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Smartphone Usage among Rural Youth and Its Potential Health Implications: A Cross-Sectional Study

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Abstract

Background: Smartphone usage has surged among rural youth, transforming communication, education, and entertainment. Despite these benefits, the potential health implications—including sleep disruption and increased stress—are emerging concerns in these communities.

Objectives: This study aimed to assess smartphone usage patterns among rural youth aged 15–25 years and evaluate the associated physical and mental health impacts. It sought to quantify daily usage durations, primary purposes of use, and the influence on sleep quality and stress levels.

Methods: A community-based cross-sectional study was conducted in a primary healthcare setting using a self-

administered, semi-structured questionnaire. A total of 122 participants were surveyed, collecting data on demographics, smartphone ownership, usage duration, and health outcomes. Data were coded, analyzed, and represented using Microsoft Excel with descriptive statistics, including means, standard deviations, frequencies, and percentages.

Results: Findings revealed that 80.2% of participants owned a smartphone, with 45.5% using them for 3–6 hours daily. The primary reason for usage was education/work (38%), followed by social media (24.8%), entertainment (21.5%), and communication (15.7%). A significant portion (41.3%) reported using smartphones before bedtime, which corresponded with delayed sleep onset and reduced overall sleep quality.

Approximately 49.2% experienced stress or anxiety linked to smartphone notifications and content, while 44.6% reported distractions affecting daily productivity. **Conclusions:** The study highlights a critical balance between the benefits and risks of smartphone usage among rural youth. It emphasizes the need for digital literacy programs, awareness campaigns about blue light effects, and strategies to foster healthier usage patterns to mitigate negative health outcomes.

Keywords: Smartphone Usage, Rural, Youth, Health **Introduction**

Smartphones have revolutionized communication, education, and entertainment worldwide, with their rapid adoption significantly altering the social and economic landscape. In India, the penetration of affordable smartphones—accelerated by initiatives such as Digital India—has extended the digital revolution to rural areas¹. This technological influx is not limited to urban centers; rural communities are increasingly embracing smartphones as essential tools for accessing information, educational content, and financial services².

For rural youth aged 15–25 years, smartphones serve as critical instruments for bridging educational gaps and fostering social connectivity. They are not only used for everyday communication but also provide platforms for online learning, digital entrepreneurship, and exposure to global information. However, the increased reliance on these devices brings with it potential health risks. Studies have demonstrated that prolonged screen time is associated with adverse outcomes such as disrupted sleep patterns, reduced sleep quality, and heightened stress and anxiety levels³. For instance, exposure to blue light from screens can interfere with melatonin production, delaying sleep onset and affecting overall circadian rhythms ⁴.

Moreover, while the educational and economic benefits of smartphone usage are widely acknowledged, emerging evidence suggests that excessive use may also contribute to psychological issues, including anxiety, depressive moods, and decreased concentration^{5,6}. Research by Haleem A (2022) highlights that in rural settings—where access to mental health resources may be limited—the negative impacts of digital overexposure are particularly concerning⁷.

Despite these findings, most studies have focused on urban populations, leaving a significant gap in our understanding of how rural youth specifically interact with and are affected by smartphone technology. This study is therefore essential to explore smartphone usage patterns among rural youth and to assess the physical and mental health implications associated with it. By addressing this gap, the research aims to inform targeted digital literacy programs and health interventions that can mitigate adverse outcomes, ultimately fostering a balanced and healthy digital environment for rural communities.

Materials and Methods

A community-based cross-sectional study was conducted over a period of three months at a primary healthcare facility located in a rural area. This setting was selected to capture data from rural youth accessing healthcare services, thereby providing a snapshot of smartphone usage patterns within this community.

The target population comprised rural youth aged 15–25 years, including both patients and their attenders who visited the primary healthcare facility. This age group was chosen based on the increasing digital engagement observed in adolescence and young adulthood.

Rural individuals aged 15–25 years, who were either patients or accompanying attendees at the healthcare

facility, and who provided informed consent were included under the study. Individuals outside the age range or those unwilling to participate were excluded.

A convenient sampling method was employed due to resource constraints and the exploratory nature of the study. A total of 122 participants were recruited during the study period.

A self-administered, semi-structured questionnaire was developed to collect data on sociodemographic Information, smartphone usage patterns, and its health implications. The questionnaire was pilot-tested with a small subset of rural youth to ensure clarity and validity of the questions.

Participants were briefed about the study's objectives, and written informed consent was obtained before questionnaire administration. The data collection was performed on-site at the healthcare facility in a designated quiet area to minimize disturbances.

Data from the completed questionnaires were coded and entered into Microsoft Excel. Frequencies and Percentages were applied to summarize categorical variables, and Means and Standard to describe continuous variables

Ethical approval was obtained from the institutional ethics committee. Participation was voluntary, and confidentiality was maintained by anonymizing all responses. Participants were assured that their data would be used solely for research purposes.

