

Original Research Article

Screens — a technological advancement: a study on screen time in the pediatric population of the Himalayan state, Uttarakhand

Vyas Kumar Rathaur^{1*}, Ayesha Imran², Tanvi Singh², Monika Pathania³

¹Department of Pediatrics, All India Institute of Medical Sciences, Rishikesh, Dehradun, Uttarakhand, India

²Department of Pediatrics, Government Doon Medical College, Dehradun, Uttarakhand, India

³Department of Medicine, All India Institute of Medical Sciences, Rishikesh, Dehradun, Uttarakhand, India

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*Correspondence:

Dr. Vyas Kumar Rathaur,

E-mail: vyasrathaur@gmail.com

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ABSTRACT

Background: In the modern era, children's proclivity towards screen-based devices is steadily increasing. Excessive screen exposure has raised concerns regarding its impact on physical, social, and behavioural health in the pediatric population.

Methods: A 9-month cross-sectional study (July 2019–March 2020) was conducted among 491 children aged 1–18 years attending routine hospital visits. Data were collected using a structured questionnaire, including demographic details, BMI, duration of screen time, age at first exposure, context of usage, reactions after screen removal, and associated physical, social, and behavioral changes. Counseling interventions were provided to children exhibiting comorbidities or behavioral issues linked to excessive screen use, along with general awareness based on recommended screen time guidelines.

Results: The study included 128 toddlers, 122 pre-school children, 154 school-aged children, and 87 adolescents. Among them, 185 were underweight, 26 overweight, and 37 obese. The majority of children spent 30 minutes to 2 hours daily on television and mobile devices, with a statistically significant association with male gender. A positive correlation was observed between BMI and duration of television ($r=0.228$, $p=0.000$) and mobile exposure ($r=0.366$, $p=0.000$). Most children were first exposed to screens between 2–3 years of age. Common contexts of screen use included before sleeping and during meals, while adolescents predominantly used screens for recreation. Irritability was the most frequent reaction upon screen removal. Physical effects included loss of appetite and weight loss, while social changes involved altered sleep patterns and reduced attention span. Behavioural changes were most commonly anger, with loneliness being the least reported.

Conclusions: Implementation of family screen plans, limiting routine screen time, and promoting screen-free periods are essential strategies to support healthy growth and balanced development in children in the digital age.

Keywords: Screen time, Digital media, Attention deficit, Screen dependency disorder

INTRODUCTION

In the 21st century, babies to adolescent are digital consumers which resulted in change in our social environment and has led to saturation of our culture and daily lives by screen device. Recent decades have seen an

upsurge in diversity of available screens. With technological advancements, screen devices have become pervasive in daily life. Television (TV), mobile phones, smart phones, computer, movies, video games have assumed central roles in our children's daily lives and have dominated the lives of many children and adolescents and occupied the spaces where they spend

their leisure time. Recent years have also seen schools adopting to digital teaching in classrooms as well as homework portals thereby paving a way to digital replacement of textbooks. Although gadget and screen devices are not harmful thing. They are marvels of technology providing us with certain uses to make our lives easier. They help us learn, communicate and be educated as part of the new digital world. However, these devices need to be used wisely, balance is required while using such devices. Parents should play a role of screen mentor for their children.

Screen viewing manipulates child's brain and leads to addiction comparable to cocaine addiction. Too much screen time may be wreaking havoc on a child's brain during key years of development. Screen dependency disorder is a new lifestyle disease brought upon by technology. Moreover, it also leads to sedentary behavior in kids which can pave way to cardiovascular diseases when they grow up. It has been associated with higher risk of type 2 diabetes mellitus, cardiovascular diseases and premature mortality.¹

It leads to detrimental effects on children's well-being and causes emotional, mental and physical problems. In children, increases in the time spent on screen have been found to negatively affect cognitive development, social interaction and leads to attention deficits, behavioural problems and obesity.²⁻⁶

Day by day, children's brain is damaging more and more and if parents do not stop or restrict their screen time, these problems will worsen more. The screen device has demonstrated both positive and negative effects, on children's physical, social and behavioral development. Considering the increasing exposure of children to screen device and the adverse effects it inflicts on physical, social and mental wellbeing of children, this study was conducted with the aim of assessing the screen time, age and the reason for which it was introduced.

