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Impact of Screen Time on Behavioral Patterns of 2-15-year-old Children in Kerala- A cross sectional study

Abstract:

Aim and background: Early childhood screen exposure is being caused by the development of small, user-friendly, and accessible multimedia goods. Screen's impact on children and adolescents' mental health is an alarming concern nowadays.The current study is aimed at assessing the association of screen media use on child behavior among 2-15-year-old children in Kerala.

Methods: A comprehensive questionnaire, derived from existing literature, was distributed through a Google form to parents and guardians of 2-15-year-old children in Kerala. The study involved the participation of 738 respondents. The questionnaire was pre tested for its reliability and validity before collecting data.

Results: Multivariate Regression analysis revealed that the frequency of everyday usage of screen media, number of devices owned, addiction and dependency increased the odds of behavior change and mean behavioral score by 5.02, 6.18, 3.07 and 2.8 times respectively.

Conclusion: The findings of this study indicate that excess screen time is associated with greater behavior problems among children. These results emphasize the importance of addressing excess screen media exposure, particularly in the context of the pandemic, and consider parental perceptions in implementing appropriate interventions.

Clinical significance: Use of technology and gadgets is fast spreading among small children. Increased screen time has been proven to have detrimental effects on a child's behavior which in turn could affect dental associated behavior as well. This can have important implications for the dentist concerning behavior management during the treatment of child patients.

Key-words: Behavior,Screen time,cross-sectional study

Introduction:

The widespread use of digital technology has drastically changed day-to-day living, with screen time now becoming a regular component of children's schedules everywhere. This tendency is especially noticeable in Kerala, a state well-known for its high literacy rates and progressive social indices. Screens (televisions, computers, smartphones, tablets, video game consoles) are becoming an increasingly important part of children's lives, starting at an early age.[1] The advent of the digital age has given rise to a generation of "digital natives," children and adolescents who exhibit a high degree of dependence on various digital devices for a multitude of essential activities. This has led to a growing body of research investigating the impact of screen time on child health. In recent years, there has been a surge of interest among researchers in understanding the determinants of screen media use (SMU) and the potential long-term consequences of excessive SMU engagement. The availability and widespread use of computers, tablets,

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televisions, and cellphones has changed the way children between the ages of two and fifteen behave. While using digital gadgets for leisure and education has its advantages, too much screen time can be harmful to young people's physical, mental, and social wellbeing. It's critical to comprehend how screen time affects kids' behavior, particularly in light of Kerala's distinct sociocultural and educational setting.

Fast development and major changes in social, emotional, and cognitive domains characterize the developmental period between the ages of 2 and 15 years. Screen usage can have a variety of effects on developing children's attention spans, sleep habits, levels of physical activity, academic achievement, and social interactions throughout these critical years.

Increased screen use has been linked to behavioral problems in youngsters, including hyperactivity, mood swings, and short attention spans, according to recent research and observations. Evidence suggested that excessive screen media use could positively[2-4] or negatively affect[5,6] young children's health. Excessive screen media use could have positive effects including reducing the attention problem, increasing letter knowledge, and training learning abilities. screen media use could have detrimental health effects, including overweight/obesity, short sleep duration and unconsolidated sleep, language delay, and children's injury. Concerns over children's holistic development are also raised by the replacement of screen-based activities with time spent on physical activities and in-person contacts. Although the internet world presents children with beneficial learning possibilities, it also exposes them to improper content and cyberbullying, which exacerbates the negative effects on their mental health. Based on these findings, experts have advised that children should not be exposed to screen media before 18-24 months and should only use electronic gadgets for less than 1 hour per day from 2 to 5 years of age, giving preference to parental guidance associated with high-quality and interactive programs[9,10].To the best of author's knowledge this will be the preliminary attempt to study on excessive screen media use and its effects on child behavior.

In Kerala, where adopting new technologies and achieving academic success are highly regarded, parents and teachers struggle to strike a balance between screen time and other important responsibilities. For children's growth to be positive, there must be strong rules and interventions to control screen time. To fully comprehend this complex landscape, researchers must explore the relationship between the diverse types of screens, the content they deliver, and their association with emotional and behavioral health indicators in children.This study intends to investigate the complex impacts of screen time on the behavioral patterns of children in Kerala, ages 2 to 15, offering insights into the implications for their development.