Results

The study involved 122 rural youth with a mean age of 20.74 years (SD = 2.95). The gender distribution was nearly equal—50.4% male and 48.8% female—with most participants enrolled in college (58.3%), followed by those in school (30.8%), and a small proportion not enrolled (4.2%). The majority of the respondents resided

in villages (62%), and a high percentage (80.2%) reported owning a smartphone, with an additional 31.4% using someone else's phone. This high level of smartphone penetration underscores that digital devices are widely accessible among rural youth.

Smartphone Usage Patterns

Participants reported varied daily usage durations. About 45.5% of respondents used their smartphones for 3–6 hours per day, while 39.7% used them for 1–3 hours, 10.7% for more than 6 hours, and only 4.1% for less than 1 hour. The primary purpose for smartphone use was education/work (38%), followed by social media (24.8%), entertainment (21.5%), and communication (15.7%). These findings indicate that smartphones are essential not only for leisure but also for academic and professional activities.

Sleep Patterns and Quality

A significant finding was that 41.3% of the participants always used their smartphones before bedtime. This high pre-bedtime usage was associated with delayed sleep onset: 46.3% reported that their smartphone use delayed their bedtime. Although the majority (64.5%) obtained 6–8 hours of sleep, a notable number reported sleep disturbances—27.2% had difficulty falling asleep, 23.3% woke up frequently, and 43% felt tired upon waking.

These outcomes suggest that exposure to blue light and mental stimulation from smartphone use are contributing to poor sleep quality.

Mental Health and Cognitive Effects

Nearly half (49.2%) of the respondents reported experiencing stress or anxiety related to smartphone notifications and content. In addition, 47.1% frequently compared their lives with others on social media, and 44.6% indicated that their smartphone use led to distraction and loss of focus. The prevalence of irritability (39.6%), mood changes (49.6%), and difficulty managing stress (55.4%) point to potential adverse psychological and cognitive effects stemming from excessive smartphone use.

Awareness and Behavioral Changes

Awareness of the adverse effects of blue light on sleep was high (66.1%), and this awareness was significantly associated with the successful reduction of smartphone usage. Participants who were aware of these effects were more likely to modify their behavior, suggesting that digital literacy programs could be effective in promoting healthier digital habits.

Table 1: Association between Dimensions of smartphone use and their impact on health and cognitive functioning of rural youth

Awareness of Blue	Light Effects vs. Sleep Q	uality				
	Sleep Quality: Good	Sleep Quality: poor	Chi-square	P value		
Aware	40 (50)	40 (50)	6.45	0.011		
Not Aware	30 (73.2)	11 (26.8)				
Interest in Awaren	ess Programs vs. Attemp	ts to Reduce Smartphone	Usage	I		
	Successful	Unsuccessful	No Attempt	Chi-	P value	
				square		
Interest: Yes	35 (42.2%)	30 (36.1%)	18 (21.7%)	9.30	0.009	
Interest: No	5 (13.2%)	13 (34.2%)	20 (52.6%)			
Educational Level	vs. Smartphone Ownersh	ուն	I			
	Ownership: Yes	Ownership: No	Chi-square	P value		
Not Enrolled	1 (20.0%)	4 (80.0%)	12.20	0.007	0.007	
School Level	25 (67.6%)	12 (32.4%)				
College Level	65 (92.9%)	5 (7.1%)				
Other	5 (62.5%)	3 (37.5%)				
Pre-Bedtime Smar	tphone Usage vs. Delayed	l Bedtime		I		
	High Delay	Low Delay	Chi-square	P value		
High Usage	35 (39.8%)	53 (60.2%)	3.63	0.057		
Low Usage	7 (21.2%)	26 (78.8%)				
Daily Smartphone	Usage Duration vs. Repo	rted Distraction		I		
	High Distraction	Low Distraction	Chi-square	P value		
High Usage	30 (44.1%)	38 (55.9%)	17.47	0.001		
Low Usage	5 (9.4%)	48 (90.6%)				
Awareness of Blue	Light Effects vs. Success	ful Reduction of Smartph	one Usage	I		

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	Successfully Reduced Usage	Not Successful	Chi-square	P value				
Aware	40 (50.0%)	40 (50.0%)	5.21	0.04				
Not aware	8 (19.5%)	33 (80.5%)						
Pre-Bedtime Smartphone Usage vs. Reported Stress/Anxiety								
	Stress/Anxiety	No Stress/Anxiety	Chi-square	P value				
High Usage	45 (51.1%)	43 (48.9%)	0.70	0.12				
Low Usage	14 (42.4%)	19 (57.6%)						

The association between dimensions of smartphone use and how they impact the health and cognitive functioning of rural youth were analyzed using Chisquare tests (Table 1).

