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TO EVALUATE EXPOSURE AND EARLY CHILDHOOD DEVELOPMENT: ANALYZING SCREEN TIME, SOCIO-DEMOGRAPHIC INFLUENCES, AND MEDIA DEVICE IMPACT

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ABSTRACT

The rise of digital media has profoundly influenced childhood development, especially during critical phases of growth. The American Academy of Pediatrics and World Health Organization advocate limiting screen time for children aged 2–5 years to less than one hour daily, emphasizing high-quality content and parental supervision. The COVID-19 pandemic accelerated screen usage in India, amplifying risks such as speech delays, cognitive and motor skill deficits, and emotional challenges. This study examines developmental outcomes linked to screen time among 0 to 6 years children in Pune, India, analyzing socio-demographic and parental factors affecting screen use. Data from 80 participants were collected through parental interviews, assessing media device availability, screen time, and developmental performance using the Communication DEALL Developmental Checklists (CDDC). Results revealed that children from rural areas (65.7%) and those with educated parents (particularly graduates) exhibited higher screen use. Devices like smart phones (63.9%) and laptops/computers (79.2%) were strongly linked to excessive screen time. Developmental analysis identified receptive language and social skills as significant predictors of screen time. Multivariate findings indicated social skills as an independent predictor, while activities of daily living approached significance. The study highlights the urgent need for targeted strategies to manage screen time effectively, particularly for children with limited social skills or those in environments with high media exposure. These insights offer a basis for policy recommendations, emphasizing parental guidance and education to mitigate the long-term impacts of excessive screen use.

Keywords: Media Device Type, Socio-Demographic Factors, Socio-Economic Status, Developmental Outcomes and Screen Time

1. INTRODUCTION

Digital media and screens have become ubiquitous in modern life, shaping the experiences of today's children who are growing up as digital natives. The American Academy of Pediatrics (AAP) and the World Health Organization (WHO) recommend limiting screen use to less than one hour per day for children aged 2 to 5 years, emphasizing high-quality content, supervised viewing, and co-viewing. (APA, 2016 & WHO, 2020) For children under 18 months, screen use should be avoided except for video chatting. Screen time encompasses digital media use across televisions, smartphones, tablets, computers, and gaming consoles. (Mckinsey, 2020

India has emerged as one of the fastest-growing digital consumer markets globally, second only to China. The COVID-19 pandemic further accelerated this trend, significantly increasing screen use among children, especially those under five years, during a critical phase of brain development. (parent survey, 2020) Excessive screen exposure at this age has been linked to speech delays, (Zimmerman, 2005) reduced brain white matter integrity (as revealed by functional

cerebral MRI studies), (Hutton, 2020) and adverse impacts on cognitive, motor, and language skills. Prolonged touchscreen device use has also been associated with emotional issues, anxiety, attention deficits, and behavioral challenges. (Lin, 2015 & Felix, 2020)

Parents play a crucial role in shaping screen use through practices like co-viewing, time and content restrictions, and active mediation. (O'Connor, 2013 & Gentile, 2014) While these strategies promote healthy habits, the pandemic's demands on digital platforms for education and social interaction amplified children's screen reliance, reducing physical activity and increasing social isolation.

Excessive screen time is associated with risks such as obesity, poor sleep quality, mental health issues, and reduced academic performance. Limited studies in India have explored these impacts on preschoolers. This study investigates developmental outcomes related to screen time in children aged 2–5 years, examining parental mediation and socio-demographic influences to develop evidence-based strategies fostering healthy development.

1. STUDY DESIGN AND PARTICIPANTS:

This research targeted 80 children aged 0–6 years residing in Pune city and its subdivisions, including Haveli, Baramati, Daund, Maval, Indapur, and Mulshi. Participants were selected using purposive sampling to ensure representation across the age range. Informed consent was obtained from parents or caretakers before data collection, and ethical clearance was secured prior to initiating the study.

Data Collection Procedures:

Data collection involved three components:

Socio-Demographic Data Collection:

Demographic details, including age, gender, community type (urban/rural), and parental education, were gathered from parents or caretakers.

Screen Time Measurement:

A custom-developed tool was used to capture screen time (e.g., television, smartphones, tablets) in minutes, as no standardized tool existed for this age group.

