DISABILITY, CBR & INCLUSIVE DEVELOPMENT

Original Research Article

Cell Phone Addiction and Its Association with Socio-Environmental Factors among Children with Neurodevelopmental Disorders

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ABSTRACT

Cell phone addiction has emerged as a critical behavioral concern, especially among children with neurodevelopmental disorders. However, exposure to smartphone addiction in this group remains scarce, especially in the context of Bangladesh. This study aims to explore the cell phone addiction level among children with NDDs and associated factors in Dhaka, Bangladesh. In this study, an analytical cross-sectional design and a criteria-based purposive sampling technique were implemented. Socio-demographic questions and the Digital Addiction Scale for Children (DASC) were used to collect necessary data. A descriptive statistic, the Pearson Chi-square test, and Regression analysis were applied to achieve the study objective. Among 182 samples, 66.8 were boys and 33.2% girls with a mean age of 6.83 years. The findings revealed that 43.5% exhibited moderate levels of addiction and 37% showed severe levels, while fewer than 20% were categorized as mildly addicted. The study found parenting time [OR = 2.34], mother's occupation [OR = 2.24], family income [OR = 2.55], and disorder type [OR = 2.18] as risk factors for cell phone addiction ($p < .05$). Cell phone addiction was prevalent among children with NDDs, particularly children with autism spectrum disorder and attention disorder/ hyperactivity disorder are at higher risk. Several socio-demographic factors are significantly associated with addiction severity, aligned with the Social Cognitive Theory, which emphasizes the role of environmental influences and behavioral characteristics in shaping individual perspectives. In addition to parents' monitoring, the development of public health policies could be a crucial initiative to combat the issue.

Keywords: Neurodevelopmental Disorder, Parenting time, Cell Phone Addiction, Socio-demographic factors.

Highlights:

The prevalence of cell phone addiction is notably higher among children with neurodevelopmental disorders, especially in the context of Dhaka city.

Proper parenting is strongly linked to managing children's behavioral addiction and fostering healthier development.

Individuals diagnosed with autism spectrum disorder and attention deficit/hyperactivity disorder are at a greater risk of excessive digital media exposure when compared to those with cerebral palsy, developmental delay, and Down syndrome.

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INTRODUCTION

Digital devices, though highly useful in modern times, have silently become a significant public health concern (Shah & Phadke, 2023; Sun et al., 2020). Nowadays, children are becoming highly dependent on smartphones and other electronic devices due to the growing integration of digital tools into the modern education system. Previous studies estimated nearly 30 hours of device usage per week among children (Al-Amri et al., 2023). In the past five years, the prevalence of smartphone addiction has been reported to range between 42% and 74% across Asian countries (Chakraborty et al., 2024; Bakar, 2021; Sulaiman et al., 2021). Alarmingly, the prevalence has been reported as high as 86% in Bangladesh, especially among children under five years old (Abdulla et al., 2023). However, cross-regional comparative data remain scarce, and most evidence relies heavily on self-reported instruments, which may limit accuracy (Gutiérrez et al., 2016). Reportedly, excessive mobile phone use negatively affects children's social interaction, cognitive development, and sleep (Jennifer, 2018; Begum & Hussain, n.d.; Viola, 2021). Moreover, screen media addiction is found to be influential for physical consequences such as vision problems, painful upper extremity, and psychological health deterioration (Geng & Liu, 2025; Mokhtarinia et al., 2022).

Children with neurodevelopmental disorders appear to be more susceptible to cellphone addiction due to specific behavioral characteristics. Individuals with autism spectrum disorders (ASD) frequently exhibit rigid behavioral patterns when using smartphones; for instance, they may repeatedly watch the same video. In addition to that, they often rely on digital devices to cope with psychological distress, a behavior explained by the Compensatory Internet Use Theory (Lu et al., 2022; Zhou et al., 2024). Similarly, existing traits in children with Attention-Deficit/Hyperactivity Disorder (ADHD), such as lack of attention, lack of control, and impatience, may increase their tendency to use smartphones. In addition, children with ADHD often find screen media more stimulating and rewarding than their peers (Zeyrek et al., 2024).

