

## Association between Digital Device Use and Speech Delay among Preschool Children Aged 2–5 Years: A Cross-Sectional Study

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### Abstract:

**Background:** The rapid expansion of digital technology has led to increased exposure of young children to smartphones, tablets, and television. Early childhood is a critical period for speech and language development, and excessive screen exposure may interfere with parent–child interaction and verbal stimulation.

**Objective:** To assess the association between digital device use and speech delay among preschool children aged 2–5 years.

**Methods:** A cross-sectional study was conducted among 200 preschool children aged 2–5 years attending the pediatric OPD. Data regarding digital device exposure, duration of screen time, age of first exposure, and parental interaction were collected using a structured questionnaire. Speech development was assessed using age-appropriate developmental milestone checklists based on standard pediatric developmental guidelines. Children who failed to achieve expected speech milestones for their age were categorised as having speech delay. Statistical analysis was performed using chi-square tests and logistic regression.

**Results:** Among the 200 children studied, 62% used digital devices daily. Speech delay was observed in 28% of participants. Children exposed to screens for more than two hours per day had significantly higher rates of speech delay compared with those exposed for less than one hour per day ( $p < 0.001$ ). Early exposure before the age of two years was also associated with increased risk of speech delay.

**Conclusion:** Excessive digital device use is significantly associated with speech delay among preschool children. Limiting screen exposure and promoting interactive communication between parents and children may help support optimal language development.

**Keywords:** Screen Time, Speech Delay, Preschool Children, Digital Devices, Language Development.

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### Introduction

Speech and language development during early childhood plays a fundamental role in cognitive, social, and academic outcomes. The preschool years represent a critical developmental window in which children rapidly acquire vocabulary, grammar, and communication skills through interaction with caregivers and the surrounding environment [1]. In recent years, digital devices such as smartphones, tablets, televisions, and computers have become increasingly integrated into daily life. Consequently, young children are being exposed to digital media at progressively earlier ages. The widespread availability of smartphones and portable digital devices has

significantly increased the amount of screen exposure among children worldwide [2]. While digital technology can provide educational opportunities, excessive exposure may negatively affect developmental processes, particularly language acquisition [3].

Several studies have demonstrated an association between increased screen time and poorer language development in early childhood. Research indicates that children with higher daily screen exposure may exhibit reduced language comprehension and expressive language abilities [5,6]. Duch et al. reported that prolonged screen exposure during

early childhood may interfere with language acquisition and developmental milestones [8].

One potential explanation is that screen exposure replaces time that would otherwise be spent in interactive communication with caregivers. Parent-child interactions, including reading, conversation, and play, are essential for stimulating vocabulary growth and communication skills [1,10]. Responsive social interaction has been shown to play a critical role in early language learning. Furthermore, observational studies have shown that excessive screen time may reduce verbal exchanges between parents and children, thereby limiting opportunities for language learning [11]. Reduced parent-child interaction associated with excessive media use may contribute to delays in speech and language development. Recent studies have also highlighted the potential impact of early exposure to digital devices on communication skills. Exposure to screens during infancy has been associated with developmental delays in communication and language domains later in childhood [12]. Although research has explored this association extensively, limited data are available regarding the relationship between digital device use and speech delay among preschool children in many developing regions, including India [7]. Understanding this association is particularly important in the context of rapidly increasing smartphone accessibility and changing parenting practices.

Therefore, the present study was conducted to evaluate the association between digital device exposure and speech delay among preschool children aged 2-5 years.

**Objectives**

**Primary Objective:** To assess the association between digital device use and speech delay among preschool children aged 2-5 years.

**Secondary Objectives**

1. To determine the prevalence of digital device use among preschool children.
2. To evaluate the relationship between duration of screen time and speech delay.

