01	-	
Internet and SNS	-	-	-	
Total hours of gadget use per day				
Up to 1 h	1		1	
2–3 h	-		-	
4 h or more	-		5.90 (0.77–5.14)	0.88
Hours of gadget use for school work per day				
Up to 1 h	1		1	
2–3 h	-		-	
4 h or more	3.72 (0.59–3.60)	0.16	-	
Parents restrict phone/gadget use.				
Yes	1		1	
No	-		-	
School restricts phone use.				
Yes	1		1	
No	-		2.65 (0.86–8.18)	0.090
Self-perceived need for help for excessive use of mobile phone				
Yes	1		1	
No	-		-	

OR: Odds ratio, CI: Confidence interval, SNS: Social networking sites

with gadget use for school work was found only among urban school students. While there were no significant associations between parental or school restrictions and PSU in either study group, it was significantly associated with the students' self-perceived need for professional help for excessive phone usage in both groups.

Covariates of PSU

Table 2 presents the results of a logistic regression analysis aimed at identifying the factors independently associated with problematic smartphone usage. Urban school students in the age group of 15–17 years were 3.16 times more likely to have PSU as compared to the other age groups studied. For rural school students, several independent predictors of PSU were identified: male gender (OR = 2.80; 95% CI = 1.31–6.01), enrollment in private schools (OR = 3.94; CI = 1.50–10.35), use of two or more other gadgets (OR = 4.34; CI = 1.40–13.42), and engagement with SNS (OR = 3.21; CI = 1.38–7.46). In addition, a higher educational level of mothers among rural school students was found to be a significant protective factor against PSU.

DISCUSSION

Smartphones are becoming a regular part of our educational landscape, with many educational institutes integrating these to support student learning. Yet PSU is a significant concern, affecting 38.9% of students in the present study. We found that the prevalence of PSU between urban and rural school students was similar. However, the determinants varied between the two groups. In urban schools, students aged 15–17 are more likely to exhibit PSU compared to younger peers. In rural schools, male students, those in private institutions, and users of multiple gadgets or SNS were more prone to PSU, as compared to female students studying in government schools, using a single gadget (smartphone), and non-use of SNS. Higher maternal education among rural school students was found to reduce the risk of PSU, highlighting the influence of family background on smartphone usage patterns.

The prevalence of PSU in this study aligns with previous research, despite variations in measurement scales.[2,10,11] However, most of the studies have been conducted in urban settings, including those from India.[8,12] While a prior study in rural Korea reported a lower prevalence (24.1%) of PSU,[13] the present study reveals comparable levels of problematic use among urban and rural students, indicating that rural students are increasingly engaging with smartphones and facing related issues. This underscores the necessity for further research in rural contexts.

Congruent with earlier research, urban students aged 15–17 years were more likely to engage in PSU.[14,15] This may be due to late adolescence (15–19 years) being a transitional phase in education, moving from school to higher education, which involves adjustments amidst increased freedom and responsibilities.[16] In the present study, male gender in rural schools was an independent predictor of PSU. Across studies, it has been observed that problematic smartphone usage is influenced by gender-specific usage patterns - gaming among males,[17,18] and social networking among females.[19-21] However, despite gender-specific usage patterns, both genders show equal susceptibility to problematic use, highlighting the need for targeted interventions.[18,22] The present study's gender imbalance, with more rural males and more urban females, reflects broader educational enrollment trends in India, where urban areas have higher female enrollment,[23] suggesting that educational and smartphone access disparities may have influenced the findings.[24,25]

Rural school students in this study who attended private schools and used multiple gadgets were significantly more likely to experience PSU compared to those in rural government schools with limited gadget access. This aligns with previous research indicating that socioeconomic status and gadget usage are predictors of PSU.[26,27]

Higher maternal education was found to be protective against PSU among rural students, highlighting the positive influence of caregiver education on students' understanding and regulation of smartphone use.[19,28] Interestingly, despite stricter regulations in rural settings, these did not predict PSU in the present study. Contrasting findings exist regarding the relationship between smartphone regulation and problematic use, with some studies linking lower regulation to higher problematic use, while others suggest the opposite.[18,29] This inconsistency may stem from adolescents' tendencies to overuse smartphones in response to perceived restrictions on their personal freedom. To address smartphone distractions in learning environments, dynamic interventions are needed to maintain students' attention and support uninterrupted learning.[30] These strategies should acknowledge the real and perceived benefits of smartphones, such as social interaction and access to information while adapting to the rapidly evolving technology landscape.

