



To Study the Prevalence of Excessive Screen Time and Its Association with Developmental Delay in Children between 6 Months To 5 Years Age

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KEYWORDS

Screen time, developmental delay, smartphone exposure, early childhood, TDSC, language delay.

ABSTRACT:

Background: Early childhood is a crucial period for brain development, and appropriate environmental stimulation is necessary for achieving developmental milestones. With the widespread availability of smartphones and other digital devices, young children are increasingly exposed to screens at an early age. Excessive screen time may interfere with language, cognitive and social development.

Objectives: To determine the prevalence of excessive screen time and to assess its association with developmental delay among children aged 6 months to 5 years.

Methods: This hospital-based cross-sectional observational study was conducted in the Department of Pediatrics, Integral Institute of Medical Sciences and Research (IIMSR), Lucknow, over a period of 18 months after ethical approval. A total of 340 children aged 6 months to 5 years attending the pediatric outpatient department were enrolled. Screen exposure was assessed using parental interviews according to WHO recommendations. Developmental screening was performed using the Trivandrum Development Screening Chart (TDSC). Data were analyzed using SPSS version 26.0. Associations between screen time and developmental delay were evaluated using the Chi-square test, and $p < 0.05$ was considered statistically significant.

Results: Smartphones were used by all children, and 88.5% were exposed to screens before 24 months of age. More than half of the children had weekday screen time exceeding 2 hours (53.5%), and 72.9% had more than 2 hours of weekend screen exposure. Developmental delay was observed in 53.8% of participants. A significant association was found between prolonged weekday and weekend screen time and developmental delay ($p < 0.001$). Speech delay, poor eye contact, reduced social interaction and behavioral problems were common among children with higher screen exposure.

Conclusion: Excessive screen time is highly prevalent in young children and is significantly associated with developmental delay, particularly affecting language and social-communication skills. Early parental counseling, adherence to recommended screen-time limits, and routine developmental screening are essential to promote healthy childhood development.

INTRODUCTION

Early childhood, particularly the first five years of life, represents a critical period for brain growth and neurodevelopment. Rapid synaptogenesis, neuronal maturation and myelination occur during infancy and toddlerhood, forming the foundation for cognitive, language, motor and socio-emotional development.

Appropriate environmental stimulation, parent-child interaction, and play-based learning are therefore essential to ensure optimal developmental outcomes. Any adverse environmental exposure during this sensitive period may negatively influence developmental trajectories (1).



In recent years, there has been an unprecedented increase in the availability and use of digital media devices such as televisions, smartphones, tablets and laptops. Smartphones, in particular, have become highly accessible and are frequently used even among infants and toddlers. Parents often introduce screens as a means of calming children, facilitating feeding, or occupying them during daily activities. However, excessive exposure to screen media may replace essential human interaction, thereby affecting language acquisition, social communication and cognitive development (2).

The World Health Organization (WHO) recommends no screen exposure for children below 2 years of age and not more than 1 hour per day for children aged 2–5 years (3). Similarly, the American Academy of Pediatrics (AAP) discourages digital media use in children younger than 18–24 months (except video chatting) and emphasizes the importance of parental co-viewing and high-quality educational content for older preschool children (4). Despite these recommendations, studies have reported that a substantial proportion of children are exposed to screens much earlier than advised and often for prolonged durations.

Excessive screen time has been associated with multiple developmental concerns. Several studies have demonstrated delayed expressive language, poor attention span, impaired executive functioning, reduced social interaction, behavioral problems and sleep disturbances among children exposed to prolonged screen viewing (5–7). Screen exposure, particularly passive viewing without caregiver interaction, reduces opportunities for responsive communication, imitation and play-based learning, which are essential for speech and social development (8).

