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Original Research Article

To Estimate the Prevalence of Internet Addiction and Comorbidities Among School Going Adolescents

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Abstract:

Background: The digital revolution has fundamentally transformed adolescent behavior patterns, with Internet addiction emerging as a significant concern. Despite extensive research, considerable debate exists regarding its conceptualization and measurement, particularly among adolescents in developing nations. This study aimed to estimate the prevalence of Internet addiction and associated comorbidities among school-going adolescents aged 10-18 years.

Methodology: A cross-sectional study was conducted among 340 adolescents from rural and urban schools in Jaipur district using purposive sampling. Data collection employed validated instruments including the Chen Internet Addiction Scale (CIAS), Hamilton Depression Rating Scale (HDRS) and Hamilton Anxiety Rating Scale (HAM-A). Statistical analysis was performed using SPSS version 20, with chi-square tests and Pearson correlation analysis.

Results: The study revealed significant Internet addiction patterns with 26.2% showing normal usage, 17.4% mild addiction, 36.5% moderate addiction and 20.0% severe addiction. Residential area ($p=0.021$) and school category ($p=0.042$) were significantly associated with Internet addiction levels. Depression was prevalent with 47.9% showing moderate and 32.1% severe depression. Anxiety affected 49.4% moderately and 20.6% severely. A significant positive correlation existed between Internet addiction and depression ($r=0.233$, $p<0.01$), while the correlation with anxiety was weaker ($r=0.086$, $p=0.114$).

Conclusion: Internet addiction is highly prevalent among adolescents with significant associations with depression and anxiety. Urban residence, private schooling and increased screen time emerged as key risk factors. The findings emphasize the urgent need for comprehensive screening protocols and targeted interventions addressing both technological behavior and mental health outcomes.

Keywords: Internet Addiction, Adolescents, Depression, Anxiety, Prevalence, Mental Health, Digital Behavior.

Introduction

The digital revolution of the 21st century has fundamentally transformed human society with the Internet becoming an inseparable part of daily life. This integration has been characterized by unprecedented growth in worldwide usage, fundamentally altering how people communicate, work and interact.[1] The Internet's transformative power lies in its ability to transcend traditional geographical boundaries, creating unprecedented opportunities for global connectivity, education and economic development. However, this digital renaissance has brought significant challenges particularly concerning excessive usage patterns that increasingly manifest as addictive behaviors among regular users.[2] The phenomenon of "Internet addiction" has emerged as a complex and multifaceted issue within the scientific community, generating considerable debate despite extensive research efforts over recent decades.[3] The controversy surrounding this condition stems from

various factors including definitional ambiguities, diagnostic challenges and methodological limitations in existing research.[4] Early research efforts were particularly problematic, often relying heavily on voluntary Internet surveys without proper demographic controls and utilizing convenience sampling methods that potentially skewed results.[5,6]

A significant milestone came with the publication of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-V), which took the groundbreaking step of identifying excessive Internet gaming as a specific addictive behavior.7 However, the field continues to grapple with diagnostic challenges as numerous assessment tools compete for prominence without any single instrument emerging as the universally accepted standard.[8] The most widely adopted assessment tools include the Internet Addiction Test (IAT), the Young Diagnostic Questionnaire (YDQ), Chen's Internet Addiction Scale and the Internet Addiction Scale.[9] Epidemiological studies focusing on Internet addiction in Southeast Asia have revealed striking variations in prevalence rates, ranging from 0% to 47.4%.[10] This remarkable disparity can be attributed to multiple factors, including methodological differences, varying diagnostic criteria, diverse cultural contexts and heterogeneous study populations. The Indian context presents unique challenges and opportunities for research with only a limited number of studies attempting to evaluate Internet addiction using multiple screening criteria within the same participant group.[11,12] International research has provided valuable insights into this phenomenon. Johansson and Götestam found 1.98% prevalence of Internet addiction among Norwegian youth, while Ha JH et al. identified significant psychiatric comorbidities in Internet-addicted children and adolescents. Multiple studies have demonstrated associations between Internet addiction and various psychological variables including depression, anxiety and impulsivity.[13,14] The Internet Addiction Scale (Chen) has emerged as a reliable and validated instrument for assessing problematic Internet use, particularly notable for its comprehensive evaluation approach developed by Chen et al. in 2003.[15] The psychological assessment components utilize two well-established clinical instruments: the Hamilton Anxiety Rating Scale (HAM-A) developed by Max Hamilton in 1959 [16] and the Hamilton Depression Rating Scale (HDRS) also developed by Hamilton (1960) [17]. Both scales have demonstrated robust psychometric properties, making them particularly suitable for assessing the psychological correlates of Internet addiction among adolescents.