Beyond individual traits, family and social factors also play a significant role in this context. Previous studies identified that bonding between child and parent, emotional factors, and social interaction have a strong relationship with cell phone addiction, particularly among kids with NDDs (Hong et al., 2021; Sun et al., 2020). In Bangladesh, one study highlighted the gadget addiction among children with NDDs and reported an average of 3–5 hours of daily use, with findings linking this excessive use to delayed motor development, impaired verbal communication, and reduced cognitive functioning (Kundu et al., 2024). However, in Bangladesh, studies investigating the issue of mobile phone addiction among children with NDDs remain limited, highlighting the need for further investigation.

Excessive smartphone use is considered a form of behavioral addiction (Andreassen et al., 2013). According to Social Cognitive Theory (SCT), developed by Bandura, human behavior is shaped by the reciprocal interaction of personal, behavioral, and environmental determinants. In this context, factors such as parenting time, mother's occupation, and family income function as environmental determinants, reflecting the level of social support, family culture, and access to digital resources. The type of disorder represents a personal determinant, indicating cognitive abilities, emotional regulation, and psychological characteristics. Together, these personal and environmental factors interact with behavioral patterns to influence the severity of addiction, consistent with SCT (Bandura et al., 1961; Warje, 2024). While several studies have examined behavioral determinants of cell

phone addiction, there is a notable gap in understanding how personal characteristics (e.g., age, gender) and environmental factors (e.g., parenting time, family economic status) contribute to this phenomenon, particularly among children with NDDs (De et al., n.d.; Nawaz et al., 2025; Zhu et al., 2025). Considering the background and existing gaps, this study seeks to address the following research question: What is the level of cell phone addiction among children with neurodevelopmental disorders, and which socio-demographic and environmental factors are associated with this addiction?

By addressing this question, the study aims to provide theory-driven evidence to provide valuable insights into parents and the Health Ministry, supporting more informed decision-making regarding screen time management and taking necessary initiatives. Furthermore, the research seeks to highlight the significant health consequences of excessive smartphone use in this often underrepresented population.

METHODS

Study Design and Sampling Technique

The study employed an analytical cross-sectional design. A criteria-based purposive sampling technique was used to ensure the inclusion of children meeting specific eligibility requirements. Participants were children diagnosed with NDDs, recruited from a special school (Autism Welfare Foundation) and a child development center (Rainbow Autism Care and Child Development Center). Recruitment was not limited to school-going children. These institutions are non-governmental welfare organizations that provide distinct types of rehabilitation and educational services. The study was conducted in Mohammadpur, a large area in the northern part of Dhaka that includes a mix of high- and middle-income communities and underdeveloped urban settlements. Participants were recruited from diverse socio-economic family backgrounds, which partially addresses concerns regarding the limitations of purposive sampling. An occupational therapist affiliated with both organizations assisted with recruitment to ensure accurate identification of eligible participants. The sample consisted of boys and girls aged between 2 and 11 years with a confirmed diagnosis of NDDs by certified professionals. The study focused on major NDDs prevalent in Bangladesh, including autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), cerebral palsy (CP), developmental delay, and Down syndrome. Children were excluded if their parents or caregivers lacked knowledge of the diagnosis, were unable to provide the required information, or if a smartphone was unavailable in the household. Consideration was also given to comorbidities and external stimuli such as medication use and recent changes in the living environment that may influence behavioral regulation among children with NDDs.

The required sample size was estimated using the single population proportion formula: $n = z\alpha^2 P (1-P)/d^2$, where n denotes the size of the population. A 95% level of significance ($z\alpha = 1.96$), an 8% margin of error ($d = 0.08$), and a 50% expected proportion ($P = 0.50$) were applied. Considering the data collection challenges anticipated in Dhaka city, an 8% margin of error was considered. The final estimated sample size was 165, accounting for an additional 10% to compensate for potential dropouts.