Developmental delay refers to a significant lag in achieving age-appropriate milestones in one or more domains such as gross motor, fine motor, language, cognitive or personal-social skills. Globally, approximately 10–15% of children are estimated to have some form of developmental delay, with a higher prevalence reported in low- and middle-income countries due to environmental, nutritional, and psychosocial risk factors (9). Early identification through screening tools is crucial because timely intervention can significantly improve developmental outcomes and long-term functioning (10).

India is witnessing rapid digitalization and increased smartphone penetration, leading to early and frequent

exposure of children to electronic media. However, awareness regarding recommended screen-time guidelines among parents remain limited. There is a growing concern among Pediatricians that excessive screen exposure may contribute to speech delay, social communication difficulties, behavioral disturbances and features suggestive of autism spectrum disorder in young children (11).

Although several international studies have explored the relationship between screen time and developmental outcomes, limited hospital-based data are available from North India, particularly among children below five years of age. Understanding the prevalence of excessive screen exposure and its association with developmental delay is essential for developing preventive strategies, parental counseling and early intervention programs.

Therefore, the present study was undertaken to determine the prevalence of excessive screen time and to assess its association with developmental delay among children aged 6 months to 5 years attending a tertiary care hospital.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based cross-sectional observational study was conducted in the Department of Pediatrics, Integral Institute of Medical Sciences and Research (IIMSR), Lucknow, India.

Study Period

The study was carried out over a period of 18 months following approval from the Institutional Ethics Committee.

Study Population and Sample Size

The study included children aged 6 months to 5 years who attended the Pediatric Outpatient Department (OPD) during the study period. A total of 340 children were enrolled.

The sample size was calculated using the standard formula:

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

Where:

- n = required sample size
- Z = 1.96 at 95% confidence level
- p = expected prevalence (66%)



- d = allowable error (5%)

The calculated minimum sample size was 340.

Inclusion Criteria

- Children aged 6 months to 5 years attending the Pediatrics OPD.
- Children whose parents/guardians provided written informed consent.

Exclusion Criteria

- Children aged <6 months or >5 years.
- Refusal of consent by parents/guardians.
- Children with known intellectual disability.
- Children with congenital anomalies or genetic disorders (e.g., Trisomy 21).

Definition of Screen Time

Screen time was assessed according to the World Health Organization (WHO) recommendations:

- **6–24 months:** Any amount of daily screen exposure was considered excessive.
- **2–5 years:** Screen time >1 hour per day was considered excessive.

Developmental Assessment

Developmental screening was performed using the **Trivandrum Development Screening Chart (TDSC)**. The TDSC is a validated 51-item screening tool developed by the Child Development Centre, Kerala, for children aged 0–6 years.

The chart assesses the following domains:

- Gross motor
- Fine motor-adaptive
- Language
- Personal-social development

A vertical line was drawn corresponding to the child's chronological age. Failure to achieve one or more milestones located to the left of the age line was

considered suggestive of developmental delay. The TDSC has a reported sensitivity of 84.62% and specificity of 90.8% and was validated against the Denver Developmental Screening Test.

Data Collection

Data were collected through structured interviews with parents/guardians and clinical assessment of the child. Information recorded included:

- Age and gender
- Socioeconomic status
- Daily duration and frequency of screen exposure
- Type of devices used (television, smartphone, tablet, etc.)

Each child underwent developmental screening using TDSC during the same visit.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using **SPSS version 26.0**. Descriptive statistics were used to determine the prevalence of excessive screen time and developmental delay. The association between screen exposure and developmental delay was analysed using the Chi-square test. Logistic regression analysis was performed to identify independent predictors of developmental delay. A p -value <0.05 was considered statistically significant.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee prior to commencement of the study. Written informed consent was obtained from the parents or legal guardians of all participants. Confidentiality and anonymity of the participants were strictly maintained.

Funding and Resources

The study was conducted using departmental facilities. Financial support, if required, was provided by the principal investigator, and consumables were arranged by the research scholar.