Methodology

This cross-sectional survey was conducted under the Department of Pediatrics at Mahatma Gandhi Medical College, Sitapura, Jaipur, from March 2023 to February 2025. After obtaining ethical approval from Mahatma Gandhi University, the investigator contacted rural and urban schools in Jaipur district to seek their participation in the study. A total of 340 students were included using purposive sampling technique. The inclusion criteria comprised adolescents aged between 10 to 18 years who were using Internet daily and were willing to participate in the study. Exclusion criteria included those who had not signed informed written consent and children with visual and hearing impairment.

Data Collection Instruments: The research tool was designed as a comprehensive written device incorporating validated and reliable instruments. After extensive literature review, the researcher developed a structured interview schedule that included five sections. Content validity was established through consultation with six subject matter experts and modifications were made based on their feedback.

Section I: Demographic Variables comprised 10 items including age, gender, education, type of family system, socio-economic status using Kuppuswamy scale, number of family members, type of recreational activity and residential area.

Section II: Internet Addiction Scale (Chen) - The CIAS is a comprehensive self-report instrument designed to assess Internet addiction severity over the past three months. Comprising 26 items rated on a 4-point Likert scale, the scale evaluates dimensions such as compulsivity, withdrawal symptoms, tolerance, interpersonal problems and time management issues. Total scores range from 26 to 104, with interpretation as follows: 0-63 (Normal), 64-74 (Mild), 75-89 (Moderate) and 90-104 (Severe).

Section III: Hamilton Depression Rating Scale (HDRS) - The HDRS is a clinician-administered scale assessing depressive symptom severity over the past week. The 17-item version evaluates symptoms with each item scored from 0 (absent) to 4 (severe), with total scores ranging from 0-52. Interpretation includes: 0-7 (No depression or remission), 8-16 (Mild depression), 17-23 (Moderate depression) and 24 and above (Severe depression).

Section IV: Hamilton Anxiety Rating Scale (HAM-A) - The HAM-A is a clinician-administered tool measuring anxiety symptom severity across 14 domains. Each item is rated from 0 (not present) to 4 (very severe), with total scores ranging from 0 to 56. Interpretation includes: 0-7

(No or minimal anxiety), 8-14 (Mild anxiety), 15-23 (Moderate anxiety) and 24 and above (Severe anxiety).

Statistical Analysis: Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 20. Quantitative data was presented as mean, median, standard deviation and confidence intervals, while qualitative data was presented using frequency and percentage. Pearson Chi-Square tests were used to assess qualitatively independent data. Pearson correlation analysis was employed to examine relationships between Internet addiction, depression and anxiety. Statistical significance was determined at p-value of 0.05 or less.

Results

The study included 340 adolescents with the largest proportion aged 10–12 years (37.35%), followed by 13–15 years (35.00%), while 16–18 years (27.65%) formed the smallest group. Males were more represented (57.40%) compared to females (42.60%) and the majority came from urban areas (73.50%) rather than rural (26.50%). Most attended private schools (79.10%) with only 20.90% in government schools. Educationally, the 11th grade (26.80%) and 10th grade (23.20%) were the most represented, whereas 12th grade (12.90%) had the least. In terms of family type, nuclear families dominated (50.30%), followed by joint families (28.50%). Socio-economic distribution showed the middle class as the largest (40.00%), followed by high (32.10%) and low class (27.90%). Access to devices was widespread, with two devices (23.50%) and one device (23.20%) being the most common, while 10.30% reported no device. Regarding screen time, the highest proportion spent 4-6 hours daily (35.00%), followed by 7–9 hours (27.94%), while 12.35% used screens for 10–12 hours. Finally, digital content preferences showed social media (27.60%) as the most consumed, followed by entertainment (22.10%) and gaming (21.50%) with educational content lower at 18.20%.