METHODS

Study design and setting

A hospital-based cross-sectional study was conducted among children attending the hospital for routine health services.

Study period

The study was carried out over a period of nine months, from July 2019 to March 2020.

Study population

The study population included apparently healthy children visiting the hospital for routine check-ups, vaccination, and post-infection follow-up.

Sampling method

A time-bound convenience sampling technique was employed, wherein all eligible participants who visited the hospital during the study period and fulfilled the inclusion criteria were consecutively enrolled.

Inclusion criteria

Children aged between 1 and 18 years were included in the study. Only those participants whose parents or guardians provided informed consent, along with assent from the child where applicable, were enrolled. The study also included apparently healthy children visiting the hospital for routine check-ups or vaccination, as well as those who had recovered from recent infections.

Exclusion criteria

Participants who did not provide informed consent and assent were excluded from the study. Children with any chronic disease were also excluded. In addition, individuals aged more than 18 years were not included.

Data collection

Data were collected using a pre-designed and structured questionnaire after obtaining informed consent from parents/guardians and assent from children wherever applicable. Information on sociodemographic characteristics, including age, gender, and educational status, was recorded. Anthropometric measurements such as weight and height were taken, and body mass index (BMI) was calculated as weight in kilograms divided by height in square meters (m²). BMI percentiles were assessed using Centers for Disease Control and Prevention (CDC) growth charts for boys and girls, and nutritional status was categorized as underweight (<5th percentile), normal weight (5th–85th percentile), overweight (85th–95th percentile), and obese (>95th percentile). Information regarding screen device use was also collected, including type of device (mobile phone, television, and computer), total daily screen time (based on parental recall of the previous day), age at first exposure to screen devices, and context of use (such as before sleeping, while eating, or for recreation). Additionally, parents were asked about the child's reaction after discontinuation of screen use (irritability, aggression, sadness, or apathy). The potential health effects associated with excessive screen use were assessed in terms of physical (changes in appetite, weight, vision problems, and headache), social (sleep disturbances and reduced attention span), and behavioral changes (anxiety, loneliness, mood swings, and anger).

Ethical approval

Ethical approval was taken from the institutional review board.

Statistical analysis

Data was collected, managed, edited, entered and analyzed by Statistical package of social sciences (IBM SPSS) software. A descriptive analysis of all patients in the study was performed. Male:female ratio was computed. Correlation was checked by Pearson’s correlation. Chi square test was used. The level of significance taken for all the statistical test was a p value of <0.05.

RESULTS

A total of 491 children aged 1-18 year were enrolled in the study over duration of 9 months from July2019 to March 2020. Male:female ratio was 1.8:1. Children were divided into following groups according to age: toddlers (1-3 year), pre-school children (3-6 year), school age children (6-12 year) and adolescent (12-18 year). It included 128 toddlers, 122 pre-school children, 154 school age children and 87 adolescents (Table 1). We analyzed these children as per the body mass index and found that amongst 491 children, 185 were underweight, 26 overweight, 37 obese and 243 had normal BMI (Table 2).

Table 1: Demography.

	Male		Female	
	N	%	N	%
Toddler	101	20.57	27	5.50
Preschool children	62	12.63	60	12.22
School age children	95	19.35	59	12.02
Adolescent	57	11.61	30	6.11

We assessed children’s screen time individually for each device and observed that majority of children (22.61% male and 13.03% female) view television for 30 min to 2 hours per day and Television viewing was statistically significant with male gender (p value=0.016). In case of mobile exposure, we found that 13.24% male and 10.18% female view mobile device for 30 min to 2 hours per day. Majority of children (25.66%) did not view mobile. Mobile viewing was also statistically significant with male gender (p value=0.019). Whereas maximum number of children do not view computer. Only 13 males and 8 females were exposed to computer.