RESULT AND OBSERVATIONS

Table 1: Distribution of the studied participants based on sociodemographic details

Sociodemographic details		Number of Participants (n=340)	Percentage
Age group	6-23 months	153	45.0
	24-60 months	187	55.0
	MEAN±SD	30.58±17.7	
Gender	Male	182	53.5
	Female	158	46.5
Family	Nuclear	114	33.5
	Extended/joint	226	66.5
Mother's education	Illiterate	23	6.8
	Primary	91	26.8
	High school	112	32.9
	Graduate	114	33.5
Father's education	Primary	91	26.8
	High school	134	39.4
	Graduate	115	33.8
Socioeconomic status	Upper	46	13.5
	Upper middle	91	26.8
	Middle	113	33.2
	Lower Middle	60	17.6
	Lower	30	8.8
Birth Order	1 st	115	33.8
	2 nd	158	46.5
	3 rd or more	67	19.7
Siblings	0	92	27.1
	1-2	158	46.5
	3 rd or more	90	26.5



Table 2: Distribution of the studied participants according to screen device use and exposure characteristics (n = 340)

Variable	Category	Number of Participants (n=340)	Percentage (%)
Number of Devices Used	1	46	13.5
	2	157	46.2
	3	137	40.3
Television Use	Yes	136	40.0
	No	204	60.0
Smartphone Use	Yes	340	100.0
	No	0	0.0
Tablet Use	Yes	0	0.0
	No	340	100.0
Laptop Use	Yes	23	6.8
	No	317	93.2
Screen Device Present in Bedroom	Yes	135	39.7
	No	205	60.3
Age at First Exposure to Screen	< 23 months	301	88.5
	24–60 months	39	11.5
Weekend Screen Time	1 hour	23	6.8
	2 hours	69	20.3
	> 2 hours	248	72.9

Table 3: Distribution of the studied participants according to weekday screen time and screen exposure habits (n = 340)

Variable	Category	Number of Participants (n=340)	Percentage (%)
Screen Time on Weekdays	1 hour	69	20.3
	2 hours	89	26.2
	> 2 hours	182	53.5
Bedtime Screen Exposure	Yes	272	80.0
	No	68	20.0



Screen Use While Eating	Always	158	46.5
	Sometimes	159	46.8
	Rarely	23	6.8

Table 4: Distribution of the studied participants based on continuous exposure to screen time

Continuous Exposure	Number of Participants	Percentage
30-60 minute	182	53.5
>60 minute	158	46.5

Table 5: Distribution of the studied participants based on supervision of screen time

Variable		Number of Participants (n=340)	Percentage
Supervision	Yes	295	86.8
	No	45	13.2
Supervision Frequency	Sometimes	182	53.5
	Often	90	26.5
	Rarely	68	20.0
Rules	Yes	92	27.1
	No	248	72.9
Parental screen time	Yes	250	73.5
	No	90	26.5
Imitates Parents	Yes	271	79.7
	No	69	20.3

Table 6: Distribution of the studied participants according to screen interference and awareness about screen time (ST) usage guidelines (n = 340)

Variable	Category	Number of Participants (n=340)	Percentage (%)
Screen Interference	Yes	136	40.0
	No	204	60.0
Awareness about ST Usage	Yes	23	6.8



Guidelines	No	317	93.2
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Table 7: Distribution of the studied participants according to developmental evaluation and developmental delay (n = 340)

Variable	Category	Number of Participants (n=340)	Percentage (%)
Development Evaluated	Yes	45	13.2
	No	295	86.8
Developmental Delay	Yes	183	53.8
	No	157	46.2

Table 8: Distribution of the studied participants according to social-communication and speech developmental parameters (n = 340)

Variable	Category	Number of Participants (n=340)	Percentage (%)
Responds to Name	Yes	184	54.1
	No	156	45.9
Eye Contact	Always	45	13.2
	Sometimes	182	53.5
	Rarely	113	33.2
Follows Commands	Yes	225	66.2
	No	115	33.8
Achieved Age-Appropriate Speech	Yes	112	32.9
	No	228	67.1

