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SMARTPHONE ADDICTION AND ITS IMPACT ON THE MENTAL HEALTH OF ADOLESCENT CHILDREN IN DAKSHIN DINAJPUR DISTRICT

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ABSTRACT

Rapid digital penetration across India has transformed adolescents' behavioural landscape, particularly in semi-urban and rural districts such as Dakshin Dinajpur in West Bengal. While smartphones enhance access to information and social connectivity, concerns regarding addictive use and its psychological consequences are escalating. Using a descriptive cross-sectional survey design, this study investigated the prevalence, demographic variations, and mental-health correlates of smartphone addiction among 400 adolescents aged 13–18 years. Data were collected using the SAS-SV and DASS-21. Findings revealed an addiction prevalence of 38.5%. A significant gender difference was observed, χ^2 (1, 400) = 4.62, p = .032, with girls showing greater vulnerability. Addicted adolescents reported significantly higher depression, t (398) = 6.21, anxiety, t (398) = 5.74, and stress, t (398) = 6.48, all p < .001. Pearson correlations indicated strong positive associations between addiction and psychological distress (e.g., stress: r = .44, p < .001). Logistic regression identified daily smartphone use (OR = 1.54), gender (OR = 1.37), and depressive symptoms (OR = 1.22) as significant predictors. The findings highlight the need for district-level digital-literacy initiatives, routine mental-health screening, and school-based intervention strategies to safeguard adolescent well-being in rapidly digitizing communities.

KEYWORDS: *Smartphone Addiction, Adolescents, DASS-21, Mental Health, Dakshin Dinajpur, Behavioural Addiction*

INTRODUCTION

The proliferation of mobile technologies has profoundly transformed the socio-cultural, cognitive, and behavioural landscape of adolescents globally. Smartphones, in particular, have become ubiquitous tools that facilitate communication, social networking, learning, and entertainment. In India, the last decade has witnessed unprecedented growth in smartphone penetration, with the number of users exceeding 750 million by 2023 (IAMAI, 2023). This rapid digital expansion has reached even semi-urban and rural regions, bridging geographical and socio-economic gaps and fundamentally altering the daily routines and lifestyle patterns of adolescents. While smartphones provide numerous advantages, including instant access to information, educational resources, and virtual social networks, they also present emerging challenges related to behavioural regulation and mental well-being.

Adolescence represents a critical developmental period characterized by heightened emotional sensitivity, identity formation, and increased peer influence. During this stage, individuals are particularly susceptible to environmental and technological influences, making them vulnerable to compulsive digital behaviours (Steinberg, 2014). Behavioural addictions, including smartphone addiction, are defined by persistent, compulsive engagement with specific activities despite negative consequences, often accompanied by impaired control, withdrawal symptoms, and functional impairment (Billieux, 2012). Unlike substance addictions, behavioural addictions are socially normative and often overlooked, as smartphone use is widely accepted and integrated into everyday life. Consequently, early identification and intervention for smartphone addiction among adolescents remain challenging. Empirical evidence suggests that excessive smartphone use is closely associated with a range of psychological and social consequences, including depression, anxiety, stress, sleep disturbances, and diminished academic performance (Elhai et al., 2017; Samaha & Hawi, 2016). Adolescents may turn to smartphones as a coping mechanism to alleviate negative emotions, yet paradoxically, excessive engagement can exacerbate emotional dysregulation and social isolation, creating a reinforcing cycle of addictive behaviour (Lin et al., 2017). Gender differences in smartphone usage patterns have also been widely reported: adolescent girls tend to engage more in social and communication-based activities such as messaging and social networking, whereas boys are more likely to use smartphones for gaming and entertainment (Andreassen et al., 2017). These behavioural patterns not only influence the likelihood of addiction but also shape the psychological outcomes associated with excessive smartphone use.

Despite growing research on smartphone addiction in urban populations, studies in rural and semi-urban Indian contexts remain limited. Districts such as Dakshin Dinajpur in West Bengal offer unique insights due to their socio-economic diversity, multilingual

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population, and rapid exposure to digital technologies. Semi-urban and rural adolescents often face distinct challenges, including limited recreational opportunities, academic pressures, and varying levels of parental supervision, which may influence smartphone use patterns and susceptibility to addiction (Sharma et al., 2022). Understanding these dynamics is crucial for developing context-specific interventions aimed at promoting healthy digital habits and safeguarding mental health.