3. To examine the influence of age at first exposure to digital devices.

**Methodology**

**Study Design:** Cross-sectional observational study.

**Study Setting:** Department of Community Medicine and Pediatric Outpatient Department

**Study Population:** Preschool children aged 2-5 years.

**Sample Size:** 200 children.

**Sampling Method:** Participants were selected using convenience sampling from children attending the Pediatric outpatient department during the study period, from July 2025 to November 2025

**Inclusion Criteria**

- Children aged 2-5 years
- Parents willing to provide informed consent

**Exclusion Criteria**

- Children with known neurological disorders
- Children with hearing impairment
- Diagnosed developmental disorders

**Data Collection:** Information was collected using a structured questionnaire, including:

- Demographic details
- Type of digital device used
- Daily screen time
- Age at first device exposure
- Parental interaction time

Speech development was evaluated based on age-appropriate developmental milestones.

**Statistical Analysis:** Data were analysed using SPSS.

- Frequency and percentage for categorical variables
- Chi-square test for association
- Logistic regression analysis

p < 0.05 was considered statistically significant.

**Results**

**Table 1: Demographic Characteristics of Participants**

Variable	Frequency (n=200)	Percentage
Age 2-3 years	70	35%
Age 3-4 years	65	32.5%
Age 4-5 years	65	32.5%
Male	112	56%
Female	88	44%

Table 1 shows the age distribution of the study participants. Among the 200 preschool children included in the study, the largest proportion was in the 2-3-year age group (35%), followed by those

aged 3-4 years (32.5%) and 4-5 years (32.5%). The age distribution indicates that children across all preschool age groups were adequately represented in the study population.

**Table 2: Digital Device Usage**

Device Type	Number	Percentage
Smartphone	128	64%
Television	96	48%
Tablet	44	22%
Laptop	32	16%

Table 2 summarises the types of digital devices used by the children. Smartphones were the most commonly used device, reported in 64% of participants, followed by television exposure in 48% of children. Tablet use was observed in 22% of participants, while laptops or computers were used by 16% of children.

**Table 3: Daily Screen Time**

Screen Time	Number	Percentage
< 1 hour	48	24%
1–2 hours	76	38%
> 2 hours	76	38%

Table 3 presents the distribution of daily screen time among the participants. Approximately 38% of children were exposed to digital screens for more than two hours per day, while another 38% used devices for 1–2 hours daily. Only 24% of children had screen exposure of less than one hour per day.

**Table 4: Prevalence of Speech Delay**

Speech Development	Number	Percentage
Normal speech	144	72%
Speech delay	56	28%

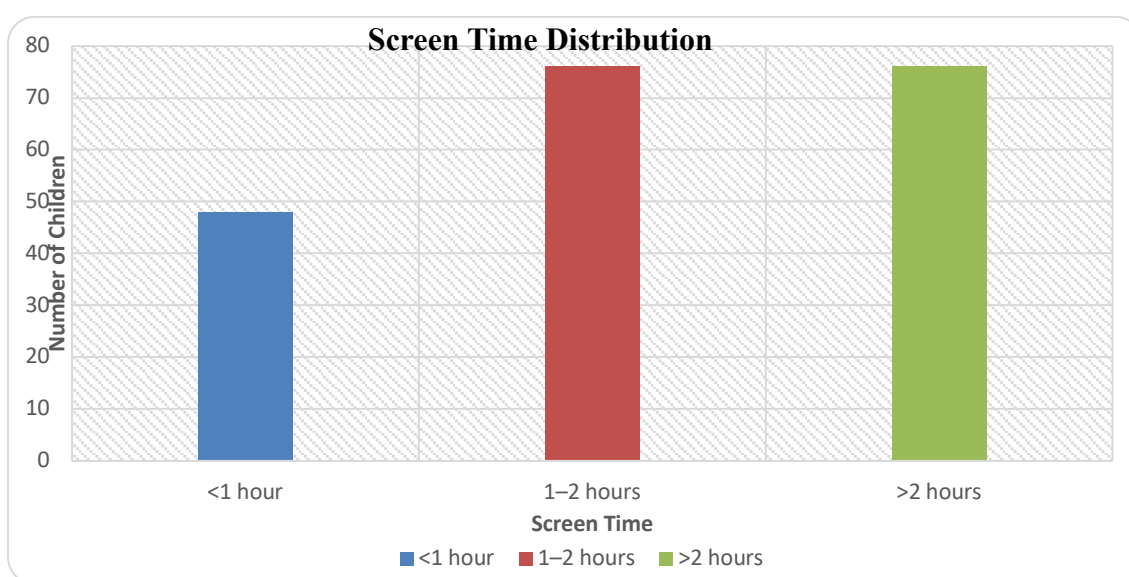
Table 4 demonstrates the prevalence of speech delay among the study participants. Of the 200 children included in the study, 56 (28%) had speech delay, whereas 144 (72%) had normal speech development.