In contrast to other studies, the present study did not find a significant association between academic performance and PSU.[14,16] This may be influenced by the self-reported nature of the data and the limited academic scores available at the time of the study. Future research could explore the dynamics of learning environments and their relationship with PSU in both urban and rural contexts.

Behavioral patterns revealed that rural students often use smartphones to connect with others, potentially addressing feelings of social isolation.[31] In contrast, urban students reported higher engagement in risky behaviors, such as communicating with strangers, indicating different usage motivations influenced by their environments.[32] While the self-reported patterns of smartphone usage by rural students are features of early phases of technology adoption with more socio-economic determinants, the usage pattern among urban school students is more likely to be influenced by earlier initiation and longer periods of personal or environmental exposure to smartphones, than their rural peers. School-based programs should also focus on fostering self-control among students, as this has been shown to protect against PSU. The study also noted that the rates of social issues associated with PSU, such as loss of friends and substance use in families, were lower than in previous studies, indicating a convergence of experiences between urban and rural students.[33]

Although not a predictor of PSU in this study, 20.9% of students reported viewing pornography, with similar rates between urban and rural students. A study from India reported that rural students downloaded pornographic content more frequently than their urban counterparts.[34] In addition, pornography has been associated with internet addiction and sexual violence among school students.[7,35] Acknowledging the prevalence of pornographic content and developing supportive strategies could help mitigate its potential negative impacts on students.

To the best of our knowledge, this is the first study, to compare problematic smartphone usage among urban and rural school students in North India using validated bilingual study instruments. Moreover, the authors have utilized the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist to ensure that the highest reporting standards for observational studies have been met.[36] The bilingual study instruments addressed language barriers, and anonymity helped reduce social biases.

The results could also be generalizable to other regions of the country and many other countries, as this ubiquitous smartphone technology is widely used by school students across the globe. The findings suggest that rural students are increasingly experiencing PSU similar to their urban peers, with urban users exhibiting higher thresholds for gratification due to longer exposure to technology. It also identifies diverse psychosocial determinants, emphasizing the protective role of maternal education and gender-specific behaviors. Moreover, the authors have utilized the STROBE

checklist to ensure that the highest reporting standards for observational studies have been met.[36]

However, limitations such as the cross-sectional design and lack of comprehensive academic data must be considered when interpreting these results. Self-reported information by the students may also have influenced the findings due to social desirability bias.

CONCLUSION

The prevalence of PSU among urban (43.7%) and rural (35.8%) school students in North India was comparable. Urban students were more likely to engage with strangers online, while rural students frequently checked their phones and felt guilt over spending. Key predictors for urban problematic use included being aged 15–17 years, whereas for rural students, factors included being a male student, private school enrollment, using multiple gadgets, and social media use. Higher maternal education was protective against PSU among rural school students. The findings highlight the necessity for targeted interventions addressing the unique risk factors in urban and rural settings to promote responsible smartphone use.

There is an urgent need for educational programs focused on digital literacy for students, parents, and educators. Future research should explore integrated interventions that support both academic and personal development to mitigate problematic use during critical formative years of life. Open communication between adolescents and caregivers is essential to prevent PSU.