Instrument

The study implemented a survey questionnaire for collecting data, including socio-demographic questions (age, gender, parental time, mother's occupation, father's occupation, and monthly family income). The socio-demographic variables were categorized locally, as standardized or literature-based thresholds were not available for this context. The study included the original version of the Digital Addiction Scale for Children (DASC). Any translation or adaptation in the DASC wasn't required, as most of the parents involved in the study have an adequate educational background and a fair practice

in the English language. In addition, direct interviews minimized biases and enhanced the understandability of the questionnaire items. Therefore, the original version of DASC was deemed culturally appropriate for this sample, as it represents universal digital media behavior and is relevant in the context of Bangladesh. DASC is a comprehensive 25-item questionnaire designed to measure the severity of digital or cell phone addiction among children and adolescents. Each item is rated on a 5-point Likert scale ranging from 1 ("never") to 5 ("always"). The total score (25 to 125) is obtained by summing the responses across all items, with higher scores indicating a greater level of addiction. While the DASC does not provide validated severity cut-offs, the categorization used in this study (mild: 25–50; moderate: 51–75; severe: ≥76) was applied solely for descriptive purposes. These locally derived categories facilitated comparison across groups but should not be interpreted as clinically established thresholds. The DASC has demonstrated excellent internal consistency (Cronbach's $\alpha = 0.94$) and robust construct validity, showing satisfactory data-model fit (Hawi et al., 2019).

Procedure

First, the researcher obtained approval from the participating institutions. Next, participants were recruited based on inclusion and exclusion criteria. All data were collected from parents or caregivers, as children with NDDs often struggle to communicate effectively. Online and direct interviews were conducted to gather the data, ensuring respondent convenience. A tablet or mobile phone was used as an assisting device throughout the process. Considering suitability and time constraints, oral informed consent was obtained from parents before each interview. Parents were informed about the study's purpose, data use, and the voluntary nature of participation before providing consent. Interviews were conducted in a private setting to maintain confidentiality, and no identifying information was recorded to protect anonymity. The overall procedure was carried out according to the national research guidelines and institutional policies. The data collection process was assisted by the administrators and health care professionals of the selected institutes. The study involved survey responses provided by parents, posed minimal risk, and there was no direct involvement of the children with NDDs.

Data Analysis

The data was analysed using IBM SPSS Statistics 28.0 software (Chicago, USA). Descriptive statistics were performed to report the data analysis, displayed as means and standard deviations (SD). Categorical data were expressed as frequencies or percentages. The chi-squared test was conducted for categorical data to identify relevant associations between mobile phone addiction and other factors. Finally, a binary logistic regression analysis was conducted to assess the impact of associated factors on cell phone addiction, categorizing it into lower addiction (mild to moderate) and higher addiction (severe). Binary logistic regression was chosen because category sizes were uneven, with a relatively small group of mild addiction. Statistical significance was set at a p-value of < 0.05.

RESULTS

Findings of the Descriptive Statistics

The study included 184 samples for analysis, with a majority of boys (66.8) compared to girls (33.2%). The mean age of the participants was 6.83 years. Nearly 67 % of the participants used to receive proper time from their parents. Regarding mothers' occupation, close to 65% were housewives. According to family income status, the majority (42.8%) of the participants reported a monthly family income of above 45000TK, while the lowest number of students (8.2%) belonged to the income bracket of 15000TK or less. The specific disorders identified in this study were: ASD=44%; ADHD= 22.8%; CP= 14.6%; Developmental delay= 14.3%; and Down syndrome= 4.3%. Finally, results, considering the DASC

scores (M = 68, SD = 17.13), indicated that the majority of respondents exhibited moderate (43.4%) and severe (37%) level of addiction to mobile phones.