The analysis shows that age group did not have a statistically significant association with internet addiction (χ^2=6.511, p=0.368). For example, among 10–12-year-olds, 30 (44.1%) were in the severe addiction group, while in the 16–18 group only 14 (20.6%) were severely addicted. Gender was also not significant (χ^2=2.493, p=0.477) with 32 (47.1%) males and 36 (52.9%) females falling into the severe category. In contrast, residential area showed significance (χ^2=14.657, p=0.021): adolescents from urban areas had higher addiction levels with 48 (70.6%) in the severe category compared to 20 (29.4%) from rural areas. Similarly, school category was significant (χ^2=9.154, p=0.042): 52 (76.5%) of severe addicts were from private schools, while only 16 (23.5%) were from government schools. Availability of devices was also significant (χ^2=31.248, p=0.027), with severe addiction most common among those with three devices at home (18, 26.5%). Screen time showed a significant association as well (χ^2=17.755, p=0.038) with adolescents spending 4-6 hours per day most represented in the moderate group (54, 43.5%) and 23 (33.8%) in severe addiction. Other factors like education level, family system, socio-economic status and type of content consumed were not statistically significant.

Table 1: Cross tabulation of Depression among Adolescents with level of Internet Addiction

Level of Depression	Level of Internet Addiction					Chi-square &p-value
	Normal	Mild	Moderate	Severe	Total	
No or minimal depression	19	0	0	0	19	χ2=186.769 P=0.001
	21.3%	0.0%	0.0%	0.0%	5.6%	
Mild depression	29	20	0	0	49	
	32.6%	33.9%	0.0%	0.0%	14.4%	
Moderate depression	17	31	92	23	163	
	19.1%	52.5%	74.2%	33.8%	47.9%	
Severe depression	24	8	32	45	109	
	27.0%	13.6%	25.8%	66.2%	32.1%	
Total	89	59	124	68	340	
	100.0%	100.0%	100.0%	100.0%	100.0%	

There was a highly significant association between depression and internet addiction (χ^2=186.769, p=0.001). Among adolescents with no or minimal depression, 19 (100%) were in the normal internet use group, with none in higher categories. In contrast, mild depression cases (n=49) were mostly distributed in normal (29, 32.6%) and mild (20, 33.9%) addiction categories. Moderate depression (n=163) was concentrated in the moderate addiction group (92, 74.2%), while severe depression (n=109) had the largest proportion in severe internet addiction (45, 66.2%). This pattern indicates that as depression severity increases, the proportion of adolescents with moderate-to-severe internet addiction also rises substantially. The Pearson correlation coefficient between depression

and internet addiction was r=0.233 (p=0.000), which is statistically significant at the 0.01 level. With a sample size of 340, this indicates a modest positive relationship higher levels of internet addiction were associated with greater depression symptoms. Though not strong, the correlation suggests a meaningful trend where problematic internet use and depression reinforce each other.

Table 2: Cross tabulation of Anxiety among Adolescents with level of Internet Addiction

Level of Anxiety	Level of Internet Addiction					Chi-square &p-value
	Normal	Mild	Moderate	Severe	Total	
No or minimal anxiety	38	0	0	0	38	$\chi 2$=249.917 P=0.001
	42.7%	0.0%	0.0%	0.0%	11.2%	
Mild anxiety	31	25	7	1	64	
	34.8%	42.4%	5.6%	1.5%	18.8%	
Moderate anxiety	20	27	92	29	168	
	22.5%	45.8%	74.2%	42.6%	49.4%	
Severe anxiety	0	7	25	38	70	
	0.0%	11.9%	20.2%	55.9%	20.6%	
Total	89	59	124	68	340	
	100.0%	100.0%	100.0%	100.0%	100.0%	