Developmental Performance Evaluation:

The 'Communication DEALL Developmental Checklists' (CDDC) assessed development across eight domains: gross motor, fine motor, activities of daily living, receptive language, expressive language, cognitive skills, social skills, and emotional skills.

Parents participated in interviews to provide socio-demographic and screen time data. Developmental performance was evaluated through observations and the CDDC, facilitated by parental input. Data were collected in a single session for consistency and recorded using an objective data collection form for manual entry into statistical software.

Statistical Analysis:

Socio-demographic variables, media device usage, screen time, and developmental performance were analyzed using chi-square tests and logistic regression. Associations between screen time and developmental domains were examined. Odds ratios, chi-square values, and P-values were calculated, highlighting the intricate relationship between screen use, socio-demographics, and child development.

RESULT

The results in Table 1 compare socio-demographic factors with screen time categories. Both boys (61.0%) and girls (64.0%) predominantly fall into the High Screen category. Rural children (65.7%) were more likely to have high screen time compared to urban children (59.4%). A higher proportion of Senior KG students (55.9%) were in the recommended screen time group. Fathers and mothers with graduate- level education had higher proportions in the High Screen group (68.3% and 63.7%, respectively). Fathers with lower education (less than 8th grade) were more prevalent in the recommended group (66.7%). Professionals (67.9%) and semi-professionals (66.3%) were more represented in the High Screen group. Children from households with both parents working were more likely to have high screen time (67.9%). Nuclear families had a greater proportion of children in the High Screen group (72.9%),

whereas joint families had a more balanced distribution (56.6% High Screen, 43.4% Recommended). None of the socio-demographic variables show statistically significant associations with screening times, as all P values are >0.05.

Table No. 1: Association of Socio-demographic and Screening Time among children.

Socio-Demographic		Screening Time		Total	Chi Square (P value
		High Screen	Recommended		
Gender	Boys	61.0%	39.0%	100.0%	0.192 (0.661)
	Girls	64.0%	36.0%	100.0%	
Community Type	Rural	65.7%	34.3%	100.0%	0.833 (0.361)
	Urban	59.4%	40.6%	100.0%	
Class	None	61.4%	38.6%	100.0%	8.553 (0.128)
	Play Group	63.2%	36.8%	100.0%	
	Nursery	74.2%	25.8%	100.0%	
	Junior KG	71.9%	28.1%	100.0%	
	Senior KG	44.1%	55.9%	100.0%	
	1st Standard	100.0%	0.0%	100.0%	
Father Education	Less than 8th	33.3%	66.7%	100.0%	4.233 (0.237)
	8th – 12th	53.8%	46.2%	100.0%	
	Graduate	68.3%	31.7%	100.0%	
	PG & Above	61.4%	38.6%	100.0%	
Mother Education	Less than 8th	75.0%	25.0%	100.0%	0.734 (0.865)
	8th – 12th	58.6%	41.4%	100.0%	
	Graduate	63.7%	36.3%	100.0%	
	PG & Above	63.9%	36.1%	100.0%	
Occupation (Head of Family)	Unskilled Worker	83.3%	16.7%	100.0%	8.847 (0.065)
	Semi Skilled Worker	0.0%	100.0%	100.0%	
	Skilled Worker	46.7%	53.3%	100.0%	
	Semi Professional	66.3%	33.7%	100.0%	
	Professional	67.9%	32.1%	100.0%	
Working Parents	Father	61.3%	38.7%	100.0%	1.837 (0.399)
	Mother	40.0%	60.0%	100.0%	
	Both	67.9%	32.1%	100.0%	
Family Type	Nuclear	72.9%	27.1%	100.0%	6.784 (0.079)
	Joint	56.6%	43.4%	100.0%	
	Extended	33.3%	66.7%	100.0%	
	Separated	80.0%	20.0%	100.0%	

The table no. 2 relationship between media device availability and children's screen time . 62.2% of children in households with a television fall into the High Screen category, while 37.8% are in the recommended category. 74.5% of children in households with a smart TV fall into the High Screen category, compared to 25.5% in the recommended category. 63.9% of children in households with smart phones fall into the High Screen category, while 36.1% are in the recommended category. 77.8% of children in households with tablets fall into the High Screen category, compared to 22.2% in the recommended category. 79.2% of children in households with laptops or computers fall into the High

Screen category, while 20.8% are in the recommended category. The association is not statistically significant (Chi-square = 0.014, 3.755, & 1.970 P = 0.907, 0.053, & 0.160) with Television, smart Television & Tables respectively. The association is statistically significant (Chi-square = 5.544 & 7.485, P= 0.019 & 0.006) with Smart phone & Laptop or Computer.

