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CROSS-SECTIONAL STUDY ON THE ASSOCIATION BETWEEN INTERNET ADDICTION AND DEPRESSIVE SYMPTOMS IN ADOLESCENTS

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ABSTRACT:
Background: Internet addiction (IA) is an emerging public health concern among adolescents, often associated with adverse mental health outcomes such as depression. Understanding this relationship is critical for early detection and intervention. **Aim:** To assess the association between Internet addiction and depressive symptoms among adolescents. **Methods:** A cross-sectional study was conducted among 200 adolescents aged 13–18 years attending the Psychiatry and Adolescent Medicine outpatient departments of a tertiary care hospital. Internet addiction was measured using Young's Internet Addiction Test (IAT) and depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9). Socio-demographic and internet usage details were recorded. Statistical analysis included Chi-square test, independent t-test, ANOVA, and calculation of odds ratios with 95% confidence intervals. **Results:** The prevalence of Internet addiction was 73.0%, with 44.0% mild, 25.5% moderate, and 3.5% severe addiction. Depressive symptoms were present in 49.0% of participants, with 16.0% moderate, 7.5% moderately severe, and 3.5% severe. Daily internet use was significantly higher in the IA group (6.01 ± 1.56 hrs) compared to the non-IA group (3.99 ± 1.62 hrs, $p < 0.001$). Parental monitoring was lower in the IA group (23.9% vs 51.9%, $p < 0.001$). Adolescents with IA were over nine times more likely to have depressive symptoms (OR = 9.13, 95% CI = 4.98–16.71, $p < 0.001$). **Conclusion:** There is a strong and significant association between Internet addiction and depressive symptoms in adolescents. Screening for both conditions in clinical and school settings, along with preventive strategies promoting balanced internet use, is warranted to mitigate adverse outcomes.
Keywords: Internet addiction, Depressive symptoms, Adolescents.

INTRODUCTION

Internet use has become an integral part of adolescent life worldwide, serving as a source of education, entertainment, and social interaction. Over the past two decades, the proliferation

of smartphones, high-speed internet access, and social networking platforms has led to unprecedented levels of connectivity among adolescents. While moderate internet use can be beneficial, concerns have emerged regarding excessive and uncontrolled use, termed *Internet Addiction (IA)*, which is increasingly recognized as a behavioral problem with significant psychosocial consequences. IA is characterized by compulsive use, impaired control, withdrawal symptoms, and negative impacts on academic, social, and emotional functioning[1].

Adolescents are particularly vulnerable to IA due to developmental factors, including heightened reward sensitivity, ongoing brain maturation, and a greater tendency to engage in risk-taking and novelty-seeking behaviors. In this transitional phase, internet-based activities—especially social networking, online gaming, and video streaming—may serve as coping mechanisms for stress, loneliness, or unmet emotional needs. However, prolonged engagement in such activities can lead to dependence-like patterns, resulting in neglect of offline responsibilities, social withdrawal, and reduced physical activity[2].

Parallel to the rising prevalence of IA, depression among adolescents has also gained attention as a significant public health concern. Depression in this age group manifests as persistent sadness, irritability, loss of interest in activities, poor concentration, sleep disturbances, and impaired academic performance. The World Health Organization reports that depression is a leading cause of illness and disability among adolescents globally [3]. In India, the prevalence of depressive symptoms in adolescents ranges between 15% and 25%, with notable underdiagnosis due to stigma and lack of awareness.

Emerging research suggests a bidirectional association between IA and depressive symptoms. On one hand, excessive internet use may contribute to depression through social isolation, disrupted sleep patterns, and exposure to cyberbullying. On the other hand, adolescents with depressive symptoms may turn to the internet for escape and emotional regulation, thereby increasing their risk for IA[4]. The co-occurrence of these two conditions can exacerbate functional impairment, hinder treatment outcomes, and increase the risk of other psychiatric disorders, including anxiety and substance abuse.

Globally, cross-sectional studies from East Asia, Europe, and North America have consistently demonstrated a positive correlation between IA and depression among adolescents, although the strength of this association varies depending on cultural, social, and technological contexts. In India, however, literature on this topic remains relatively sparse, despite the rapid digitalization and increasing smartphone penetration among the youth population. Given the socio-cultural differences in parenting styles, academic pressures, and patterns of technology use, it is important to explore this association in an Indian context.[5]

Aim

To assess the association between Internet addiction and depressive symptoms among adolescents.