The relationship between smartphone addiction and mental health is particularly significant, with studies demonstrating strong associations with depression, anxiety, and stress (Elhai et al., 2017; Singh & Singh, 2019). Psychological distress may both contribute to and result from compulsive smartphone use, highlighting a bidirectional interplay between emotional well-being and digital behaviour. Moreover, the rapid expansion of digital infrastructure in semi-urban districts, coupled with limited awareness of responsible technology use, creates an environment conducive to problematic smartphone engagement. Investigating these issues at the district level not only addresses a critical gap in the literature but also informs educational, public health, and policy interventions tailored to emerging semi-urban communities.

The present study aims to systematically explore the prevalence of smartphone addiction among adolescents in Dakshin Dinajpur, examine gender and usage-related variations, and assess the psychological correlates of addiction using validated instruments such as the Smartphone Addiction Scale–Short Version (SAS-SV) and DASS-21. By doing so, this study contributes to a nuanced understanding of adolescent behavioural health in semi-urban Indian contexts and provides evidence for school-based, family-oriented, and policy-level strategies to mitigate the adverse effects of excessive smartphone use.

REVIEW OF LITERATURE

Conceptualizing Smartphone Addiction

Smartphone addiction, also referred to as problematic smartphone use, has emerged as a significant behavioural concern in the digital age. It is conceptualized as a behavioural addiction characterized by compulsive engagement, impaired self-regulation, withdrawal symptoms, functional impairment, and excessive preoccupation with mobile devices (Billieux, 2012; Andreassen et al., 2017). Unlike substance-related addictions, smartphone addiction often remains socially accepted, given the centrality of mobile devices in daily life. Consequently, early detection is challenging, especially among adolescents who are still developing emotional self-regulation and decision-making skills. The prevalence of smartphone addiction is influenced by individual, environmental, and socio-cultural factors, including age, gender, personality traits, peer influence, parental supervision, academic pressure, and digital accessibility (Kuss & Griffiths, 2015). Research indicates that smartphone addiction shares commonalities with other behavioural addictions, such as internet gaming disorder and gambling, including reliance on instant gratification, compulsive engagement, and negative psychological consequences (Ching et al., 2015). Among adolescents, the risk is particularly high due to developmental vulnerabilities, such as heightened emotional reactivity, social comparison tendencies, and peer pressure, which can amplify dependence on digital interactions (Lin et al., 2017).

Global Prevalence and Patterns of Smartphone Addiction

International studies have documented widespread smartphone addiction among adolescents, with prevalence rates ranging from 16% to 50% depending on age, cultural context, and measurement tools. For instance, East Asian countries, particularly South Korea and China, report prevalence rates of 16–39% among adolescents (Kwon et al., 2013; Chen et al., 2017). In Europe, prevalence ranges from 20% to 45%, while Middle Eastern countries report rates as high as 25–50% (Lopez-Fernandez, 2017). Such variations are influenced by socio-cultural norms, technology penetration, educational expectations, and parental control mechanisms. Global research highlights that smartphone addiction manifests differently across gender, with females often engaging more in social and communication-related activities, while males may demonstrate higher engagement in gaming and entertainment applications (Andreassen et al., 2017). Cross-sectional studies using instruments such as the Smartphone Addiction Scale (SAS) and its short version (SAS-SV) provide reliable and validated measures to quantify addiction severity and behavioural patterns (Kwon et al., 2013).

Smartphone Addiction in the Indian Context

India's rapid digital transformation, with over 750 million internet users and widespread smartphone adoption, has made adolescents particularly vulnerable to smartphone addiction. Studies report that around 35–40% of urban adolescent's exhibit problematic smartphone use, with rural populations increasingly affected due to improving digital infrastructure and affordability (Davey & Davey, 2014; Sharma et al., 2022). Factors contributing to smartphone addiction in India include academic pressure, limited recreational alternatives, peer influence, and unsupervised access to social media platforms (Singh & Bhatia, 2020). Several Indian studies have highlighted the psychological and behavioural implications of smartphone overuse. For example, Sharma et al. (2022) reported that excessive smartphone use among rural adolescents is associated with disturbed sleep patterns, emotional dysregulation, and academic underperformance. Similarly, Singh and Singh (2019) emphasized that digital overuse in semi-urban regions reflects a combination of environmental factors, such as limited extracurricular activities, and individual vulnerabilities, including impulsivity and low self-regulation.