A trend was observed between high pre-bedtime usage and delayed bedtime (p \approx 0.057), suggesting that excessive usage before sleep might push back sleep onset. The analysis clearly demonstrated that prolonged daily smartphone use is significantly linked to higher levels of distraction (p < 0.001), which could adversely affect productivity and learning. Although pre-bedtime usage did not show a significant association with reported stress/anxiety, this indicates that stress may result from a combination of factors beyond just screen exposure. The significant association between awareness of blue light effects and the ability to reduce smartphone usage (p < 0.05) underscores the potential of targeted digital literacy programs and awareness campaigns in mitigating adverse outcomes.

The comprehensive analysis of the results indicates that while smartphones are indispensable for educational and social engagement among rural youth, excessive or illtimed usage is linked to delayed sleep and cognitive distraction. Although not all associations (e.g., between pre-bedtime usage and stress) reached statistical significance, the overall trend supports the notion that high smartphone use adversely affects sleep quality and focus. Moreover, awareness of digital risks appears to empower behavioral modifications, underscoring the need for targeted digital literacy and health promotion interventions. These findings contribute to a nuanced understanding of the dual role of smartphones—as tools for connectivity and potential sources of health risk and call for strategies to foster healthier digital practices among rural youth.

Discussion

Our study of rural youth in India revealed that smartphone use is both widespread and deeply integrated into daily life, with 80.2% of participants owning smartphones—a finding that aligns with the narrowing digital divide in rural areas reported by Ghumre et al.¹ and Maheshwari². Nearly half of our participants used their smartphones for 3–6 hours daily, reflecting the critical role these devices play in education, work, and social connectivity, as noted in previous studies^{3,4}. The findings reveal a high penetration of smartphone ownership among rural youth, with most using these devices for education and work.

However, a significant portion of the sample also reported extended usage before bedtime, which was associated with delayed sleep onset and compromised sleep quality. The results demonstrated that pre-bedtime smartphone use was associated with delayed sleep onset and poorer sleep quality. Approximately 41.3% of

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participants reported using their devices before sleep, a behavior that disrupts circadian rhythms. This is consistent with the systematic review by Han X⁸ and the meta-analysis by Leow et al.⁹, both of which emphasize the adverse impact of electronic media exposure on sleep. Our results further support the findings of Sohn SY et al.¹⁰ and Tao Y et al.¹¹, who reported that excessive smartphone use compromises sleep quality among adolescents and college students.

Mental health impacts were also notable, with almost half of the respondents experiencing stress or anxiety related to constant connectivity and social media interactions. The data further suggest that habitual smartphone use—particularly when used as an alarm or for continuous notifications—may impair focus and contribute to mood changes ^{12,13}. Similar trends have been observed in recent literature, which links excessive digital engagement to both sleep deprivation and reduced stress management capabilities ^{10,14,15}.

In addition, our chi-square analysis revealed a highly significant association between prolonged daily smartphone use (>3 hours) and increased distraction (p < 0.001), echoing the cognitive impacts reported by Demirci et al. ¹² and Park M et al. ¹⁶. Although our data did not show a statistically significant link between prebedtime usage and stress or anxiety (p > 0.05), studies by Levenson et al. ¹⁴ and Khan A et al. ¹⁷ have documented such associations, suggesting that stress might be influenced by additional contextual factors not fully captured in our study.

Importantly, we observed that awareness of the adverse effects of blue light was associated with a higher likelihood of successfully reducing smartphone usage. This finding is supported by Montag et al. ¹³ and Khan A et al. ¹⁷ and highlights the potential of digital literacy

programs—a notion also reinforced by Mishra and Yadav⁷ and Swain and Pati.¹⁸.

Furthermore, additional studies from recent years ^{8,15,19–21} underline that the negative impacts of smartphone overuse on sleep and cognitive function are a global concern. For instance, Sinha S et al. ¹⁵ and Huang et al. ¹⁹ reported that excessive smartphone use adversely affects sleep quality among adolescents and college students, while Yu DJ et al. ²⁰ and Alzhrani et al. ²¹ observed similar trends in diverse cultural contexts.

In summary, our integrated findings suggest that while smartphones enhance access to information and connectivity, their excessive or poorly timed use can detrimentally affect sleep and cognitive functioning. Given the robust evidence from recent studies ^{8–22} linking overuse to negative health outcomes, targeted interventions—such as digital literacy programs and behavioral modifications—are urgently needed to promote healthier smartphone practices among rural youth.

The study's cross-sectional design and the use of convenience sampling are limitations that may affect the generalizability of the findings. Future research should consider longitudinal designs and randomized sampling to further elucidate causal relationships and long-term impacts.

Conclusion

While smartphones serve as a vital tool for bridging the digital divide and enhancing access to educational and social resources among rural youth, their excessive use is associated with significant health implications. The findings call for the development of targeted digital literacy programs, awareness campaigns addressing the effects of blue light, and strategies to promote balanced screen time. Policy makers, educators, and healthcare

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professionals must work collaboratively to mitigate these risks and foster a healthier digital environment for rural

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