Ethical approval: The research/study was approved by the Institutional Review Board at Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, India, number IEC No. INT/IEC/2015/683, dated November 02, 2015.
Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent.
Financial support and sponsorship: Nil.
Conflicts of interest: There are no conflicts of interest.
Use of artificial intelligence (AI)-assisted technology for manuscript preparation: The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Yu S, Sussman S. Does smartphone addiction fall on a continuum of addictive behaviors? Int J Environ Res Public Health 2020;17:E422.
2. Tangmunkongvorakul A, Musumari PM, Tsubohara Y, Ayood P, Srithanaviboonchai K, Techasrivichien T, *et al*. Factors associated with smartphone addiction: A comparative study between Japanese and Thai high school students. PLoS One 2020;15:e0238459.
3. India Cellular and Electronics Association (ICEA). India to export 30% of its total smartphone production in FY24. IBEF; 2024. Available from: https://www.ibef.org/news/india-to-export-30-of-its-total-smartphone-production-in-fy24-icea-report [Last accessed on 2024 Aug 18].
4. Raihan S, Uddin M, Ahmmed S. Dynamics of youth and gender divide in technology in Bangladesh. South Asia Econ J 2021;22:205-32.
5. Mukherjee E, Mazar O, Aggarwal R, Kumar R. India exclusive report. Digital Empowerment Foundation; 2017. Available from: https://defindia.org/wp-content/uploads/2017/09/india-exclusive-report_def-chapter.pdf [Last accessed on 2024 Aug 18].
6. Ministry of Health and Family Welfare, Government of India. Adolescent health. National Health Mission; 2014. Available from: https://nhm.gov.in/index1.php?lang=1&level=2&sublinkid=818&lid=221 [Last accessed on 2024 Jul 10].
7. Amudhan S, Prakasha H, Mahapatra P, Burma AD, Mishra V, Sharma MK, *et al*. Technology addiction among school-going adolescents in India: Epidemiological analysis from a cluster survey for strengthening adolescent health programs at district level. J Public Health (Oxf) 2022;44:286-95.
8. Sánchez-Martínez M, Otero A. Factors associated with cell phone use in adolescents in the community of Madrid (Spain). Cyberpsychol Behav 2009;12:131-7.
9. Basu D, Kate N, Nehra R, Grover S, Khehra N. Does the excessive use of mobile phones in young adults reflect an emerging behavioral addiction? J Postgrad Med Educ Res 2012;46:177-82.
10. Cha SS, Seo BK. Smartphone use and smartphone addiction in middle school students in Korea: Prevalence, social networking service, and game use. Health Psychol Open 2018;5:2055102918755046.
11. Harris B, Regan T, Schueler J, Fields SA. Problematic mobile phone and smartphone use scales: A systematic review. Front Psychol 2020;11:672.
12. Nikhita CS, Jadhav PR, Ajinkya SA. Prevalence of mobile phone dependence in secondary school adolescents. J Clin Diagn Res 2015;9:C06-9.
13. Lee HY, Cho YC. Relationship between psychosocial factors and smartphone addiction among middle school students in rural areas. J Korea Acad Ind Coop Soc 2015;16:4711-22.
14. Lee EB. Facebook use and texting among African American and Hispanic teenagers: An implication for academic performance. J Black Stud 2014;45:83-101.
15. Haug S, Castro RP, Kwon M, Filler A, Kowatsch T, Schaub MP. Smartphone use and smartphone addiction among young people in Switzerland. J Behav Addict 2015;4:299-307.
16. Gao Q, Jia G, Fu E, Olufadi Y, Huang Y. A configurational investigation of smartphone use disorder among adolescents in three educational levels. Addict Behav 2020;103:106231.
17. Lee SY, Lee D, Nam CR, Kim DY, Park S, Kwon JG, *et al*. Distinct patterns of Internet and smartphone-related problems among adolescents by gender: Latent class analysis. J Behav Addict 2018;7:454-65.
18. Son HG, Cho HJ, Jeong KH. The effects of Korean parents' smartphone addiction on Korean children's smartphone addiction: Moderating effects of children's gender and age. Int J Environ Res Public Health 2021;18:6685.