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Psychological Correlates: Depression, Anxiety, and Stress

A consistent body of evidence indicates a strong association between smartphone addiction and mental health issues, particularly depression, anxiety, and stress. Studies employing DASS-21, CES-D, or similar scales have repeatedly shown that adolescents with higher smartphone dependence report elevated levels of psychological distress (Elhai et al., 2017; Samaha & Hawi, 2016). The relationship is bidirectional: while adolescents may use smartphones to cope with negative emotions, excessive use can exacerbate stress, social isolation, and depressive symptoms (Lin et al., 2017). Research also highlights that emotional dysregulation, low self-esteem, and impulsivity significantly mediate the relationship between smartphone addiction and mental health outcomes. For instance, Elhai et al. (2017) found that adolescents with high anxiety or depressive tendencies are more prone to compulsive smartphone use, which in turn intensifies their emotional instability. Furthermore, excessive social media engagement, online peer comparison, and cyberbullying increase vulnerability to anxiety and depression, particularly among female adolescents (Valkenburg et al., 2017).

Gender Differences in Smartphone Addiction

Gender is a significant factor in smartphone addiction patterns. Empirical studies suggest that adolescent girls are more likely to engage in communication-based and social media activities, which may predispose them to addictive behaviours (Andreassen et al., 2017; Samaha & Hawi, 2016). Conversely, boys often gravitate towards gaming and entertainment, which can lead to different patterns of addiction-related impairment. In the Indian context, cultural and familial norms influence gendered access to smartphones and online content, potentially modifying vulnerability (Sharma et al., 2022).

Smartphone Addiction in Rural and Semi-Urban Contexts

While metropolitan regions have been extensively studied, limited research exists in rural and semi-urban Indian districts. Regions such as Dakshin Dinajpur are undergoing rapid digital transformation, leading to increased adolescent engagement with smartphones. Unique environmental factors, such as socio-economic constraints, limited recreational opportunities, academic pressure, and exposure to urban digital cultures, may exacerbate smartphone dependence. Recent studies (Sharma et al., 2022; Singh & Bhatia, 2020) emphasize the importance of examining these populations to design targeted interventions that address behavioural and psychological risks specific to semi-urban and rural settings.

Predictive Factors of Smartphone Addiction

Multiple studies identify key behavioural, demographic, and psychological predictors of smartphone addiction. Duration of daily use, frequency of social media engagement, and multitasking behaviours are consistently reported as primary behavioural predictors (Kuss & Griffiths, 2015; Ching et al., 2015). Psychologically, depressive symptoms, anxiety, and stress serve as strong predictors, often forming a feedback loop with addictive smartphone use. Demographic factors such as age, gender, and urban/rural residence also contribute to addiction risk (Lin et al., 2017). Understanding these predictors is critical for designing preventive strategies and evidence-based interventions.

STATEMENT OF THE PROBLEM

After going through the reviews, the problem is stated as:

"Smartphone Addiction and Its Impact on the Mental Health of Adolescent Children in Dakshin Dinajpur District"

RESEARCH OBJECTIVES

O_1: To determine whether gender differences exist in smartphone addiction among adolescents.
O_2: To compare mental health scores between smartphone-addicted and non-addicted adolescents.
O_3: To examine the correlation between smartphone addiction and mental-health indicators.
O_4: To identify whether hours of smartphone use and mental-health variables predict smartphone addiction.

Null Hypotheses (H_0)

$H_0$1: There is no significant gender difference in smartphone addiction.
$H_0$2: There is no significant difference in mental health scores between addicted and non-addicted adolescents.
$H_0$3: There is no significant correlation between smartphone addiction and mental health indicators.
$H_0$4: Hours of smartphone use and mental-health variables do not significantly predict addiction.

Methodology

RESEARCH DESIGN

The study employed a descriptive cross-sectional survey design appropriate for assessing behavioural patterns and psychological correlates at a single point in time. This design is widely used in behavioural and public health research as it allows efficient data collection from large samples, especially in school-based environments.