Table 1: Descriptive statistics of the categorical variables (n=184)

Variable	Category	n (%)
Gender	Boy	123 (66.8%)
	Girl	61 (33.2%)
Proper time	Yes	127 (66.8%)
	No	57 (33.2%)
Mother's occupation	Housewife	119 (64.7%)
	Working woman	65 (35.3%)
Diagnosed disorder	ASD	81 (44%)
	ADHD	42 (22.8%)
	CP	27 (14.6%)
	Developmental delay	26 (14.3%)
	Down syndrome	8 (4.3%)
Family income	15000 or less	15 (8.2%)
	16000 - 30000	38 (20.7%)
	31000 - 45000	52 (28.3%)
	>45000	79 (42.8%)
Addiction Level	Mild	36 (19.6%)
	Moderate	80 (43.4%)
	Severe	68 (37%)

Socio-demographic factors associated with cell phone addiction

According to the chi-square test, cell phone addiction (mild, moderate, severe) was significantly associated with parenting time, mother's occupation, monthly family income, and disorder type (all $p < .05$). However, no significant association was observed between addiction level and gender.

To further examine the impact of these factors on addiction severity, a binary logistic regression analysis was conducted by categorizing participants into lower addiction (mild to moderate) and higher addiction (severe). The regression model identified that parenting time significantly increased the likelihood of being in the higher addiction category (OR = 2.34, 95% CI [1.23, 4.44], $p = .010$). Mother's occupation was also a significant predictor (OR = 2.24, 95% CI [1.20, 4.17], $p = .012$), as was monthly family income (OR = 2.55, 95% CI [1.23, 5.30], $p = .012$). Lastly, disorder types significantly predicted addiction severity (OR = 2.18, 95% CI [1.18, 4.05], $p = .014$).

Table 2: Pearson Chi-square analysis results (n=184)

		Cell phone addiction			
		Mild	Moderate	Severe	P-value
Gender	Boy	22%	42.3%	35.7%	0.51
	Girl	14.8%	45.9%	39.3%	
Proper time	Yes	20.5%	48.8%	30.7%	0.02*
	No	17.5%	31.6%	50.9%	
Mother's occupation	Housewife	23.5%	46.2%	30.3%	0.03*
	Working woman	12.3%	38.5%	49.2%	
Family income	15000 or less	46.7%	40%	13.3%	<0.01*
	16000 - 30000	34.4%	39.4%	26.2%	

	31000 - 45000	9.6%	59.6%	30.8%	
	>45000	13.9%	35.4%	50.7%	
Disorder	ASD	22.3%	44.4%	33.3%	
	ADHD	2.4%	45.2%	52.4%	
	CP	33.4	40.7%	25.9%	
	Developmental delay	19.2%	38.5%	42.3%	0.04*
	Down syndrome	37.5%	50%	12.5%	

Table 3: Binary logistic regression analysis findings (n=184)

Predictor	Category	Reference Category	p	OR	95% CI for Exp(B)
Parenting time	Adequate vs Inadequate	Adequate	.009	2.34	(1.23 – 4.44)
Mother's occupation	Working mother vs Housewives	Working mother	.010	2.24	(1.20 – 4.17)
Monthly income	High-income family vs Low-income family	High-income family	.009	2.55	(1.23 – 5.30)
Disorder type	ASD, CP, or Down syndrome vs ADHD or Developmental delay	ASD, CP, or Down syndrome	.013	2.18	(1.18 – 4.05)

DISCUSSION

The present study aimed to evaluate the level of cell phone addiction and its association with socio-demographic factors among children with neurodevelopmental disorders (NDDs). The findings revealed that a large proportion of participants exhibited overuse, with 43.5% exhibiting moderate levels of addiction and 37% showing severe levels, while fewer than 20% were categorized as mildly addicted. The mean DASC score was 68 (Range from 25 to 125), indicating a generally high dependency on mobile phones within this population. These results raise significant concerns for children with NDDs, as excessive reliance on mobile devices may adversely affect the developmental, social, and emotional outcomes.

Notably, severe addiction was prevalent among children with ASD, ADHD, and developmental delay compared to those with CP and Down syndrome. This suggests that specific behavioral characteristics, such as inflexible response, attention difficulties, and difficulties with social interaction and communication, may exacerbate susceptibility to smartphone addiction.

