

Early Screen Exposure in Children Under Five with Neurodevelopmental Disorders: Prevalence, Patterns, and Clinical Correlates from an Indian Child Development Centre

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Abstract

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Keywords:

- bilingualism,
- Children,
- Cognition,
- Linguistic

Objectives:

- 1) To determine the prevalence of screen use in children 6 months to 5 years with neurodevelopmental disorders (NDD).
- 2) To identify patterns of screen use and factors associated with screentime in the same population.

Methods: A cross-sectional observational study was conducted at a multidisciplinary clinic for children with special needs between February to June 2021 at a tertiary care hospital. 50 participants, 6 months to 5 years with NDD were recruited. A semi structured parent questionnaire was administered and a developmental assessment was done for each child.

Results: All 50 participants (100%) were exposed to screen media, with a mean screen time of 116 minutes/day (95% CI: 85.2–147.4). Excessive screen time was observed in 72% of the children. Greater screen time was associated with more severe delays in the communication and emotional domains. Parents' perception of the value of screen media was an important contributor to children's screen use, while co-viewing was associated with lower screen time.

Conclusions: Excessive screen use is widespread in young children with neurodevelopmental disorders, underscoring the need for routine media-use screening during developmental consultations. Parent counselling on mindful media use, high-quality content, and co-viewing should be considered an integral component of early intervention services.

Introduction:

World over, media and screen use in early childhood has increased with children spending more time online, and at earlier ages^[1-6]. There has been extensive research on media and screen use in early child development. Early childhood is a time of rapid growth, development, and maturation. An important element of the human brain, “neuroplasticity”, which is high during this period, determines changes in response to experiences. During the first three years of life, a child’s brain may create over one million new connections per second - essential for the development of hearing, language, and cognition. The effect on screen use at this vulnerable period in development has been greatly studied in typically developing children with enough evidence pointing to detrimental effects^[7-20].

Most studies were conducted in typically developing children in high income countries, with very few studies done in India. There was initially a delay in establishing guidelines earlier due to limited availability of data ^[21]. Current guidelines for screen use and time in children less than 5 years have been developed by the Indian Academy of Pediatrics in 2021 ^[22]. There has been a lot of changes since then in many countries which have adopted no social media till 16 years of age ^[23,24]. The adverse effects of excessive screen time have been reported not only in a neurotypical child population but also children with Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD) who are susceptible to excess screen use ^[25]. In addition to assessment of screen time, it is also important to measure or describe what screen users are doing and why^[26] to understand better, the effect of media use on development and behaviour

A study to look for any association between screen time and genetic risks for neurodevelopmental disorders in children by Takahashi et al in Japan found that in children 24 to 40 months of age, the genetic risk of ASD was associated with longer screen time and that of ADHD with an increase in screen time over time. These data suggest that prolonged screen time may not be a cause of the

genetic risk for NDD, but an early sign of NDDs.^[27]

While several studies highlight the adverse effects of screen use, benefits have also been documented with use of digital devices. These include being used to assist in communication, visual schedule for ASD, and as a platform for creating social stories or for behavioral reinforcement. Furthermore, many children with ADHD or ASD have a comorbid learning disability in which keyboarding or audiobooks are extremely helpful^[26]. For children with cerebral palsy, digital media may help connectivity in rural areas, and be used as assistive devices to help with peer interaction, education, be a motivational therapy tool and can be used for hand functions^[28].

Despite growing concerns about screen use, there is limited evidence on digital media exposure among young children with developmental delay, particularly in low- and middle-income countries. To our knowledge, no Indian study has examined the prevalence, patterns, and factors associated with excessive screen use in children under 5 years with developmental delay. This study aimed to determine the prevalence and patterns of screen use and identify factors associated with excessive screen exposure to inform targeted counselling and intervention strategies.