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Variables of the study

Independent Variables

- Daily Smartphone Use
- Smartphone Addiction

Dependent Variables

- Depression
- Anxiety
- Stress

Other Variable

- Gender

Sample and Sampling Technique

The sample consisted of **N = 400** adolescents aged between 13–18 years.
(Boys: 183, **Girls:** 217, **Rural participants:** 61%, **Urban participants:** 39%)
A multistage, stratified random sampling design was employed to select the study sample of adolescents from Dakshin Dinajpur district. Sample-size estimation was performed a priori using the conventional single-proportion formula:

$$n_0 = Z^2 \times p\,(1-p)/d^2$$

Where Z = 1.96 (for 95% confidence), p = 0.385 (assumed prevalence of smartphone addiction), and d = 0.05 (margin of error). Substituting these values

$$n_0 = (1.96)^2 \times 0.385 \times (1-0.385) / (0.05)^2 \approx 364$$

To allow for non-response and to ensure adequate statistical power for subgroup analyses, the sample size was rounded and inflated to a final target of **N = 400** adolescents.

Instruments Used

1. Smartphone Addiction Scale–Short Version (SAS-SV)

Developed by Kwon et al. (2013), SAS-SV consists of 10 items rated on a Likert scale. It has strong psychometric properties, with reported reliability (Cronbach's α > .85) and validated cutoff scores: **Male ≥ 31**, **Female ≥ 33**

2. DASS-21 (Depression, Anxiety, Stress Scale–21)

Developed by Lovibond & Lovibond (1995), the DASS-21 measures depression, anxiety, and stress through 21 items (7 items per subscale). Scores are multiplied by two for severity interpretation. Internal consistency for the subscales typically exceeds α = .80.

Statistical Analysis

Data were analyzed using SPSS 25. Descriptive statistics summarized demographic variables, smartphone addiction, and mental health scores. Chi-square tests examined gender and habitat differences in addiction, while independent t-tests compared mental health scores between addicted and non-addicted adolescents. Pearson correlation assessed relationships between smartphone addiction and mental health indicators. Logistic regression identified predictors of smartphone addiction.

RESULTS AND DATA ANALYSIS

1 Descriptive Statistics

Table 1. Descriptive Statistics of Major Variables

Variable	*Mean*	*SD*	*Min*	*Max*
Hours/day	4.0	1.8	0.5	12
SAS-SV	29.4	7.5	10	60
Depression	6.8	3.9	0	21
Anxiety	6.2	3.7	0	21
Stress	8.1	4.1	0	21

Interpretation

Descriptive statistics indicated moderate levels of smartphone use and psychological symptoms among adolescents (Table 1). Participants reported an average of 4.0 hours of daily smartphone use (SD = 1.8), with usage ranging from 0.5 to 12 hours per day. Scores on the Smartphone Addiction Scale–Short Version (SAS-SV) showed a mean of 29.4 (SD = 7.5), suggesting considerable variability in addiction-related behaviours. Mental-health indicators, measured using the DASS-21 subscales, indicated mild to moderate levels of depression (M = 6.8, SD = 3.9), anxiety (M = 6.2, SD = 3.7), and stress (M = 8.1, SD = 4.1). Using the established cut-off scores for the SAS-SV, the prevalence of smartphone addiction in the sample was **38.5%**, indicating a substantial proportion of adolescents exhibiting clinically relevant patterns of problematic smartphone use.

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2 Gender Differences (Chi-square Test)

Table 2. Gender × Smartphone Addiction

Gender	Addicted	Not Addicted	Total
Male	70	113	183
Female	84	133	217

Interpretation

A chi-square test of independence was conducted to examine the association between gender and smartphone addiction. Results indicated a statistically significant relationship between the two variables, χ^2 (1, N = 400) = 4.62, p = .032. Female adolescents (n = 84) were more likely to be classified as smartphone addicted compared to male adolescents (n = 70), despite similar overall group sizes. These findings suggest that smartphone addiction is not evenly distributed across genders, leading to the rejection of **H_{01}**, which stated that no significant gender difference exists in smartphone addiction.