The study further identified several socio-demographic factors significantly associated with addiction severity, including parenting time, mother's occupation, monthly family income, and disorder type. These findings align with the Social Cognitive Theory (Bandura et al., 1961), which emphasizes the role of environmental influences and behavioral characteristics in shaping individual perspectives. Compared to high-income nations, family-centered rehabilitation is undeveloped in low- and middle-income countries (LMICs), such as Bangladesh, where substantial knowledge gaps remain in disability care and support systems. The current findings, which highlight the role of parents and the family environment, may help enhance our understanding of family interaction in disability management and influence strategic approaches to strengthening rehabilitation policies (van Oort, & Jalovčić, 2023) From an inclusive development perspective, these findings are also consistent with the Community-Based Rehabilitation (CBR) Matrix, particularly its social, livelihood, and health components, which highlight primary prevention, social and family support, and the promotion of quality of life and self-reliance (Besoain-Saldaña et al., 2020). Integrating these ideas emphasizes the necessity of building family-

and community-centered solutions for long-term inclusion of people with disabilities in LMICs.

Consistent with earlier research, the present findings indicated the primary role of the family environment in managing the behaviors of children with special needs. Rosenbaum and Novak-Pavlic (2021) highlighted that parental involvement and guidance are essential for the healthy development of children with NDDs. The study confirms that children whose parents did not provide adequate time were 2.3 times more likely to be severely addicted than those whose parents did. Similarly, children of working mothers had 2.2 times higher possibility of high addiction compared to children of housewives. A possible reason could be a longer absence of parents, leading to a lack of supervision (Lee, & Kim, 2021). However, studies suggested that family culture or parenting style may pose a greater contribution to cell phone addiction than economic status and parenting time (Li et al., 2024). These findings highlight that parents play a significant role in facilitating children's behavior and fostering a healthy lifestyle (Bowling et al., 2019; Crowell et al., 2019). Previous studies suggest that children who spend more time with parents are more likely to engage in outdoor play and structured activities, which helps in reducing reliance on smartphones. In contrast, lack of parental support may promote feelings of loneliness, a personal factor emphasized in the Social Cognitive Theory (SCT) (Yue et al., 2022). This sense of loneliness can contribute to emotional dysregulation and increase dependence on digital media, aligning with the Compensatory Internet Use Theory (Zhao & Jin, 2023; Zhong et al., 2025). From a CBR perspective, strategies such as providing structured parent training and education, promoting family-oriented activities, and creating inclusive community play spaces are essential for enhancing parent–child interaction and supporting the development of individuals with NDDs. Additionally, the CBR policy emphasizes the importance of supporting parents in balancing work and caregiving responsibilities. Workplace adjustments such as flexible hours, nearby work options, or caregiver-friendly policies may help to mitigate parenting-related challenges and promote healthier digital behaviors among children with NDDs (Kannan, 2024).

The findings also revealed that children from high-income families (earning more than 30,000 BDT per month) had 2.6 times higher chance of being in the severe-addiction group compared to children from low-income families. Interestingly, this contrasts with earlier studies that identified lower family income as a stronger contributor to excessive device use (Zhong et al., 2025). Conversely, another study found no significant relationship between economic status and cell phone addiction (Abdullah et al., 2022). However, findings remain unclear regarding the family income and addiction level, while both low and high income are found to be associated with gadget dependency (Lin & Liu, 2020). Moreover, Previous studies suggest that digital devices are more accessible and adaptable for children from high-income families. Conversely, parents from low-income backgrounds often go through significant hardships and may not prioritize issues such as cellphone addiction. Consequently, both high- and low-income groups may contribute to the development of cellphone addiction, although the underlying mechanisms are different across socioeconomic contexts (Abdullah et al., 2022 & Li et al., 2024).