Table 9: Distribution of the studied participants according to social, behavioural and cognitive characteristics (n = 340)

Variable	Category	Number of Participants (n=340)	Percentage (%)
Social Interaction	Yes	137	40.3
	Sometimes	89	26.2
	No	114	33.5



Repetitive Behavior	Yes	204	60.0
	No	136	40.0
Relationship Difficulty	Yes	157	46.2
	No	183	53.8
Cognitive Issues	Yes	114	33.5
	No	226	66.5
Tantrums	Often	228	67.1
	Very often	112	32.9

Table 10: Association of developmental delay and its determining factors

Variables		Development delay		p-value
		Yes (n=183)	No (n=157)	
Age group	6-23 months	78 (42.6%)	75 (47.8%)	0.342
	24-60 months	105 (57.4%)	82 (52.2%)	
Gender	Male	92 (50.3%)	90 (57.3%)	0.194
	Female	91 (49.7%)	67 (42.7%)	
Continuous Exposure	30-60 minute	92 (50.3%)	90 (57.3%)	0.194
	>60 minute	91 (49.7%)	67 (42.7%)	
Screen time on weekends	1 hour	0 (0.0%)	23 (14.6%)	<0.001
	2 hours	137 (74.9%)	111 (70.7%)	
	>2 hours	46 (25.1%)	23 (14.6%)	
Screen time on weekday	1 hour	23 (12.6%)	46 (29.3%)	<0.001
	2 hours	22 (12.0%)	67 (42.7%)	
	>2 hours	138 (75.4%)	44 (28.0%)	

p<0.05= statistically significant; p>0.05= statistically non-significant

Table 11: Association of age at first exposure to screen and its determining factors



Variables		Age at first exposure to screen		p-value
		<23 months (n=301)	24-60 months (n=39)	
Age group	6-23 months	153 (50.8%)	0 (0.0%)	<0.001
	24-60 months	148 (49.2%)	39 (100.0%)	
Gender	Male	153 (50.8%)	29 (74.4%)	0.006
	Female	148 (49.2%)	10 (25.6%)	
Family	Nuclear	108 (35.9%)	6 (15.4%)	0.011
	Extended/joint	193 (64.1%)	33 (84.6%)	
Mother's education	Illiterate	17 (5.6%)	6 (15.4%)	0.007
	Primary	84 (27.9%)	7 (17.9%)	
	High school	105 (34.9%)	7 (17.9%)	
	Graduate	95 (31.6%)	19 (48.7%)	
Father's education	Primary	82 (27.2%)	9 (23.1%)	0.105
	High school	123 (40.9%)	11 (28.2%)	
	Graduate	96 (31.9%)	19 (48.7%)	
Socioeconomic status	Upper	41 (13.6%)	5 (12.8%)	0.010
	Upper middle	74 (24.6%)	17 (43.6%)	
	Middle	109 (36.2%)	4 (10.3%)	
	Lower Middle	50 (16.6%)	10 (25.6%)	
	Lower	27 (9.0%)	3 (7.7%)	
	1 st	97 (32.2%)	18 (46.2%)	



Birth Order	2nd	144 (47.8%)	14 (35.9%)	0.211
	3rd or more	60 (19.9%)	7 (17.9%)	
Siblings	0	74 (24.6%)	18 (46.2%)	0.017
	1-2	144 (47.8%)	14 (35.9%)	
	3rd or more	83 (27.6%)	7 (17.9%)	

$p < 0.05$ = statistically significant; $p > 0.05$ = statistically non-significant

DISCUSSION

The present study evaluated the prevalence of excessive screen exposure and its association with developmental delay among children aged 6 months to 5 years attending a tertiary care hospital. With rapid digitalization and easy availability of smartphones, screen exposure has become almost universal in early childhood. In our study, **100% of children used smartphones** and a large proportion were exposed to screens before 23 months of age (88.5%), indicating very early introduction of digital media. Similar trends have been reported globally, where handheld devices are increasingly used as a behavioral management or entertainment tool by caregivers (2,5).