Table No. 2: Association of Media devices available at home and screening time among children.

Media Devices	Screening Time		Total	Chi Square (P value
	High Screen	Recommended		
Television	62.2%	37.8%	100.0%	0.014 (0.907)
Smart Television	74.5%	25.5%	100.0%	3.755 (0.053)
Smart Phone	63.9%	36.1%	100.0%	5.544 (0.019)
Tablet	77.8%	22.2%	100.0%	1.970 (0.160)
Laptop / Computer	79.2%	20.8%	100.0%	7.485 (0.006)

Table No. 3: Association of Media devices used by Children and screening time.

Media Device Used by Child	Screening Time		Total	Chi Square (P value
	High Screen	Recommended		
Television	71.0%	29.0%	100.0%	7.140 (0.008)
Smart Television	80.0%	20.0%	100.0%	6.533 (0.011)
Smart Phone	68.4%	31.6%	100.0%	11.003 (0.001)
Tablet	100.0%	0.00%	100.0%	3.711 (0.054)
Laptop / Computer	100.0%	0.00%	100.0%	1.827 (0.176)

Table 3 highlights the association between media device usage and screen time in children. Television users show a significant association with High Screen time (71.0%, Chi-square = 7.140, P = 0.008). Similarly, 80.0% of smart TV users and 68.4% of Smartphone users fall into the High Screen category, both statistically significant (P = 0.011 and P = 0.001, respectively). Tablet and laptop/computer users exhibit 100.0% High Screen time, with borderline significance for tablets (P = 0.054) but non-significant results for laptops/computers (P = 0.176). These findings emphasize the influence of device type on children's screen behaviors.

Table No. 4: Relationship between screening time and developmental performance among children.

Predictors	Binary				Multivariate			
	B	S.E.	P value	Odds Ratio	B	S.E.	P value	Odds Ratio
Gross Motor	1.614	0.468	0.001	5.023	0.686	0.710	0.334	1.985
Fine Motor	1.745	0.372	0.001	5.726	0.784	0.636	0.218	2.190
Activities of Daily Living	1.869	0.355	0.001	6.479	1.313	0.700	0.061	3.717
Receptive Language	2.623	0.496	0.001	13.778	0.741	0.786	0.346	2.099

Expressive Language	1.835	0.363	0.001	6.263	-1.619	1.326	0.222	0.198
Cognitive Skill	1.905	0.372	0.001	6.721	0.999	0.625	0.110	2.716
Social Skill	2.336	0.376	0.001	10.343	1.226	0.604	0.042	3.408
Emotional Skill	1.927	0.343	0.001	6.870	0.862	0.584	0.140	2.369
Overall	2.090	0.350	0.001	8.08	0.711	0.760	0.349	2.036

Table 4 presents the analysis of predictors for High Screen time in children, using binary and multivariate logistic regression. Binary analysis highlights strong unadjusted associations, with Receptive Language showing the highest odds ratio (OR = 13.778, P = 0.001), indicating children with reduced receptive language skills are 13.8 times more likely to have High Screen time. Social Skills (OR = 10.343, P = 0.001) also emerged as a key predictor. Other significant predictors include Gross Motor (OR = 5.023), Fine Motor (OR = 5.726), Activities of Daily Living (OR = 6.479), Expressive Language (OR = 6.263), Cognitive Skills (OR = 6.721), and Emotional Skills (OR = 6.870).

Multivariate analysis, which accounts for interrelationships among predictors, found Social Skills to be an independent predictor (P = 0.042, OR = 3.408). Activities of Daily Living approached significance (P = 0.061, OR = 3.717), while other domains; including Receptive and Expressive Language, showed non- significant adjusted associations (P > 0.05). This suggests overlapping effects or diminished independent contributions in the adjusted model.