Materials and methods:

This study employed a cross-sectional design, utilizing a well-validated questionnaire[11]among children aged 2-15 years residing in Kerala, India. The instrument was electronically administered via a Google Form to parents and guardians. The questionnaire comprehensively assessed various aspects of screen media use and its impact on children within this demographic group. It was organized into five key domains:1) Screen Media Environment: This domain explored the digital landscape surrounding the children, examining factors such as device availability and internet access prevalence.Child Screen Media Use Patterns: This section captured the children's screen media consumption habits, including the types of media used, duration of use, and frequency of engagement.Context of Screen Media Use: This domain investigated the various contexts in which children engaged with screen media (e.g., educational purposes, entertainment, social interaction). Early Exposure Effects: This section explored potential effects of early screen media exposure on the study population. Parental Perception of Child's Media Use: This section assessed parental perspectives on their children's screen media engagement, including perceived benefits and concerns. The questionnaire comprised 12 carefully crafted questions specifically tailored to the unique characteristics of our study population. Participant data was collected from June 2022 to October 2022.This project was approved by the Ethics Committee of the MDCRC (Malabar Dental college & Research Centre).

The general average measures ICC test-retest for the questionnaire was 0.99 and Kappa 0.88. Related to the validity, this instrument was approved as valid assessed by Pearson correlation coefficient (r= 0.89). The instrument was translated to local language(Malayalam) and back translation was done to ensure the psychometric properties. It was reported as satisfactory in both scenarios.

The formula calculates the required sample size to estimate a population proportion with a given level of confidence (5% significance level). The critical value of Z at the 5% significance level ($Z_{(1-\alpha)} = 1.96$) is used to determine the appropriate sample size for a 95% confidence interval. The relative error (d) defines the acceptable margin of error in the estimate. The sample size for this study comprises 738 participants.

Statistical analysis:

MS Excel 2016 was used to fabricate the data sheet. IBM SPSS Corp. in Armonk, New York for Windows, Version 25.0, was used for the statistical analysis. The data followed non-parametric distribution. Chi-square test was used to ascertain the demographic characteristics of the study population. The intra-class correlation coefficient (ICC) was used to do the test-retest reliability as it reflects both correlation and agreement. Kappa coefficient quantifies the level of agreement of categorical variables and measures intra-rater reliability or test-retest reliability. The association of different variables of screen media use with mean behavior score using multiple linear regression analysis. The statistical constant was fixed at $p<0.05$.

Results:

A total of 738 parents participated in the study, representing children across three age groups: 2-5 years (43.5%), 6-10 years (39.6%), and 11-15 years (16.9%) [Refer Fig.1]. The gender distribution among thechildren was relatively balanced, with 52.4% being female and 47.6% being male.

Table 1shows the comparison of frequency of use of screen media, number of devices owned by the child, use for school-related activities, time spent on screen media activities per day and dependency on online educational apps with mean behavior score using One-way ANOVA test. The mean values of behavior scores of different frequencies of use of screen media did not show statistically significant difference ($p>0.05$). However, the number of devices owned by the child, use for school activities, total time spent and dependency on online educational apps were found to have statistically significant influence on mean behavior score($p<0.05$).

Association of different variables of screen media use with mean behavior score using multiple linear regression analysis is shown in table 2. It was noted that use of screen media almost everyday increased the risk of adverse behavior in the child by 5.029 times and the result was found to be statistically significant($p<0.05$). Children owning more than 4 screen media devices had higher chances of exhibiting poor behavior (OR-6.187). Children who used screen media on a daily basis for school based activities showed a change of behavior score with an associated odds ratio of 3.074. Children who used screen media for more than 5 hours a day exhibited an odds ratio of 2.851 while children who showed high dependency on educational apps for assignments showed an odds ratio of 2.892.