The chi-square analysis revealed a significant relationship between anxiety and internet addiction (χ^2=249.917, p=0.001). Adolescents with no or minimal anxiety (n=38) were all normal internet users (38, 42.7%), with none in mild, moderate, or severe categories. Those with mild anxiety (n=64) were mainly in normal (31, 34.8%) and mild addiction (25, 42.4%). Moderate anxiety (n=168) was strongly associated with moderate addiction (92, 74.2%), while severe anxiety (n=70) showed the highest proportion in the severe addiction group (38, 55.9%). These results demonstrate a clear gradient—higher anxiety corresponds with more severe internet addiction. The Pearson correlation between anxiety and internet addiction was r=0.086 (p=0.114), which is not statistically significant. With 340 participants, this weak correlation suggests no consistent linear relationship. While the cross-tabulation (Table 16) indicated strong associations between severe anxiety and addiction, the correlation test shows that across all adolescents, anxiety levels do not strongly predict internet addiction.

Discussion

The growing prevalence of Internet use among adolescents has raised significant concerns about its potential impact on mental health outcomes, particularly in relation to depression and anxiety. This study's findings reveal important patterns that contribute to our understanding of these complex relationships within the contemporary adolescent experience.

The present study revealed significant Internet addiction patterns with 36.5% showing moderate and 20.0% showing severe addiction, totaling 56.5% with problematic Internet use. These findings align with several international studies, including Kawabe et al. (2016) [18] who reported 2.0% severe addiction and 21.7% moderate addiction and Vigna-Taglianti et al. (2017) [19] who found prevalence rates of 14.2% among males and 10.1% among females. Similarly, Seyrek et al. (2017) [20] reported 1.6% severe and 16.2% moderate addiction rates. However, our study shows higher overall prevalence, possibly reflecting increased digital integration in recent years or cultural differences in Internet usage patterns. The significant urban-rural divide in Internet addiction (p=0.021) mirrors findings from Xin et al. (2018) [21] and Prabhakaran et al. (2016) [22]. Urban adolescents showed higher prevalence of moderate (75.8%) and severe (70.6%) addiction compared to rural counterparts, likely attributed to better Internet infrastructure, greater device access and increased exposure to digital content in urban environments. School category emerged as a significant factor (p=0.042) with private school students showing higher addiction rates. This corresponds with findings from Tsitsika et al. (2011) [23] and Tang et al. (2014) [24], who identified academic-related stress and better technological access as contributing factors. The association between device availability and addiction severity (p=0.027) supports findings from Afolabi et al. (2022) [25], emphasizing how multiple Internet access points increase addiction risk. Screen time significantly correlated with addiction levels (p=0.038), particularly among those spending 4-6 hours daily. This aligns with recent research by Tereshchenko et al. (2021) [26] and Kavici et al. (2024) [27], who established clear links between screen time duration and addiction severity. The predominance of social media consumption (27.6%) parallels findings from Xin et al. (2018) [21] and recent studies by Mohamed et al. (2024) [28].

The high prevalence of depression (80.0% showing moderate to severe levels) represents a concerning finding that exceeds rates reported in many

previous studies. This aligns with recent research by Zhao et al. (2023) [29] and Tang et al. (2020) [30], who found significant depression rates among adolescents during periods of increased stress. The 13-15 age group showed highest vulnerability, corresponding with research by Shen et al. (2021) [31] identifying early to mid-adolescence as a critical period for depressive symptom development. The relationship between screen time and depression, particularly among 4-6 hour daily users, supports findings from Tereshchenko et al. (2021) [26] who specifically highlighted prolonged screen exposure's impact on psychological well-being and sleep patterns. Content consumption patterns, especially higher severe depression rates (32.1%) among social media users, align with research by Tao et al. (2024)32 and de Ávila et al. (2020) [33].