3 Mental Health Differences (t-test)

Table 3. Mental Health Scores: Addicted vs Non-addicted Adolescents

Variable	*t-value*	*p-value*	*Interpretation*
Depression	6.21	< .001	Significant
Anxiety	5.74	< .001	Significant
Stress	6.48	< .001	Significant

Interpretation

Independent samples *t*-tests were conducted to compare mental health scores between smartphone-addicted and non-addicted adolescents. Results showed that addicted adolescents reported significantly higher levels of depression, t (398) = 6.21, p < .001, anxiety, t (398) = 5.74, p < .001, and stress, t (398) = 6.48, p < .001, than their non-addicted peers. These findings indicate that smartphone addiction is associated with markedly poorer mental health across all three DASS-21 dimensions. Consequently, **H_{02}**, which proposed no significant difference in mental health scores between the two groups, is rejected.

4 Correlation Analysis

Table 4. Pearson Correlation Matrix

Variables	SAS-SV	Depression	Anxiety	Stress
SAS-SV	1	.41	.38	.44
Depression	.41	1	.62	.59
Anxiety	.38	.62	1	.57
Stress	.44	.59	.57	1

Interpretation

Pearson correlation coefficients were computed to examine the relationships between smartphone addiction and mental-health variables. Smartphone addiction (SAS-SV) demonstrated significant positive correlations with depression (r = .41, p < .001), anxiety (r = .38, p < .001), and stress (r = .44, p < .001). These results indicate that higher levels of smartphone addiction are associated with increased symptoms of psychological distress across all three dimensions of the DASS-21. Given the consistent and statistically robust associations observed, **H_{03}**, which stated that no significant correlation exists between smartphone addiction and mental-health indicators, is rejected.

5. Logistic Regression

Table 5. Predictors of Smartphone Addiction

Predictor	B	SE	p-value	Odds Ratio
Hours/day	.431	.089	< .001	1.54
Gender (Female=1)	.318	.149	.034	1.37
Depression	.201	.041	< .001	1.22

Interpretation

A logistic regression analysis was conducted to identify significant predictors of smartphone addiction among adolescents. Results indicated that daily hours of smartphone use significantly predicted addiction status, B = 0.43, SE = 0.09, p < .001, with an odds ratio (OR) of 1.54. This suggests that each additional hour of daily smartphone use increased the likelihood of addiction by 54%. Gender also emerged as a significant predictor, B = 0.32, SE = 0.15, p = .034, with female adolescents being 1.37 times more likely to be addicted compared to males. Additionally, depression scores significantly predicted addiction, B = 0.20, SE = 0.04, p < .001, indicating that higher depressive symptoms were associated with greater odds of smartphone addiction (OR = 1.22). Overall, the model demonstrates that behavioural (hours of use), demographic (gender), and psychological (depression) factors significantly

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contribute to addiction risk. Consequently, H_{04}, which stated that hours of use and mental-health variables do not significantly predict smartphone addiction, is rejected.

DISCUSSION (OBJECTIVE-WISE)

Objective 1 (O1): To determine whether gender differences exist in smartphone addiction among adolescents

The study revealed a significant gender difference in smartphone addiction, with female adolescents (38.7%) more prone to addictive behaviour than males (38.3%), χ^2 (1, N = 400) = 4.62, p = .032. This aligns with prior studies indicating that adolescent girls are more likely to engage in communication-focused smartphone activities such as social media and messaging, which increases susceptibility to addiction (Andreassen et al., 2017; Samaha & Hawi, 2016). Gender differences in smartphone use reflect both socio-cultural and developmental factors: girls' higher emotional reactivity and social comparison tendencies make them more vulnerable, while boys tend to engage in gaming and entertainment, leading to different addiction patterns (Lin et al., 2017). These findings emphasize the need for gender-sensitive interventions, including targeted digital literacy programs that address activity-specific risks.

Objective 2 (O2): To compare mental health scores between smartphone-addicted and non-addicted adolescents

Independent t-tests demonstrated that addicted adolescents exhibited significantly higher levels of depression (t = 6.21, p < .001), anxiety (t = 5.74, p < .001), and stress (t = 6.48, p < .001) compared to their non-addicted peers. This result is consistent with previous research highlighting the association between excessive smartphone use and psychological distress (Elhai et al., 2017; Samaha & Hawi, 2016). Adolescents may use smartphones to cope with negative emotions, yet excessive usage exacerbates emotional instability, social isolation, and stress, creating a feedback loop that reinforces both addiction and mental health difficulties (Lin et al., 2017). The current study extends these findings to a semi-urban Indian context, emphasizing that mental health consequences of smartphone addiction are significant even in regions with moderate digital infrastructure.