Discussion:

Technology has now become an integral part of any young child's life worldwide. However, excessive screen media exposure may have adverse side effects affecting the behavior of a child. This could have serious public health implications as it could affect the overall socio-emotional growth and cognitive skills of the child. This study thus examines a child's screen usage and its impacts on child behavior scores.[12]

The present study findings examining the frequency of screen media use and its association with children's behavior scores did not yield statistically significant results. However, several other screen media factors have been observed to have significant influence on the behavior score of children. These factors included the number of devices they own, how often they use screens for schoolwork, their total screen time, and their reliance on educational apps. Our findings resonate with previous research by Barr et al(2007),[2] demonstrating a significant association between excessive screen time and behavioral alterations in children. These alterations encompass diminished social competencies, attentional difficulties, and heightened impulsivity. Additionally, in concordance with existing literature[13,14] this study revealed a positive correlation between the number of media devices in a child's environment and their overall screen time.

A recent systematic review found moderately strong evidence for associations between screen time(ST) and depressive symptoms and weak evidence for associations of ST with problem behaviors, anxiety, hyperactivity, inattention, and poor sleep.[15] One potential explanation is that time spent engaging in ST might replace time spent sleeping. Few studies have tested this proposal. In two independent studies with adolescents (15-year-olds), sleep duration mediated the relationship between computer use and health symptoms (e.g., nervousness, headache),[16] and sleep onset difficulties mediated the relationship between computer use and psychological symptoms (e.g., feeling low, irritability).[17]

The research on screen time (ST) and its impact on anxiety and depression in children presents a mixed picture. While some studies have identified a positive correlation, suggesting that increased ST is linked to higher anxiety and depression rates [18-20], others have found no significant association or even potential benefits associated with greater ST [21-23]

In an Indian survey of parental opinions about the effect of television on children's sleep, it was reported that 18% of parents believed their child (aged 3–10 years) had a decreased or disturbed sleep pattern as a result of television viewing. [24]

Given the substantial time children dedicate to screen time (ST) activities, it often displaces other essential activities like sleep. In this study we assessed the association of different variables of screen media use with mean behavior score using multiple linear regression analysis. It has been observed that the frequency of use, owning more than 4 screen media devices, total time spent exceeding 5 or more hours and high dependence on online educational apps exhibited significant influence on child behavior. Our analysis aligns with prior research[24] demonstrating sleep duration as a significant mediator between ST (including types and content) and the emergence of problem behaviors in children. Furthermore, the growing prevalence of multiple devices accessible to children likely contributes to increased ST and potentially influences behavioral changes, as supported by existing literature[25].

Previous studies have suggested that excessive screen time may be linked to various behavioral changes in children, including diminished social skills, increased impulsivity, and attention problems.[26]Understanding this variable can shed light on the potential effects of device ownership on children's behavior and how limiting or managing device access could influence their development. The amount of time children spend on screen media activities daily is a critical variable to consider. By analyzing the duration of daily screen media use, we can establish correlations between extended screen time and changes in behavior, sleep patterns, and overall lifestyle.

Significant behavioral correlations were also found between the reliance on online educational apps and the usage of screen media for school-related tasks. This is consistent with research by Przybylski and Weinstein (2019)[27], which indicates that depending on the content and usage environment, structured instructional use can have both beneficial and detrimental effects. Even though educational applications might improve learning, relying too much on them without enough offline interaction can cause problems including attention deficit disorder and increasing screen dependency. Excessive screen time, even if focused on educational apps, can contribute to issues such as decreased physical activity, disrupted sleep patterns, or mood changes. Organizations like the American Academy of Pediatrics (AAP) suggest age-specific limits for overall screen time, which includes educational screen time. These guidelines help ensure children have a balanced routine incorporating physical activity, social interaction, and other non-screen activities.[28]

There was significant variability in parental perceptions regarding excessive screen media use and its influence on child behavior according to the study data.Current study responses show 48% of parents recognize the potential negative effects of excessive screen time on their child's behavior. They believe prolonged screen use can lead to decreased physical activity, attention problems, difficulties with social interactions, and changes in mood or behavior.[29]On the other hand, some parents acknowledge that excessive screen time can have negative consequences but believe that a moderate and balanced approach is key. From the responses obtained in the current study, around 37% of the responses indicated a permissive attitude towards screen media use, perceiving it as a harmless or even beneficial activity for their child. They may downplay the potential negative effects on behavior and believe their child's screen engagement is normal for their generation.