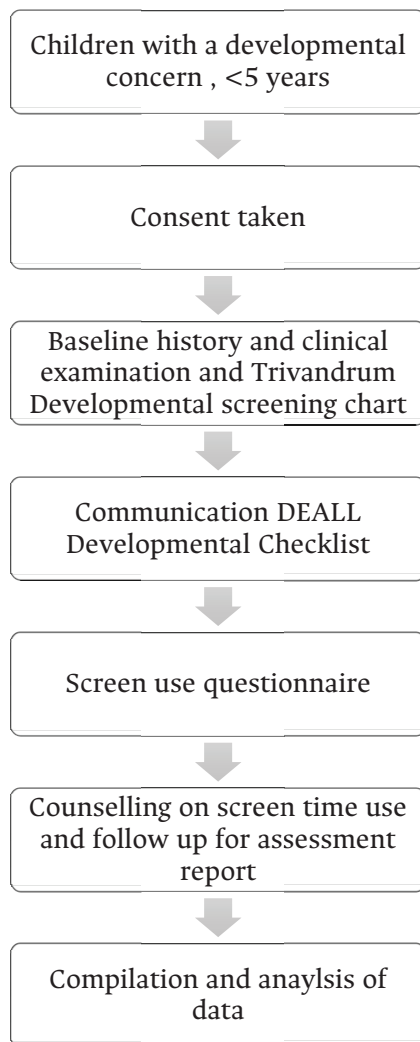
Materials and methods:

The study design was a cross-sectional observational study. The period of study was from February to June 2021. Patients were recruited from a Centre for Children with Special Needs, in a teaching hospital in a major city in South India. Children between the ages of 6 months and 5 years presenting to a specialty clinic with developmental delays were included in the study.

Sample size

A sample size of 50 was calculated based on a recent study of screen time in Indian children by 15-18 months of age, where 88.7% of children were exceeding the recommended screen time of 1 hour/ day ^[29]2019. Mothers of 370 healthy developmentally normal children (15-18 months of age. Using this figure and a precision of 10%, we arrived at a figure of 50 parent- child pairs.

Study flow diagram



Screening Tools

Trivandrum developmental screening chart (0-6 years)

The Trivandrum Developmental Screening Chart (TDSC) is a validated screening tool for children 0-6 years. If one item was delayed- the test was considered positive ^[30].

Communication DEALL Developmental Checklist-

The CommDEALL developmental checklist (CDDC) is an indigenous validated tool to assess developmental skills of children up to the age of 6 years, along eight developmental domains, with

norms based on an Indian population^[31]. The CDDC can be used across a variety of developmental disabilities and languages, to draw out a developmental profile. It covers 8 domains: gross motor, fine motor, activities of daily living, receptive language, expressive language, cognition, social and emotional development. Each domain has 36 items, total of 288 items. For assessment, methods of direct observation and parental interviewing are used.

Screen use questionnaire to assess prevalence and patterns-

At that time this study was designed, only limited validated tools existed to measure daily screen exposure. The existing tools were developed for older age-groups 5-15 years and above 18 years. There was no tool that comprehensively measured screen time and its correlates among toddlers. The screen use questionnaire used in this study was modified from a screen use questionnaire called SCREENS-Q which was developed by a group in Denmark to meet the research needs of a comprehensive tool to assess screen habits of children and the possible screen media related correlates based on a socio-ecological perspective [frequency, content, and co-viewing]. The aim of this study was to test the ScreenQ, a composite measure of screen-based media use. METHODS: ScreenQ is a 15-item parent report measure reflecting AAP recommendations. Range is 0-26, higher scores reflecting greater non-adherence. With no "gold standard" available, four validated measures of skills and parenting practices cited as influenced by overuse were applied as the external criteria, including expressive language, speed of processing, emergent literacy, and cognitive stimulation at home. Psychometric analyses involved Rasch methods and Spearman's ρ correlations. RESULTS: Sixty-nine families were administered ScreenQ. Child age ranged from 36 to 63 months old (52 ± 8 ; 35 girls^[32]).

This was a semi structured questionnaire which included demographics, number of devices owned, which device was used by the child, screen time use, reasons for screen use, content viewed, parental perceptions and awareness, child behaviours and coviewing.

Written consent from the parents was obtained from the parents before participation. This study was approved by the Institutional Ethics Committee (IEC). (IEC reference number:13/2021).

Results:

Guidelines for screen time in children were developed by IAP and other international organizations, and state that below the age of 2 years there should be no screen use (with the exception of video calls) and for children 2-5 years should not be more than 1 hour per day [4,22,33,34]. Therefore, for this study, any screen time for those children 2 years and below and screen time more than 1 hour for 2-5 years old was considered excessive screen use.

Demographics-

The mean age of the children was 39 months with ages ranging from 8 to 60 months.