Children who view TV for more than 2 hours constitutes 84 underweight, 19 overweight, 28 obese and 64 children with normal BMI. Positive correlation was found between BMI and time of TV exposure (r=0.228, p=0.000) Children who view mobile for more than 2 hours constitutes 27 underweight, 20 overweight, 27 obese and 18 children with normal BMI. Positive correlation was found between BMI and time of mobile exposure (r=0.366, p=0.000). Only 1 obese child view

computer for more than 2 hours. Positive correlation was found between BMI and time of computer exposure (r=0.172, p=0.000). Maximum children first used mobile and TV at age of 2-3 year (Table 3).

When we assessed the circumstances in which the children used screen device we found that, 72 toddler, 57 pre-school children, 77 school age children and 60 adolescents used screen device before sleeping which was statistically significant (P=0.008, chi square=11.70), 118 toddler, 92 pre-school children, 39 school age children and 20 adolescents use screen while eating which was statistically significant (P=0.000, chi square=182.71) and 10 toddler, 26 pre-school children, 111 school age children and 83 adolescents use screen while recreation which was statistically significant (P=0.000, chi square=232.02).

When we assessed the reaction of children in different age group after stopping the use of screen device, we found that in toddler age group 65 children were irritable, 62 were sad, 23 were aggressive. In pre-school age group, 78 were irritable, 62 were aggressive, 44 were sad. In school age group 97 were irritable, 77 were aggressive, 34 were sad. In adolescent group, 42 were irritable, 36 were aggressive, 18 were sad (Figure 1).

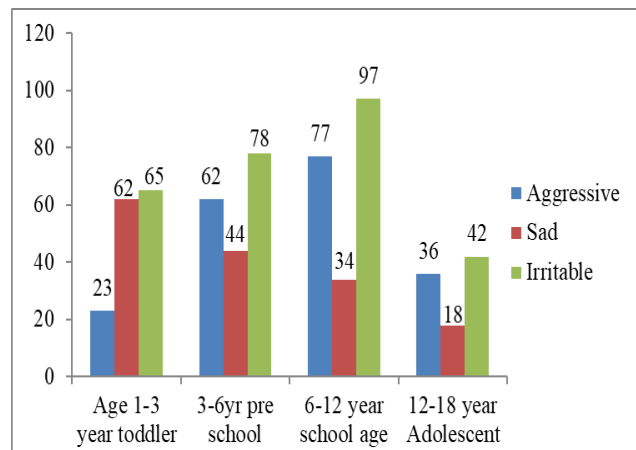


Figure 1: Reaction after stopping the use of screen device in different age group.

When we assessed the age group wise distribution of physical changes in morbidity pattern caused by over use of screen devices, we found that in toddler age group 74 children had loss of appetite, 54 had overeating, 11 had weight loss, 15 had weight gain, 16 had vision problem and 10 had headache.

In pre-school age group, 65 children had loss of appetite, 57 had overeating, 101 had weight loss, 21 had weight gain, 26 had vision problem and 29 had headache. In school age group 83 children had loss of appetite, 71 had overeating, 112 had weight loss, 42 had weight gain, 53 had vision problem and 43 had headache. In adolescent group, 54 children had loss of appetite, 33 had

overeating, 47 had weight loss, 40 had weight gain, 41 had vision problem and 32 had headache (Table 4). On investigating the social changes in morbidity pattern caused by over use of screen devices we found that in toddler age group 21 children had change in sleep pattern, 16 had change in attention span, in pre-school age group 36 had change in sleep pattern and 29 had change in attention span, in school age group, 39 had change in sleep pattern and 53 had change in attention span and in adolescent age group 19 had change in the sleep pattern

and 28 had change in attention span (Table 4). When we assessed the behavioral changes in morbidity pattern caused by over use of screen devices we found that in toddler age group 6 had anxiety, 4 had loneliness, 28 had mood swings, 52 had anger, in pre-school age group 27 had anxiety, 21 had loneliness, 24 had mood swings, 38 had anger, in school age group, 43 had anxiety, 21 had loneliness, 53 had mood swings, 62 had anger and in adolescent age group 34 had anxiety, 26 had loneliness, 29 had mood swings, 42 had anger (Table 4).