Excessive screen time can have implications for pediatric dental treatment. According to a study conducted by Alaki S M et al(2023),[30] excessive screen time can affect a child's attention span and ability to cooperate during dental treatments. Prolonged screen exposure, especially to dental-related content, can potentially increase a child's anxiety and fear of dental treatments. Videos or images portraying dental procedures in a negative light can amplify their apprehensions, making it challenging for the dental team to establish trust and ensure a smooth dental experience.[29] Excessive screen time can contribute to certain oral habits such as prolonged pacifier or thumb sucking, which may impact the dental structure and alignment. Additionally, sedentary screen time can lead to reduced physical activity, affecting overall oral health and development. During dental procedures, the child must remain still and cooperate to ensure their safety and the successful completion of the treatment. Excessive screen time can distract the child, leading to unintentional movements or reactions that may interfere with the dental procedure or compromise safety.

By minimizing excessive screen time and employing effective communication strategies, dental clinics can optimize the success of pediatric dental treatments and ensure a positive experience for both the child and the dental team. One potential limitation of the study could be the reliance on self-reported data, which may introduce recall bias and inaccuracies, particularly among younger children and among parents. This study only captures a snapshot of the association between screen time and behavior at one point in time, making it difficult to establish causality or the direction of the relationship. Furthermore, the study's focus on a specific geographical region (Kerala) may limit the generalizability of the findings to other populations with different socio-cultural backgrounds or levels of technology

access. More long-term studies to track changes in screen time and behavior over time, provide a more comprehensive understanding of the impact of screen time on behavioral patterns and long-term mental and physical health, including dental treatment outcomes. By exploring this area, practitioners, educators, and policymakers can develop comprehensive approaches to safeguard children's oral health and overall well-being in a digitally advancing world.

Control for potential confounding variables, such as socio-economic status, parental education, and family structure, to isolate the specific impact of screen time on behavioral patterns is to be considered in future studies. A diverse sample should be included to ensure the generalizability of the results. We need to develop and implement educational interventions for parents and caregivers to promote healthy screen time habits and mitigate potential negative impacts on children's behavior in days to come. One should raise awareness about the importance of limiting screen time and promoting alternative activities for children in the community.

Table 1: Comparison of frequency of use of screen media, number of devices owned by the child, use for school related activities, time spent on screen media activities per day and dependency on online educational apps with mean behavior score – One-way ANOVA test.

Variables		Mean	Std. Deviation	95% Confidence Interval for Mean		F value	P value
				Lower Bound	Upper Bound		
Frequency of use of screen media	1 day or less per week	17.60	6.025	10.12	25.08	1.892	0.131[c]
	2-3 days a week	23.44	7.055	18.02	28.87		
	4-5 days a week	23.53	5.368	20.94	26.11		
	Every day of the week	23.53	5.462	22.86	24.20		
Number of devices owned by the child	0-2 devices	23.15	5.430	22.48	23.81	9.685	<0.001[b]
	3-4 devices	22.41	6.325	19.16	25.66		
	>4 devices	29.33	2.610	27.89	30.78		
Use of screen media for school activities	Don't know	23.67	3.215	15.68	31.65	4.296	0.002[a]
	No, never	21.30	5.673	19.98	22.61		
	Yes, daily	30.48	5.040	23.60	34.37		
	Yes, less often than weekly	23.22	5.895	21.47	24.97		
	Yes, weekly	26.21	5.639	22.38	28.03		
Time spent by the child per day in screen-based activities during leisure time	1-29 mins	21.51	6.34	20.01	23.01	2.984	0.012[a]
	30-59 mins	23.39	5.70	22.11	24.67		
	1-2 hrs	24.61	4.69	23.51	25.71		
	2-3 hrs	24.60	4.40	23.28	25.92		
	3-5 hrs	23.58	5.96	18.80	26.37		
	5 hrs or more	27.36	5.182	20.88	30.85		
Child dependent on online educational apps for home assignments	Never	22.08	5.942	20.95	23.22	4.636	0.003[a]
	Occasionally	24.23	5.444	23.04	25.43		
	Rarely	22.89	5.081	21.20	24.59		
	Yes mostly	24.98	4.671	23.81	26.16		