64% were male and 36% were female. 80% resided in urban areas and 20% in rural areas.

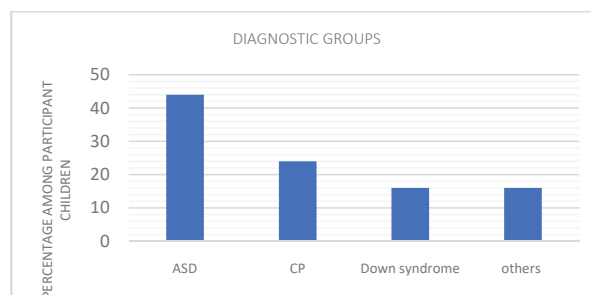
The mean maternal age was 30 years (range 21-40 years). 78% of the mothers were either graduates or postgraduates, but only 20% were employed.

The mean age of the fathers was 35 years (range 29-45 years), with 3 fathers either deceased or separated from the families. 78.7% of the fathers were graduates and postgraduates and 53.2% of them were employed professionally.

Diagnosis-

The diagnostic groups were divided into 4 - Autism Spectrum Disorder, Cerebral Palsy, Down Syndrome, and Others (which were a miscellaneous group, of Global Developmental Delay (GDD), speech delay, social pragmatic communication disorder, genetic syndromes). The proportion of children in each group in the table.

Diagnosis of the children included in the study



Devices owned and used daily-

100% families owned smart phones, 98% had televisions and 74% owned laptops.

The majority of children viewed their smartphones and TV seven days a week.

Screen time use -

Of the 50 children who participated in this study, the average amount of screen time spent across all ages was 116.3 minutes, (SD 109.6), 95% CI: 85.2 minutes - 147.4 minutes. The prevalence of excessive screen time (>1 hour/ day among children age 2 years and above or any duration/day among children age less than 2 years) was found to be 72.0%

Patterns of screen use -

60% of families reported screen use during meals, while 40% kept the TV on in the background even when no one was watching.

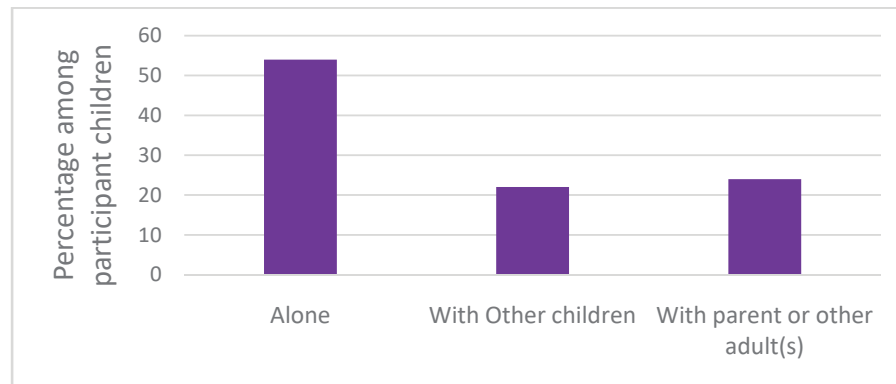
Factors Affecting Screen Use-

Viewing with other family members (covieing)

Most of the children (54%) were watching by themselves, 22% with other children and 24% viewed screens with a parent or other adults.

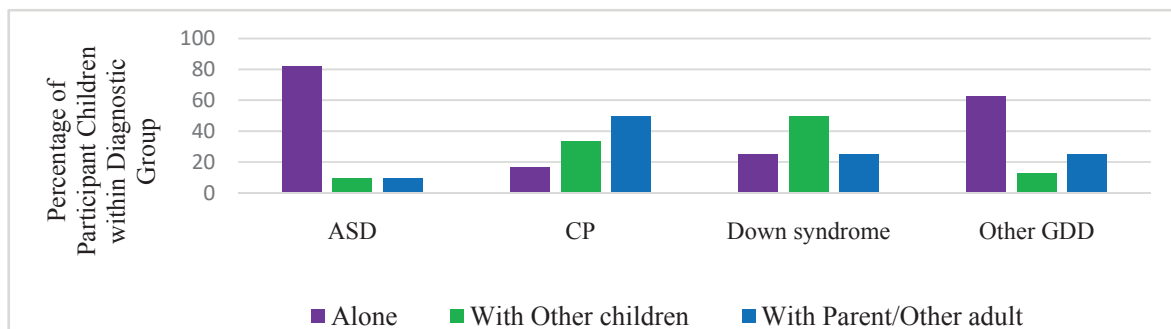
Covieing by Diagnostic Group

Viewing with other family members (covieving)



Most of the children with ASD would view screen media alone, whereas the Down syndrome/ CP

group tend to co view with either other children or adults.