Table 2: Age group wise distribution of BMI.

	Toddler		Preschool children		School age children		Adolescent	
	N	%	N	%	N	%	N	%
Underweight	75	15.27	47	9.57	33	6.72	30	6.11
Normal	43	8.76	57	11.61	99	20.16	44	8.96
Overweight	6	1.22	2	0.41	9	1.83	9	1.83
Obese	4	0.81	16	3.26	13	2.65	4	0.81

Table 3: Age at first use of any device.

	Overall		<1 year		1-2 year		2-3 year		3-4 year		4-5 year	
	N	%	N	%	N	%	N	%	N	%	N	%
Tv	418	85.13	27	6.45	86	20.57	176	42.10	114	27.27	15	3.58
Mobile	317	64.56	22	6.94	75	23.65	123	38.80	88	27.76	9	2.83
Computer	22	4.48	4	18.18	6	27.27	6	27.27	6	27.27	0	0

Table 4: Morbidity pattern caused by over use of screen devices.

		Toddlers	Preschool children	School age children	Adolescent
Physical changes	Loss of appetite	74	65	83	54
	Overeating	54	57	71	33
	Weight loss	11	101	112	47
	Weight gain	15	21	42	40
	Vision problem	16	26	53	41
	Headache	10	29	43	32
Social changes	Change in sleep pattern	21	36	39	19
	Change in attention span	16	29	53	28
Behavioural changes	Anxiety	6	27	43	34
	Loneliness	4	21	21	26
	Mood swings	28	24	53	29
	Anger	52	38	62	42

DISCUSSION

One of the most notable changes in our environment in the 21st century is that today’s generation of children and adolescents is growing up immersed in digital media which has led to both positive and negative effects on healthy development and has saturated our social culture and daily lives by screen devices. Nowadays, it is not necessary for children to go out on streets to get exposed to bad neighborhood or bad friends because now parents themselves provide a virtual bad street to their children in their very homes. This study investigated screen viewing patterns and their correlates in different age group of children, considering multiple type of the screen devices,

including TV, computer and mobile screen devices. Based on a recent systematic review of the literature, this study is the first in Uttarakhand to investigate the widespread access and use of screen device by children of all age group and to study their correlates in such detail. In this study we enrolled 491 children, majority of them were of school going children of age group 6-12 year. On assessing the screen viewing time per day we found that maximum screen viewing time was 30 min to 2 hours per day for television. In case of mobile viewing, maximum children do not view mobile at all. This may be due to the population belonging to low socio-economic status where only father owns the mobile and as father has to go out for work, so children do not have much access to mobile.

Amongst children who view mobile, the maximum screen viewing time was 30 min to 2 hours per day. Both Television and mobile viewing were statistically significant with male gender. High screen time for male gender is disturbing and detrimental for health as it is inversely proportional to the outdoor play time. Maximum number of children do not view computer in our study. This may be also due to the financial constraints of the family. On the contrary Kabali et al found that on an average children spend 47 min on mobile device, 45 min a day watching television and 15 min per day playing games on video consoles.⁷ This difference of more use of mobile device may be due to the disparity in socio-economic status in both the studies.

Time with screens is an important risk factor for childhood obesity.⁸ We observed the similar result in our study. More the screen time, more is the chance of child to get obese. Television viewing is linked to increased BMI.⁹ Screen viewing leads to all energy 'in' and no energy 'out' and leads to weight gain after hours of watching screen device.¹⁰

For each hour of television viewing per day, children consume additional 167 calories which could result in obesity in future.¹¹ We assessed the correlation between screen time of various modes of screen with respect to body mass index. We found that amongst 26 overweight and 37 obese children, 19 and 28 children view television for more than 2 hours and there was a positive correlation between TV exposure time and weight ($r=0.228$, $p=0.000$). Similar observation we observed with mobile screen and increased weight. Amongst 26 overweight and 37 obese children, 20 and 27 children respectively view mobile for more than 2 hours and there was positive correlation amongst them ($r=0.366$, $p=0.000$). The reason of weight gain may be the habit of snacking while watching the screen device, secondly it may be due to the decreased physical activity while watching the screen and thirdly, it may be due to the exposure of children to different food advertisement which stimulate the appetite.