[a]p value<0.05 – Statistically significant; [b]p value<0.001 - Highly significant; [c]- Statistically not significant

Table 2: Association of different variables of screen media use with mean behavior score – Multiple linear regression analysis

Variables		Odds ratio	Std. Error	P value	95% confidence interval of odds ratio	
					Lower Bound	Upper Bound
Frequency of screen media use	1 day or less per week	1.000	Ref	Ref	Ref	Ref
	2-3 days a week	3.944	2.906	0.090[c]	0.775	10.664
	4-5 days a week	4.026	2.582	0.053[c]	0.056	10.108
	Every day or almost everyday	5.029	2.277	0.028[a]	0.547	9.511
Number of devices owned by the child	0-2 screen media devices	1.000	Ref	Ref	Ref	Ref
	3-4 screen media devices	0.735	1.345	0.585[c]	-3.382	1.912
	>4 screen media devices	6.187	1.427	<0.001[b]	3.379	8.995
Use of screen media for school activities	No, never	1.000	Ref	Ref	Ref	Ref
	Yes, daily	3.074	0.777	<0.001[b]	1.546	4.602
	Yes, less often than weekly	2.795	1.060	0.009[a]	0.708	4.882
	Yes, weekly	1.807	1.005	0.073[c]	0.171	3.785
Time spent by the child per day in screen-based activities during leisure time	1-29 mins	1.000	Ref	Ref	Ref	Ref
	30-59 mins	1.444	0.876	0.101[c]	-0.281	3.168
	1-2 hrs	2.400	0.918	0.009[a]	0.593	4.207
	2-3 hrs	2.651	1.028	0.010[a]	0.629	4.674
	3-5 hrs	0.635	1.702	0.710[c]	-2.716	3.985
	5 hrs or more	2.851	1.844	0.123[c]	-0.778	6.480
Child dependent on online educational apps for home assignments	Never	1.000	Ref	Ref	Ref	Ref
	Occasionaly	2.140	0.794	0.007[a]	0.578	3.702
	Rarely	0.800	1.033	0.439[c]	-1.233	2.834
	Yes mostly	2.892	0.859	0.001[a]	1.201	4.584

[a]p value<0.05 – Statistically significant; [b]p value<0.001 - Highly significant; [c]- Statistically not significant

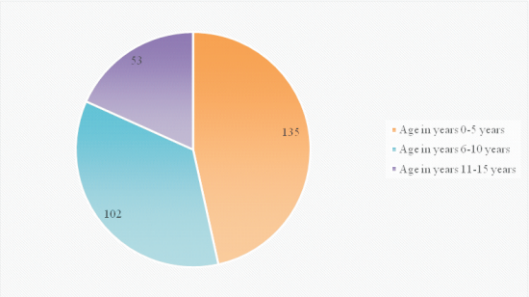

Figure 1: Graphical representation of the age distribution of the study population

Conclusion:

Children's overuse of screens and media raises concerns about its impact on psychological health. Creating a tech-free zone for kids is difficult in the digital age. This study emphasizes the importance of implementing age-specific guidelines to address behavioral changes associated with screen time, especially after increased usage during the pandemic.Paying attention to the amount and content of digital screen exposure is crucial for the healthy development of children and youth. Adopting evidence-based practices and responsible screen time management can improve dental experiences and oral health for children in Kerala and beyond.

Clinical significance: Managing screen time is also very much essential in pediatric dental care as it affects children's cooperation and attention during treatments. Strategies to mitigate negative effects can lead to improved outcomes and reduced anxiety. Parental perceptions can evolve with more information and experience, making awareness and education vital in their decision-making.

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