**Table 5: Association between Screen Time and Speech Delay**

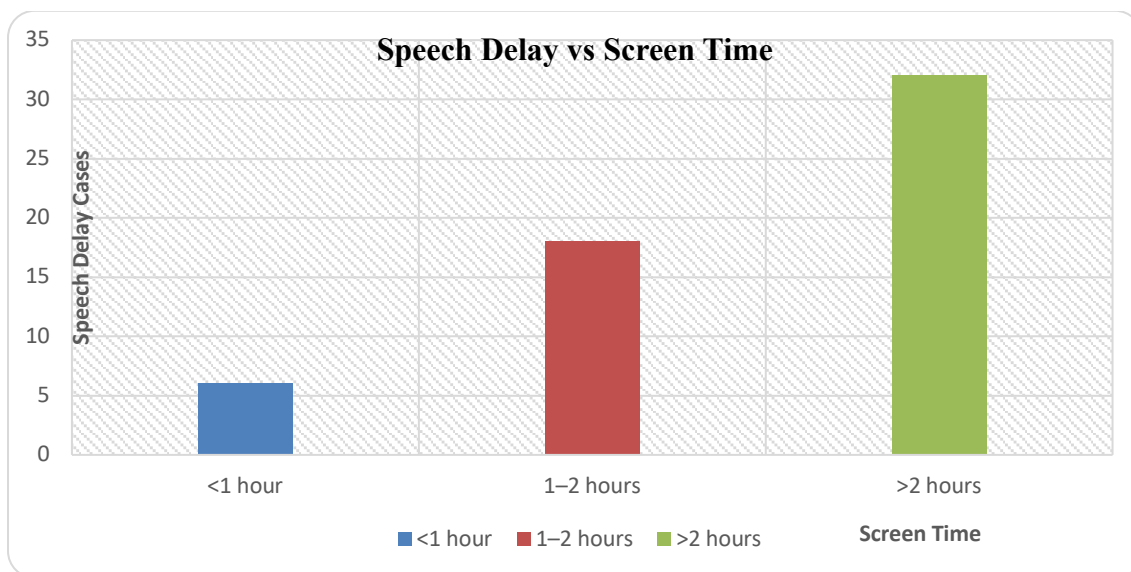
Screen Time	Speech Delay (n)	Normal Speech (n)	Total	$\chi^2$ value	p value
<1 hour	6	42	48		
1–2 hours	18	58	76		
>2 hours	32	44	76	21.0	<0.001
Total	56	144	200		

A chi-square test was performed to examine the association between daily screen time and speech delay. The analysis revealed a statistically significant association between prolonged screen

exposure and speech delay among preschool children ( $\chi^2 = 21.0$ ,  $df = 2$ ,  $p < 0.001$ ). Children with more than two hours of daily screen time showed the highest prevalence of speech delay.

**Figure 1: Distribution of Screen time among participants**

The screen time distribution graph shows that the largest proportion of children (38%) were exposed to digital devices for more than two hours per day. Similarly, 38% of children had screen exposure between one and two hours daily, while only 24% of children had screen time of less than one hour per day



**Figure 2: Association between screen time and speech delay**

The bar graph comparing screen time categories with speech development status demonstrates that the prevalence of speech delay increases with longer durations of screen exposure. Children with more than two hours of daily screen time showed the highest proportion of speech delay.