19. Cheung TL, Lee RL, Tse AC, Do CW, So BC, Szeto GP, *et al*. Psychometric properties and demographic correlates of the Smartphone Addiction Scale-Short Version among Chinese children and adolescents in Hong Kong. Cyberpsychol Behav Soc Netw 2019;22:714-23.
20. Fischer-Grote L, Kothgassner OD, Felnhofer A. Risk factors for problematic smartphone use in children and adolescents: A review of existing literature. Neuropsychiatr 2019;33:179-90.
21. Kim SG, Park J, Kim HT, Pan Z, Lee Y, McIntyre RS. The relationship between smartphone addiction and symptoms of depression, anxiety, and attention-deficit/hyperactivity in South Korean adolescents. Ann Gen Psychiatry 2019;18:1.
22. Park SY, Yang S, Shin CS, Jang H, Park SY. Long-term symptoms of mobile phone use on mobile phone addiction and depression among Korean adolescents. Int J Environ Res Public Health 2019;16:E3584.
23. N.S.S 75th Round. Household social consumption on education in India. Ministry of Statistics and Programme implementation; 2020. Available from: https://164.100.161.63/sites/default/files/publication_reports/report_585_75th_round_education_final_1507_0.pdf [Last accessed on 2024 Aug 10].
24. IIPS. National family health survey (NFHS-4), 2015-16: India, Mumbai: IIPS; 2017. Available from: https://rchiips.org/NFHS/NFHS-4Reports/India.pdf [Last accessed on 2024 Aug 10].
25. Ramalingam A, Kar SS. Is there a digital divide among school students? An exploratory study from Puducherry. J Educ Health Promot 2014;3:30.
26. Gürarslan Baş N, Karatay G. Effects of technology usage on the addictive behaviors of secondary school students. Perspect Psychiatr Care 2020;56:871-7.
27. Lin Y, Liu Q. Perceived subjective social status and smartphone addiction tendency among Chinese adolescents: A sequential mediation model. Child Youth Serv Rev 2020;116:105222.
28. Son H, Park S, Han G. Gender differences in parental impact on problematic smartphone use among Korean adolescents. Int J Environ Res Public Health 2021;18:E443.
29. Peng S, Zhou B, Wang X, Zhang H, Hu X. Does high teacher autonomy support reduce smartphone use disorder in Chinese adolescents? A moderated mediation model. Addict Behav 2020;105:106319.
30. Kumar DK, Radcliffe PJ. Teaching while surrounded by smartphones. In: 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Berlin, Germany; 2019. p. 4194-7. Available from: https://ieeexplore.ieee.org/document/8857363/. [Last accessed on 2024 Aug 17].
31. Zhen R, Liu RD, Hong W, Zhou X. How do interpersonal relationships relieve adolescents' problematic mobile phone use? The roles of loneliness and motivation to use mobile phones. Int J Environ Res Public Health 2019;16:E2286.
32. Pawłowska B, Zygo M, Potembska E, Kapka-Skrzypczak L, Dreher P, Kędzierski Z. Prevalence of Internet addiction and risk of developing addiction as exemplified by a group of Polish adolescents from urban and rural areas. Ann Agric Environ Med 2015;22:129-36.
33. Kim HJ, Min JY, Min KB, Lee TJ, Yoo S. Relationship among family environment, self-control, friendship quality, and adolescents' smartphone addiction in South Korea: Findings from nationwide data. PLoS One 2018;13:e0190896.
34. Koovakkai D, Muhammed PS. Internet abuse among adolescents: A study on the locale factor. Webology 2010;7:1-10.
35. Dawson K, Tafro A, Štulhofer A. Adolescent sexual aggressiveness and pornography use: A longitudinal assessment. Aggress Behav 2019;45:587-97.
36. Vandenbroucke JP, von Elm E, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, *et al*. Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration. PLoS Med 2007;4:e297.

How to cite this article: Jamir L, Duggal M, Grover S, Kumar D, Philip S, Nehra R. Psychosocial characteristics of smartphone use behaviors – comparison between urban and rural school students in India. J Neurosci Rural Pract. 2025;16:35-43. doi: 10.25259/JNRP_377_2024