Compared to children with ASD, CP, or Down syndrome, children with ADHD or developmental delay were 2.2 times more likely to be in the severe addiction group. However, the odds for children with ASD are also not negligible. On the other hand, participants with CP and Down syndrome had a higher level of smartphone dependency as well, though the level was often moderate. The major concern for children with ASD and ADHD is that they are more vulnerable to cell phone addiction due to their traits and behavior patterns, and it's often challenging to control (Lu et al., 2022; Zeyrek et al., 2024; Zhou et al., 2024). Moreover, due to excessive mobile phone usage, children often overlook physical activity (PA). Whereas PA is highly beneficial for children with NDDs,

particularly for ASD and ADHD, it is highly beneficial to improve basic child developmental elements such as cognition, socialization, motor function, and self-regulation (Bukvić et al., 2021; Kim et al., 2015). However, the scarcity of accessible and well-equipped playgrounds in Dhaka city may also contribute to limited PA and increased screen use among children with NDDs. Currently, there are no public playgrounds in Dhaka specially designed for children with disabilities (Chiran, 2018). Although a few organizations are promoting inclusive play spaces, they are primarily focusing on rural areas (Humanity & Inclusion UK, 2018). Past studies highlighted that excessive device use was associated with delayed development of verbal communication, memory function and intellectual abilities; however, evidence is still limited regarding the relationship between media addiction and developmental delay (Abu Bakar et al., 2025). Although children with CP and Down syndrome frequently use screens more than their counterparts, no noticeable negative effects were found in previous research. Additionally, a few previous studies revealed that using devices helped individuals with Down syndrome and cerebral palsy, particularly in terms of enhancing social communication and reducing reliance on others (Menezes et al., 2020; Coşkun et al., 2025; Nonis n.d.; Fritz 2017).

CONCLUSIONS

The study effectively identified parental time, mother's work, family income, and disorder type as major predictors of smartphone addiction in children with NDDs. The findings suggest that adequate time and direction from family members can help reduce the severity of mobile phone addiction and create positive developmental outcomes. Furthermore, children with ASD, ADHD, and developmental delays have been reported to be more likely to develop gadget addiction, underlining a key area of concern that requires designed interventions for this especially vulnerable group.

Strengths and Limitations

This study's primary strength was the involvement of parents, special educators, and physical therapists. Their participation ensured greater accuracy and smoothness in the data collection process by providing perspectives from both home and professional settings. Secondly, the use of face-to-face interviews helped respondents better understand the questionnaire, reducing misinterpretation and minimizing potential response bias. Thirdly, the study applied not only chi-square tests to evaluate associations but also regression analysis to confirm relationships and their effects, thereby improving the robustness of findings.

However, the study has a few limitations. First, the sample distribution across disorder types was uneven, with fewer participants diagnosed with CP, developmental delay, and Down syndrome compared to ASD and ADHD. This imbalance may affect the comparative strength of findings across disorder types, although the higher prevalence of ASD and ADHD in the population also needs to be considered (Koly et al., 2021). Furthermore, the study was unable to provide strong supporting evidence on the relationship between cell phone addiction and certain disorders such as CP, Down syndrome, and developmental delay, due to the scarcity of prior research in these specific groups. This highlights a critical area for future studies to understand disorder-specific vulnerability pathways.

Recommendations and future directions

From a public health perspective, the findings call for the development of standard policies on recommended screen time for children with NDDs, as WHO guidelines are designed only for typical children. Such policies should account for the heterogeneity across disorder types, as this study identified distinct device usage.

Implementation of CBR-focused strategies, such as redesigning play-based environments and strengthening child–family interaction, is strongly recommended. However,

improving parents' knowledge of CBR principles and disability inclusion is essential to ensure meaningful participation. CBR programs should extend reach and support victim families by providing practical guidance and offering alternatives to digital entertainment. Additionally, schools should collaborate with CBR specialists to encourage healthy digital habits, structured play, and consistent routines across home and school settings.

Future research should consider longitudinal designs or mixed-methods to establish causal inferences between socio-demographic factors, disorder type, and smartphone addiction that may further guide effective interventions and policy development.

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