### Discussion

The present study evaluated the relationship between digital device use and speech delay among preschool children aged 2–5 years. Early childhood is a crucial period for speech and language development, during which environmental stimulation and caregiver interaction play a vital role in shaping communication abilities [1]. The findings of the present study demonstrated that 62% of children were exposed to digital devices on a daily basis, with smartphones being the most frequently used device. This observation reflects the rapidly increasing accessibility of mobile technology in households and the growing integration of digital media into the daily routines of young children. Similar trends have been reported globally, where smartphones and tablets have become the most common digital devices used by children due to their portability and ease of access [2,3]. Studies from India have also reported a substantial increase in screen exposure among preschool children, particularly through smartphones, as parents often use them for entertainment or educational purposes [4].

In the present study, speech delay was observed in 28% of participants. This prevalence is comparable with previous research suggesting that increased exposure to digital media may contribute to

delayed language development in early childhood. Madigan et al. reported that higher screen time was associated with poorer performance on developmental screening tests, particularly in communication domains [5]. Similarly, Zimmerman and Christakis found that increased media viewing in young children was associated with delayed expressive language development (6). Indian studies have also reported similar findings, indicating a higher prevalence of speech delay among children with increased exposure to digital devices [4,7].

Our results indicate that children with more than two hours of daily screen time had significantly higher rates of speech delay compared with those who had lower screen exposure.

This finding supports previous studies demonstrating a negative association between prolonged screen exposure and language development. For instance, a systematic review by Duch et al. reported that excessive screen time in early childhood may interfere with language acquisition and cognitive development [8]. Similarly, a recent study conducted in Saudi Arabia found that children with prolonged use of smart devices had a significantly higher risk of speech delay compared with children with limited screen exposure [9].

One possible explanation for this relationship is that excessive screen exposure may reduce opportunities for face-to-face communication between children and caregivers. Interactive communication with parents and caregivers plays a critical role in language learning by promoting

vocabulary development, phonological awareness, and social communication skills [1,6]. When children spend prolonged periods interacting with screens rather than engaging in verbal interaction with adults, opportunities for language stimulation may be reduced.

Furthermore, several studies have demonstrated that increased screen exposure may reduce the number of verbal exchanges between parents and children, which are essential for language acquisition. Research has shown that children learn language most effectively through responsive social interaction rather than passive media exposure (10). Radesky et al. also reported that excessive use of mobile media devices may interfere with parent-child interactions and reduce conversational exchanges within families [11].

Another important observation in the present study was that early introduction of digital devices before the age of two years was associated with a higher prevalence of speech delay. This finding is consistent with previous research indicating that early screen exposure during infancy may negatively affect language development. Takahashi et al. reported that children who were exposed to screens during infancy were more likely to exhibit communication delays at later developmental stages [12]. Similar findings have also been reported in Indian pediatric populations, where early smartphone exposure has been associated with delayed speech milestones and reduced parent-child interaction [4,7]. The findings of the present study, therefore, emphasise the importance of monitoring and regulating digital device use in young children. Current guidelines from the American Academy of Paediatrics recommend limiting screen exposure in young children and encouraging interactive activities such as reading, storytelling, and play to support optimal language development [3]. Parents and caregivers should be encouraged to prioritise interactive communication with children and ensure that screen use does not replace valuable opportunities for social and linguistic interaction.

Overall, the results of this study highlight the potential impact of excessive digital device use on speech development in preschool children and underscore the need for greater awareness among parents, healthcare professionals, and educators regarding appropriate screen time practices during early childhood.

### Conclusion

The present study demonstrates a significant association between prolonged digital device exposure and speech delay among preschool children. Children exposed to more than two hours of screen time daily had a higher prevalence of speech delay. These findings highlight the need for

parental awareness regarding appropriate screen use and the importance of interactive communication for healthy language development in early childhood.

### Limitations

1. Cross-sectional design limits the ability to establish causality.
2. Screen time data were based on parental reports, which may introduce recall bias.
3. The study did not assess the type or educational quality of digital content.
4. Sample size was relatively small and limited to a single geographic area.

### Future Implications

Future research should:

- Conduct longitudinal studies to determine causal relationships between screen exposure and speech development.
- Evaluate the role of educational versus non-educational screen content.
- Explore the impact of parental co-viewing and interaction during digital media use.
- Develop public health guidelines to promote balanced digital exposure in early childhood.

Early identification of children at risk of speech delay may facilitate timely intervention through speech therapy and parental counselling.

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