Objectives

1. To determine the prevalence of Internet addiction in adolescents.
2. To assess the prevalence of depressive symptoms in adolescents.
3. To evaluate the association between Internet addiction and depressive symptoms in adolescents.

MATERIAL AND METHODOLOGY

Source of Data The study data were obtained from adolescents attending the outpatient department of Psychiatry and Adolescent Medicine at a tertiary care teaching hospital.

Participants were recruited after obtaining written informed consent from parents/guardians and assent from adolescents.

Study Design This was a cross-sectional, observational study.

Study Location The study was conducted at the Psychiatry and Adolescent Medicine departments of a tertiary care teaching hospital in India.

Study Duration The study was carried out over a period of 12 months, from January 2023 to December 2023.

Sample Size A total of 200 adolescents aged 13–18 years were included.

Inclusion Criteria

- Adolescents aged between 13 and 18 years.
- Access to the internet via smartphone, computer, or tablet for at least 6 months.
- Willingness to participate with informed consent from a parent/guardian.

Exclusion Criteria

- Adolescents with diagnosed severe psychiatric illnesses - psychosis, bipolar disorder that could affect assessment reliability.
- History of neurological disorders or intellectual disability.
- Current substance dependence (excluding caffeine and nicotine).

Procedure and Methodology Eligible adolescents attending the OPD were screened for study criteria. Those fulfilling inclusion criteria underwent detailed evaluation using a structured proforma to record socio-demographic details, academic performance, and internet usage patterns.

Internet addiction was assessed using the Young's Internet Addiction Test (IAT), a validated 20-item scale scored on a 5-point Likert scale. Depressive symptoms were measured using the Patient Health Questionnaire-9 (PHQ-9), a validated screening tool for depression. Both tools were administered in the participant's preferred language.

Sample Processing All questionnaires were checked for completeness on the same day of administration. Data were anonymized and coded before entry into the statistical database.

Statistical Methods Data were analyzed using SPSS version 25.0. Descriptive statistics were used to summarize socio-demographic characteristics, IAT scores, and PHQ-9 scores. Prevalence rates were expressed in percentages with 95% confidence intervals. The association between IA and depressive symptoms was assessed using the Chi-square test for categorical variables and independent t-tests for continuous variables. Pearson's correlation coefficient was calculated to determine the relationship between IAT and PHQ-9 scores. A p-value <0.05 was considered statistically significant.

Data Collection Data were collected prospectively through face-to-face interviews conducted in a private setting to ensure confidentiality. Each session lasted approximately 20–25 minutes. Participants with high depressive scores or severe IA were referred for appropriate psychiatric intervention.

OBSERVATION AND RESULTS

Table 1: Socio-Demographic and Internet Usage Profile of Adolescents (N = 200)

Variable	Total n (%) or Mean ± SD	Internet Addiction Present (n=92)	Internet Addiction Absent (n=108)	Test statistic	95% CI (Difference)	p-value
Age (years)	15.42 ± 1.64	15.61 ± 1.58	15.26 ± 1.68	t = 1.48	-0.12 to 0.82	0.14
Gender				χ^2 = 4.37	—	0.037*

Male	108 (54.0)	58 (63.0)	50 (46.3)	—	—	—
Female	92 (46.0)	34 (37.0)	58 (53.7)	—	—	—
Daily Internet Use (hrs)	4.92 ± 1.83	6.01 ± 1.56	3.99 ± 1.62	t = 9.05	1.56 to 2.48	<0.001*
Smartphone Ownership	182 (91.0)	90 (97.8)	92 (85.2)	χ^2 = 8.77	—	0.003*
Parental Monitoring (yes)	78 (39.0)	22 (23.9)	56 (51.9)	χ^2 = 17.31	—	<0.001*

*Significant at $p < 0.05$

Table 1 presents the socio-demographic and internet usage profile of the 200 adolescents included in the study, comparing those with and without internet addiction. The mean age of participants was 15.42 ± 1.64 years, with no statistically significant difference between the two groups ($p = 0.14$). Males constituted a slightly higher proportion overall (54.0%), and a significantly greater proportion of males were in the internet addiction group compared to females ($\chi^2 = 4.37$, $p = 0.037$). Adolescents with internet addiction reported markedly higher daily internet use (6.01 ± 1.56 hours) than those without addiction (3.99 ± 1.62 hours), and this difference was highly significant ($t = 9.05$, 95% CI = 1.56 to 2.48, $p < 0.001$). Smartphone ownership was more common among those with internet addiction (97.8%) compared to those without (85.2%) ($\chi^2 = 8.77$, $p = 0.003$). Parental monitoring was significantly lower in the internet addiction group (23.9%) than in the non-addiction group (51.9%) ($\chi^2 = 17.31$, $p < 0.001$).