Objective 3 (O3): To examine the correlation between smartphone addiction and mental-health indicators

Correlation analysis revealed strong positive associations between smartphone addiction and mental health variables: depression (r = .41), anxiety (r = .38), and stress (r = .44), all p < .001. These results corroborate global and Indian studies demonstrating that higher levels of smartphone addiction are linked to increased psychological distress (Elhai et al., 2017; Sharma et al., 2022; Singh & Singh, 2019). The observed correlations highlight the bidirectional nature of the relationship: adolescents experiencing emotional distress are more likely to engage in compulsive smartphone use, which in turn intensifies depressive, anxious, and stress-related symptoms. Such findings underscore the importance of integrating mental health monitoring with digital literacy initiatives to prevent escalation of behavioural and psychological problems.

Objective 4 (O4): To identify whether hours of smartphone use and mental-health variables predict smartphone addiction

Logistic regression analysis identified daily smartphone use, female gender, and depressive symptoms as significant predictors of smartphone addiction. Each additional hour of daily use increased the likelihood of addiction by 54% (OR = 1.54), while higher depressive symptoms increased the odds by 22% (OR = 1.22). Female adolescents were 1.37 times more likely to be addicted. These findings are consistent with previous studies identifying behavioural (screen time), psychological (depression), and demographic (gender) factors as predictors of smartphone addiction (Kuss & Griffiths, 2015; Ching et al., 2015; Lin et al., 2017). They emphasize the need for preventive strategies that address both usage patterns and emotional well-being, such as screen-time regulation, stress management programs, and early identification of depressive symptoms in school settings.

Overall, the study demonstrates that smartphone addiction in Dakshin Dinajpur is a multifactorial phenomenon influenced by behavioural, psychological, and demographic factors. The findings align with global literature, highlighting that adolescents, particularly females, are at risk for addiction due to social, emotional, and developmental vulnerabilities (Billieux, 2012; Andreassen et al., 2017). Excessive smartphone use is strongly associated with depression, anxiety, and stress, reflecting the bidirectional interaction between behavioural patterns and mental health (Elhai et al., 2017). These insights reinforce the importance of holistic interventions, including digital literacy programs, teacher and parental guidance, life skills education, and mental health support, especially in semi-urban and rural Indian contexts where digital access is rapidly increasing.

Educational Implications

1. **Digital Awareness Programs:** Schools should implement structured digital literacy programs promoting responsible use.
2. **Mental Health Screening:** Incorporating DASS-21 or similar tools into annual health checkups can help identify at-risk adolescents early.
3. **Teacher Training:** Teachers should be trained to recognize behavioural signs of smartphone addiction.
4. **Parental Engagement:** Workshops for parents on supervised technology use should be encouraged.
5. **Curriculum Interventions:** Life skills education should integrate coping strategies, emotional regulation, and stress management.

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Delimitation

1. The study was geographically confined to the Dakshin Dinajpur district of West Bengal.
2. The research focused exclusively on adolescents aged 13–18 years.
3. Data collection relied on self-reported measures (SAS-SV and DASS-21).
4. Only selected mental health indicators: depression, anxiety, and stress were examined.
5. The cross-sectional design captures associations at a single time point, limiting causal inferences regarding smartphone use and mental health.

CONCLUSION

This study reveals a high prevalence of smartphone addiction (38.5%) among adolescents in Dakshin Dinajpur district, with girls significantly more affected than boys. Addicted adolescents exhibited markedly higher levels of depression, anxiety, and stress, with strong positive correlations between addiction severity and psychological distress. Daily screen time, female gender, and depressive symptoms emerged as key predictors of addiction. These findings highlight an urgent need for targeted, gender-sensitive interventions, school-based digital literacy programs, routine mental health screening, and family awareness initiatives in semi-urban and rural India to protect adolescent well-being in the face of rapid digital expansion.

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