One of the most important findings of this study was the marked protective effect of co-viewing. Children who watched screens independently had a mean screen time of 166 minutes/day, whereas those who co-viewed with a caregiver had a significantly lower mean screen time of just 58 minutes/day—a nearly threefold reduction ($p < 0.001$). This finding suggests that co-viewing may be an effective strategy for mitigating excessive screen exposure in young children with neurodevelopmental disorder

The effect of coviewing on screen time

	N	screen time in minutes			
viewing	50	mean	std. dev	mini- mum	maxi- mum
alone	27	165.74	122.29	10.00	480.00
covieving	23	58.26	50.60	5.00	180.00

Context and Factors contributing to screen use:

At this young age, children do not get the choice of what they want to do nor can they do it independently. If a child is using the screen, it usually with parental knowledge and consent. This study also aimed to investigate the factors and the context that may be contributing to the excessive screen use.

Positive parental attitudes toward screen media were associated with a two- to threefold higher likelihood of excessive screen use. Awareness of screen time recommendations alone did not reduce screen exposure, while concerns about its health and developmental effects were associated with lower screen use hild behaviours that contribute to increased screen use.

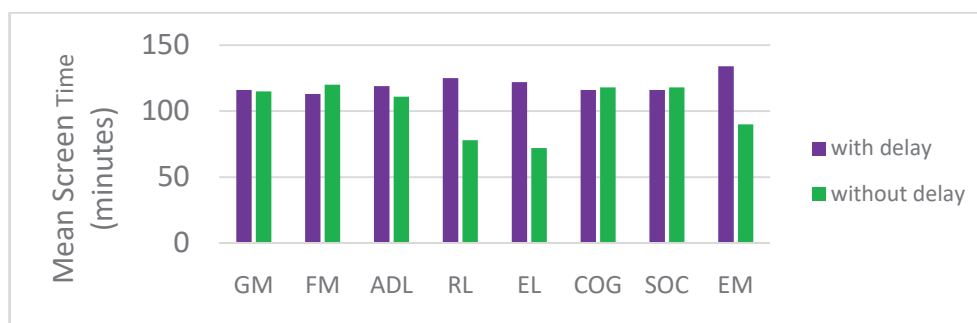
These behaviors' include conflict when turning off the screen, which may lead the parents to give in to their demands, which in turn acts as a

positive reinforcement, and these children also have excessive screen time. Of the 5 parents that reported conflict each time screen time ended, the average screen time was 192 minutes. Kids who prefer screens (when given a choice) show much higher screen use.

Screen time and development quotient-

A notable finding was the association between increased screen exposure and poorer developmental outcomes. Children with the highest screen time demonstrated the greatest delays in receptive and expressive language and emotional development, whereas those with lower screen exposure had comparatively milder language delays.

Screen time and development quotient



Content-

Content viewed during screentime was assessed by categories 1) Educational young child-oriented programs, 2) cartoons and rhymes 3) shows for older children 4) Games 5) Others

In all the categories of children, except the Down syndrome group, it was seen most of the children were watching non educational child-oriented programs like cartoons, rhymes, and other YouTube videos made for kids.

Discussion:

Devices owned-

In this study, every family owned at least one smart phone and 98% owned a television set. Similar findings were observed in other studies from India, which indicates many families have access to screen media [21,29,35,36]. This could also be an advantage in terms of reaching out to parents and possibly access to intervention through an online platform.

Watching with meals-

60% of the children in this study viewed a screen while eating. This was similar to other studies in neurotypical children where 56-70% parents

reported meals were eaten with screen media on^[36-38]. One of the reasons that parents stated as to the use screens often at mealtimes, is as a source of distraction to get their child sit down and eat. This is particularly noted with developmental concerns including inattention, hyperactivity and underlying sensory processing difficulties, where mealtime is a challenge to most of these parents and so to get their children to sit and eat, and keep sitting, and screens are a convenient method to get children sit and eat. Additionally for children with Cerebral Palsy and higher levels of functional limitation (GMFCS level VI/V, EDACS level III or more) screens are used to keep the child engaged and interested during the prolonged meal duration.