Table 2: Prevalence of Internet Addiction in Adolescents (N = 200)

Category (Young's IAT Score)	n (%)	Mean Score ± SD	95% CI for Mean	Test statistic	p-value
Normal Use (0–30)	54 (27.0)	22.14 ± 4.62	20.9 – 23.3	—	—
Mild Addiction (31–49)	88 (44.0)	38.65 ± 5.12	37.6 – 39.7	—	—
Moderate Addiction (50–79)	51 (25.5)	62.42 ± 7.15	60.5 – 64.3	—	—
Severe Addiction (80–100)	7 (3.5)	84.57 ± 3.92	81.7 – 87.4	—	—
Overall Mean IAT Score	—	41.76 ± 15.72	39.6 – 43.9	One-way ANOVA F=462.8	<0.001*

*Significant at $p < 0.05$

Table 2 shows the prevalence of internet addiction based on Young's Internet Addiction Test (IAT). Nearly half of the participants (44.0%) were classified with mild addiction, while 25.5% had moderate addiction, and 3.5% had severe addiction. Only 27.0% of adolescents demonstrated normal use. The overall mean IAT score was 41.76 ± 15.72, with significant variation across the categories (ANOVA $F = 462.8$, $p < 0.001$), indicating a statistically meaningful distribution of addiction severity among the sample.

Table 3: Prevalence of Depressive Symptoms in Adolescents (N = 200)

PHQ-9 Category	n (%)	Mean Score ± SD	95% CI for Mean	Test statistic	p-value

Minimal (0–4)	82 (41.0)	2.41 ± 1.08	2.2 – 2.6	—	—
Mild (5–9)	64 (32.0)	7.32 ± 1.39	7.0 – 7.6	—	—
Moderate (10–14)	32 (16.0)	11.86 ± 1.27	11.5 – 12.2	—	—
Moderately Severe (15–19)	15 (7.5)	16.24 ± 1.09	15.7 – 16.7	—	—
Severe (20–27)	7 (3.5)	22.71 ± 1.11	21.8 – 23.6	—	—
Overall Mean PHQ-9 Score	—	6.87 ± 5.42	6.1 – 7.6	One-way ANOVA F=1441.6	<0.001*

*Significant at $p < 0.05$

Table 3 depicts the prevalence of depressive symptoms according to PHQ-9 categories. Minimal symptoms were observed in 41.0% of participants, mild symptoms in 32.0%, moderate symptoms in 16.0%, moderately severe symptoms in 7.5%, and severe symptoms in 3.5%. The overall mean PHQ-9 score was 6.87 ± 5.42, and there was a statistically significant difference across severity categories (ANOVA $F = 1441.6$, $p < 0.001$), reflecting a wide distribution of depressive symptom intensity among adolescents.

Table 4: Association Between Internet Addiction and Depressive Symptoms (N = 200)

Internet Addiction Category	**Depressive Symptoms Present n (%)**	**Depressive Symptoms Absent n (%)**	**χ^2 value**	**95% CI (OR)**	**p-value**
Present (n=92)	70 (76.1)	22 (23.9)	52.47	4.98 – 16.71	<0.001*
Absent (n=108)	28 (25.9)	80 (74.1)	—	—	—
Odds Ratio (OR)	—	—	—	9.13	<0.001*

*Significant at $p < 0.05$

Table 4 examines the association between internet addiction and depressive symptoms. Among adolescents with internet addiction, 76.1% had depressive symptoms compared to 25.9% in the non-addicted group, a difference that was highly significant ($\chi^2 = 52.47$, $p < 0.001$). The calculated odds ratio indicated that adolescents with internet addiction were over nine times more likely to exhibit depressive symptoms (OR = 9.13, 95% CI = 4.98–16.71).