A major finding of this study was the **high prevalence of developmental delay (53.8%)**. This proportion is higher than global estimates of 10–15% reported in community-based populations (9). The higher prevalence in the present study may be attributed to hospital-based sampling, where parents often seek consultation due to developmental concerns, as well as increased exposure to environmental risk factors such as prolonged screen use, reduced parent–child interaction, and limited stimulation. Early childhood requires rich verbal and social engagement for optimal neurodevelopment; displacement of these interactions by screen media may adversely affect milestone acquisition (1,8).

The study also demonstrated a statistically significant association between longer weekday and weekend screen time and developmental delay ($p < 0.001$). Children exposed to screen time exceeding two hours daily were more likely to have developmental delay. These findings are consistent with previous studies that

reported an inverse relationship between screen time and developmental performance. Madigan et al. found that higher screen exposure at 24 and 36 months was associated with poorer developmental screening scores at later ages (5). Similarly, Duch et al. reported that excessive screen viewing in children under 3 years negatively affected cognitive and language development (6).

Early age of first screen exposure is another important determinant. In the present study, the majority of children were exposed before 2 years of age. Early introduction of digital media contradicts WHO and AAP recommendations, which advise avoiding screen exposure in children younger than 2 years (3,4). During infancy, learning occurs primarily through sensory exploration, imitation and face-to-face communication. Passive screen viewing lacks contingent social interaction and therefore provides limited developmental stimulation (8).

Speech and social-communication delays were prominent in the study population. A large proportion of children did not achieve age-appropriate speech (67.1%), had poor eye contact, and showed impaired response to name. These findings support earlier research demonstrating that excessive screen exposure is associated with expressive language delay and reduced social responsiveness (7,11). Children learn language through reciprocal interaction with caregivers; when screens replace human communication, opportunities for vocabulary development and social learning decrease.

Behavioral issues were also frequently observed. Many children had tantrums, repetitive behaviors and relationship difficulties. Previous studies have reported



associations between prolonged screen time and attention problems, behavioral dysregulation, and reduced executive functioning (7). Screen exposure, especially fast-paced or overstimulating content may overstimulate developing neural pathways leading to decreased attention span and behavioral disturbances.

Another notable observation was bedtime screen exposure (80%) and screen use while eating (over 90% always or sometimes). Screen use during meals reduces family interaction and responsive feeding practices, while bedtime exposure may disrupt melatonin secretion and sleep patterns. Poor sleep quality has been linked to behavioral problems and impaired cognitive development in young children (11).

Parental behavior also played a role. A high proportion of children imitated parental screen usage, and most households lacked screen time rules. Only 6.8% of parents were aware of screen time guidelines. Previous literature suggests that parental modeling strongly influences child's media habits, and co-viewing without interaction does not provide educational benefit (4,11). Therefore, parental awareness and counselling are critical preventive strategies.

Overall, the findings of the present study support the hypothesis that excessive screen exposure, particularly early introduction and prolonged duration is significantly associated with developmental delay, especially in language and social domains. Limiting screen time and encouraging interactive play, reading and caregiver engagement may help improve developmental outcomes.

CONCLUSION

Excessive screen exposure was highly prevalent among children aged 6 months to 5 years, with most introduced to screens before two years of age. Developmental delay was identified in over half of the children and showed a significant association with longer daily screen time, particularly beyond two hours, mainly affecting language and social-communication skills.

Early screen introduction, bedtime screen use and poor parental awareness contributed to this association. Limiting screen exposure, promoting parent-child interaction and play, and routine developmental screening with parental counseling are essential to support healthy early childhood development.

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