DISCUSSION

The findings from this study provide an in-depth analysis of socio-demographic influences, media device availability, usage patterns, and developmental predictors of children's screen time. These insights emphasize the multifaceted nature of screen time behaviors and underscore the need for targeted interventions to mitigate associated risks.

The study found no statistically significant gender differences in screen time, with comparable proportions of boys (61.0%) and girls (64.0%) in the High Screen category. Rural children (65.7%) exhibited slightly higher screen time compared to urban children (59.4%), but this trend was not statistically significant. These findings suggest that screen behaviors may transcend traditional demographic boundaries like gender and location.

Parental education emerged as an important factor. Fathers with lower educational attainment (≤8th grade) were predominantly associated with the recommended screen time group (66.7%), in contrast to graduates, where 68.3% of their children were in the High Screen category. This inverse trend may reflect variations in media accessibility or awareness of screen time guidelines. Similarly, nuclear families showed a higher proportion of children (72.9%) in the High Screen category compared to joint families, though this association lacked statistical significance.

Prior studies, such as those by Jago et al. (2012) and Kwon et al. (2024), have highlighted similar trend noting the influence of parental education and family structure on children's media consumption. Kwon et al., for example, reported a significant increase in screen time during the COVID-19 pandemic, which subsequently returned to pre-pandemic levels in 2021, suggesting the dynamic nature of screen habits.

The availability of media devices played a significant role in shaping screen time behaviors. High Screen time was more prevalent in households with portable devices, such as smart phones (63.9%, P = 0.019) and laptops/computers (79.2%, P = 0.006). Conversely, stationary devices like televisions (62.2%) and smart TVs (74.5%) showed no significant associations. These findings highlight the greater impact of personal, portable devices on children's screen time compared to shared devices.

Previous research corroborates these findings. For instance, Mutlu et al. (2024) found that households with mobile devices reported significantly higher screen time compared to those relying solely on traditional media like televisions. Similarly, Kabali et al. (2015) observed that early exposure to personal devices, often starting before age one, was associated with prolonged screen use.

Device-specific engagement emerged as a critical determinant of screen behaviors. Statistically significant associations were observed between High Screen time and usage of smartphones and laptops/computers. Interestingly, all children using tablets or laptops/computers fell into the High Screen category, though statistical significance was not achieved

for laptops/computers (P = 0.176). These findings align with studies by Kabali et al. (2015) and Jago et al. (2012), which highlighted the early and widespread adoption of personal devices among children.

Beyond screen duration, the type and context of usage significantly influenced developmental outcomes. For example, Martinot and Bernard (2021) found that screen exposure during family meals negatively impacted language development, while Rai et al. (2023) emphasized the benefits of interactive screen activities, such as parent-child storybook reading.

The study identified strong associations between developmental delays and High Screen time. Decreases in gross motor, fine motor, and receptive language skills were significant predictors, with receptive language showing the strongest unadjusted association (odds ratio: 13.78). Social skills also emerged as a critical factor, maintaining significance even after adjustment (odds ratio: 3.41, P = 0.042). These results underscore the bidirectional relationship between developmental challenges and excessive screen exposure.

Previous research supports these findings. Yamamoto and Mezawa (2023) and McArthur et al. (2022) reported negative impacts of excessive screen time on language acquisition and problem-solving skills. Conversely, studies like ASL and E (2019) suggested potential benefits of interactive gadget usage for language development, though such findings remain contentious and context-dependent.

Conclusion

This study highlights the significant impact of socio-demographic factors, media device availability, and usage patterns on screen time among children in Pune, India.

Media device availability, particularly portable devices like smart phones and laptops, emerged as key predictors of increased screen time. Importantly, developmental domains such as receptive language and social skills were strongly associated with screen behaviors, underscoring the potential developmental risks of excessive screen time.

The findings emphasize the necessity of targeted interventions to promote balanced screen time, focusing on parental education and active mediation to mitigate risks. The integration of culturally tailored guidelines for screen use, along with strategies to enhance awareness among parents, could foster healthier developmental outcomes in young children. Further research with larger sample sizes and longitudinal designs is essential to deepen understanding and inform policy recommendations for managing screen exposure in early childhood.

CONFLICT OF INTEREST

None

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