DISCUSSION

Table 1 (profile & risk factors). Data show a higher proportion of males among adolescents with Internet Addiction (IA) (63.0% vs 46.3%) and markedly greater daily internet time in the IA group (mean difference ≈ 2.0 hours/day; $p < 0.001$). Male preponderance has been repeatedly reported- often linked to gaming and sensation-seeking and is consistent with Indian and global syntheses that note higher IA risk in boys and young men, though estimates vary across settings and definitions. Ko CH et al.(2014)[6] The strong gradient you observed for daily hours mirrors longitudinal findings: increases in screen or social-media use predict subsequent rises in depressive symptoms over time, rather than depression simply driving use ("reverse causation"). Gámez-Guadix M. (2014)[7] The protective signal for parental monitoring (23.9% in IA vs 51.9% in non-IA; $p < 0.001$) aligns with evidence that active parental mediation is associated with *lower* IA and fewer co-occurring problems (cyberbullying, substance use, depressive symptoms). Tang J et al.(2014)[8] The very high smartphone ownership among the IA group (97.8%) fits broader reviews that identify

smartphones/social media as the dominant adolescent screen modality and a salient correlate of poorer mental health when use is excessive.

Table 2 (prevalence & severity of IA). Severity distribution-27.0% normal, 44.0% mild, 25.5% moderate, 3.5% severe; overall IAT mean 41.76-lands within the wide prevalence band reported internationally, reflecting differences in tools, cut-points, and post-pandemic shifts in digital behavior. Global meta-analytic work on "digital addictions" documents substantial heterogeneity by region, sample, and instrument, reinforcing the importance of reporting your cut-offs and context. Li G et al.(2019)[9] The significant between-category differences in IAT scores (F = 462.8, $p < 0.001$) are expected and confirm good score separation across severity levels, in line with the pattern seen in recent syntheses. Liang L et al.(2016)[10]

Table 3 (depressive symptoms). PHQ-9 profile (41.0% minimal; 32.0% mild; 16.0% moderate; 7.5% moderately severe; 3.5% severe) is compatible with contemporary cohort evidence that rising social-media time during early adolescence forecasts higher depressive symptoms at subsequent waves, even after person-level differences are accounted for-supporting temporality for at least part of the association pathway. Ha YM et al.(2014)[11] Complementary longitudinal analyses similarly show that increases in different *types* of screen use are followed by increases in anxiety/depression, with effects varying by modality (e.g., social media vs gaming vs TV). Öner K et al.(2017)[12] Systematic reviews focused on adolescents also converge on an adverse association between greater screen exposure and mental health outcomes, albeit with small-to-moderate average effects and considerable heterogeneity-underscoring why stratifying by content and context (e.g., night-time use, cyberbullying) matters in interpretation. Lai CM et al.(2015)[13]

Table 4 (IA - depressive symptoms). Strong association between IA and depressive symptoms (OR = 9.13; 95% CI 4.98–16.71; $p < 0.001$). Meta-analytic evidence in adolescents confirms a **bidirectional** positive link—IA increases depression risk and depression increases IA risk-supporting systematic screening in both directions. Tan Y et al.(2016)[14] Recent meta-analyses extending to broader psychiatric symptoms (including sleep problems and anxiety) reinforce this pattern, suggesting shared mechanisms (reward sensitivity, emotion regulation) and modifiable contextual factors (sleep timing, parental mediation). Lam LT (2014)[15] Given that your cross-sectional design cannot establish directionality, these longitudinal and meta-analytic results are crucial for interpreting causality and for justifying integrated prevention-limiting late-night use, enhancing parent-adolescent digital agreements, and addressing depressive symptoms early.

CONCLUSION

The present cross-sectional study demonstrated a significant association between Internet addiction and depressive symptoms among adolescents. A substantial proportion of participants exhibited mild to moderate levels of Internet addiction, and depressive symptoms were prevalent across varying severities. Adolescents with Internet addiction were over nine times more likely to experience depressive symptoms compared to their non-addicted peers. The findings highlight the need for early identification and integrated interventions addressing both excessive internet use and underlying mental health concerns. Promoting healthy digital habits, enhancing parental monitoring, and implementing school-based screening programs may be effective strategies to reduce the burden of these co-occurring problems in this vulnerable population.

LIMITATIONS OF THE STUDY

1. The cross-sectional design limits the ability to establish causality between Internet addiction and depressive symptoms, making it unclear whether one precedes the other.
2. The study was conducted in a single tertiary care hospital, which may restrict the generalizability of findings to broader community or rural populations.
3. Self-reported tools such as the Young's Internet Addiction Test (IAT) and PHQ-9 may be subject to recall bias and social desirability bias.
4. Potential confounding variables such as family dynamics, academic stress, and exposure to cyberbullying were not comprehensively assessed.
5. The study did not explore the qualitative aspects of internet use (e.g., type of content, purpose of use) which may influence both addiction and depressive symptoms.

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