Coviewing:

In this study it was found that children who view screens on their own were at higher risk of excessive screen time, and that co viewing was associated with lower levels of harmful practices. This is because parents can supervise and monitor what their children are watching and like has been emphasized earlier, co viewing with an adult reinforces learning making the screen time well spent. However, this may be difficult for parents who rely on the screen to engage the child and

get house work or other work done take or care of another sibling, which seemed to be the real challenge for these parents who were interviewed.

Between the ASD and non-ASD group, it was seen that the children with ASD watch on their own more than the non-ASD group. Children with Down syndrome and CP were found to watch with others. Children with CP may also enjoy a parent or sibling's company but parental assistance to use the device requires covieing.

Solo viewing and excessive screen time-

It was seen in this study that solo viewing increased screen time to an average of 166 minutes, and while covieing, screentime reduced to 58 minutes which is within the recommended limits. Therefore, covieing has a protective effect from excessive screen time use. This could be explained by the fact that parents are present to supervise the screen use, place boundaries and set limits to the screen time.

Parental perceptions-

It was also seen that parental perceptions greatly influenced the amount of screen time use. The reasons/ function for screen use included helping the child to calm down, educational, some respite for parents, to get some work/ household chores done. This is similar to other studies done in neurotypical children [38–42]. Many parents are not aware of the negative effects of screen exposure toward their children, even considering that the use of educational applications in the smartphone may be beneficial. In this study it was found that parents who believed that the screen helped their child to learn new things or enhance their creativity had a statistically higher screen time than those who did not. In this study we found that about 40% were aware that screen time guidelines/ recommendations are present. This awareness was related to advice or information from the child's therapist or the doctor, to decrease screen use and hence knew that excessive screen time was not advised. Despite these concerns, there was an excess screentime in both groups. This could be because of the practical difficulty of enforcing these rules. The prominence of media in the home combined with the numerous responsibilities of

parents of young children may make it difficult to successfully restrict media use.

Childs behaviour-

The child's behaviour also influenced increased screen use. It was seen that in 64% of the children, there was conflict when trying to limit screen use, leading to excessive screen time. Electronic devices appear as a coping strategy for parents' frustration with children's behavior, with a calming effect, and as a facilitator of daily routines and childcare^[43].

In children with ASD another reason parents allow their children screentime is because it allows the child to relax or calm down^[44]. Children with ASD are far more difficult to manage than typically developing pre-schoolers; as such, television can provide a break for overwhelmed parents. Children with ASD also are likely to gravitate to such stimulation.

As was seen in this study, 38 % parents who responded that their child would choose screens over other activities had a mean screen time of 155 minutes.

Context and content of screen use-

In this study, one of the main reasons, given by parents on why they allow screen use was cited as to get some work done like household chores, cooking, taking care of another sibling. Content watched was largely non educational cartoons. Online streaming of YouTube was also very popular in our study. YouTube is the largest free platform for online video in the world. In a report, Young Kids and YouTube: How Ads, Toys, and Games Dominate Viewing, an analysis of videos watched by kids in this age group, and it was found an abundance of advertising and other non-educational content (45). For those who co viewed along with an adult, content varied from cooking shows, serials, and reality shows. This is similar to the few studies done in neurotypical children, showing that most of the content viewed are non-educational cartoons/ Youtube videos^[21,43,47].

Screen use and development:

An important finding of this study was the clear association between screen exposure and

developmental performance. Higher screen time was consistently associated with greater delays in receptive and expressive language and emotional development. In contrast, children with lower screen exposure had relatively better developmental quotients, particularly in the language domains. Although the cross-sectional design precludes causal inference, these findings reinforce concerns regarding excessive screen use during the critical period of language acquisition.

Conclusion:

When recommending screen use, clinicians should emphasize mindful practices such as selecting high-quality, age-appropriate content and engaging in co-viewing with the child. Screens should be avoided during mealtimes, with content closely monitored to ensure it supports the child's development. Parents can be guided toward alternative activities tailored to their child's abilities, including reading books, peer interactions, and hands-on play, to reduce reliance on screens.

Conflict of Interest: None

Funding: None

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