The combined moderate to severe anxiety prevalence (70.0%) indicates substantial anxiety symptoms across the study population. The significant association between screen time and anxiety ($p=0.012$) supports recent findings by Kavici et al. (2024) [27] and Tao et al. (2024) [32]. Adolescents spending 4-6 hours daily on screens showed highest moderate anxiety rates (37.5%), while those with 7-9 hours demonstrated increased severe anxiety (25.7%). Social media consumption patterns showed higher severe anxiety representation (32.9%), though not statistically significant. This trend corresponds with research by Zhao et al. (2023) [29], who identified social media use as contributing to anxiety symptoms. The urban bias in anxiety prevalence, while not statistically significant, reflects additional stressors urban adolescents face, including academic competition and societal expectations.

The study's most significant finding is the strong positive correlation between Internet addiction and depression ($r=0.233$, $p<0.01$), while showing weaker correlation with anxiety ($r=0.086$, $p=0.114$). This differential pattern suggests distinct mechanisms through which Internet addiction influences various mental health aspects, supporting recent research by Zhao et al. (2023) [29] who identified anxiety as a mediating factor between Internet addiction and depression. The cross-tabulation analysis revealed striking patterns where 66.2% of severe Internet addiction cases experienced severe depression, while no adolescents with minimal depression showed higher addiction levels. This progressive relationship supports a potential dose-response pattern, consistent with findings from Lai et al. (2015) [34] and Shen et al. (2021) [31]. The universal presence of depression among severe Internet addiction cases emphasizes the critical nature of this relationship. The weaker anxiety-Internet addiction correlation, despite significant chi-square association, adds complexity to existing literature. This finding contrasts with some studies like Mohamed et al. (2024) [28] who found stronger direct associations. However, it aligns with research by Kavici et al. (2024) [27], suggesting that Internet addiction's relationship with anxiety may be moderated by factors such as social support. Recent research provides additional context for these findings. Narayanappa et al. (2024) [35] demonstrated effectiveness of psychoeducational interventions, while Rajan et al. (2024) [36] emphasized importance of preventive measures in educational settings. These intervention studies support the clinical relevance of our findings and suggest potential pathways for addressing identified problems.

Clinical Implications and Future Directions: The strong association between Internet addiction and depression necessitates integrated screening protocols when assessing either condition. The differential relationships suggest need for tailored intervention strategies, as supported by Shek et al. (2023) who found greater effectiveness in interventions addressing both technological behavior and underlying psychological factors. The findings emphasize urgent need for comprehensive mental health screening and intervention programs among adolescents. The high prevalence rates across various demographic categories underscore the widespread nature of these concerns. Future research would benefit from longitudinal studies to establish causal relationships and examine developmental trajectories of these conditions. The study's limitations include its cross-sectional design, which limits causal inference and potential cultural specificity that may limit generalizability. However, the comprehensive assessment approach and significant sample size provide valuable insights into these critical relationships among Indian adolescents.

Conclusion

This comprehensive study reveals alarming prevalence rates of Internet addiction and associated mental health issues among school-going adolescents. With 56.5% showing problematic Internet use and 80% experiencing moderate to severe depression, the findings underscore a significant public health concern requiring immediate attention. The study identified several key risk factors for Internet addiction, including urban residence, private school attendance, increased device availability and extended screen time. The strong positive correlation between Internet addiction and depression ($r=0.233$, $p<0.01$) demonstrates a critical relationship that demands clinical attention, while the weaker correlation with anxiety suggests more complex underlying mechanisms. The high prevalence of mental health issues indicates

widespread psychological distress among adolescents. The progressive relationship between addiction severity and mental health problems suggests potential dose-response patterns requiring further investigation. These findings have significant implications for educational policy, mental health services and family interventions. The study contributes valuable insights to the growing literature on digital behavior and mental health in developing nations, emphasizing the urgent need for culturally appropriate interventions. The findings call for immediate action from healthcare providers, educators, policymakers and families to address this emerging public health crisis. Developing comprehensive strategies that promote healthy digital habits while supporting adolescent mental health is essential for safeguarding the well-being of future generations in our increasingly connected world.

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