Overall, 418 children (85.13%) had used television, 317 children (64.56%) had used mobile device and 22 children (4.48%) had used computer. Amongst them the age group at which the children first used the screen device is 2-3 years. On the contrary, Kabali et al observed that age at which the children first used the mobile device was 1 year.⁷

We observed that most parents let their children use screen before sleeping (63.64%), while eating (64.35%) or for recreation (55.02%). When we compared the situations under which the child uses screen device in various age group, we found that in toddler and pre-school age group maximum number of children use it while eating (92.18% and 75.4% respectively) whereas school age and adolescent age group uses it for recreation (72.07% and 95.40% respectively). Kabali et al enrolled some different situations for the circumstances in which

the children used screen device and found that three of four parents gave children a mobile device when doing chores and to keep them calm; 1 of 4 to put children to sleep.⁷ This suggests that screen devices are used as "digital pacifiers" to distract children and parents use the screen device as a means to manage children's behavior whereas older aged children use screen for recreation.

According to psychologist, Aric Sigman children exhibit screen related addictive behavior and causes symptoms like attention deficit disorder, weight gain, poor eyesight, headaches, poor nutrition and in young children these side effects can be seen along with emotional symptoms like guilt, anxiety, loneliness. According to Claudette Avelino Tandoc, many children get irritable and agitated when disturbed from their activity on mobile and are prone to suffer mood swings.¹² Screen device mainly mobile phones emits blue light which puts break on melatonin causing sleep disturbances, headache and can even lead to visual defects.¹³⁻¹⁵ Increased screen time also causes backache and other musculoskeletal discomfort.¹⁵

When we assessed the reaction of children after stopping the use of screen device, we found that maximum children became irritable after stopping the screen device. In morbidity pattern, the most common physical change in different age group caused by over use of screen devices in toddler and in adolescent age group was loss of appetite whereas in pre-school age and school age group maximum had weight loss. When we assessed the social changes caused by over use of screen devices, we found that in toddler and pre-school age group maximum had change in sleep pattern whereas in school age and adolescent age group maximum had change in attention span.

When we assessed the behavioral changes caused by over use of screen devices, we found that in all age group the reaction which was most common was anger and least common was loneliness. Thakur et al noted that viewing television causes poor peer relationships and increases the risk for social.¹⁶

Isolation, anxiety disorder, agoraphobia and antisocial behavior including aggression. Children with 2 or more hours of daily screen time are more likely to have increased psychological difficulties, including hyperactivity, emotional and conduct problems, difficulties with peers and poor school performance.^{17,18} We also noted the similar findings in our study.

In this era of screen, screens are not only in every home, but in almost every pocket. Spending a lot of time in front of screen device in the early years of development can lead to increased screen time later in childhood, which can contribute to problems with peers and at school. Parents play a vital role on impact of children's screen viewing, co-viewing with adult can be helpful in making it an active process and facilitating learning from it.¹⁹ Playing is essential for the development of social,

cognitive, emotional, physical and moral aspects. Children retain more what they learn while playing and play provides children the opportunities for different types of development – physical, social, emotional, intellectual, language and skill development. So, parents need to be attentive and should engage their children in independent goal-oriented, high quality and more focused play.²⁰ Children have lots to lose from spending more time in front of screens, instead of playing and interacting with friends and loved ones. Even when the TV is simply on in the background, infants and toddlers lose out. The idea to avoid these losses is to balance media use with other healthy behaviors.

The American Academy of Pediatrics (2016) recommended that for children younger than 18 months, screen use should be avoided except for video chatting. For children aged 18 to 24 months, parents should select high-quality programming and view it together with their children to help them understand the content. For children aged 2 to 5 years, screen time should be limited to one hour per day of high-quality programs, with parents encouraged to co-view media. For children aged 6 years and older, consistent limits should be placed on screen time and the types of media consumed, ensuring that screen use does not replace adequate sleep, physical activity, and other essential health behaviors. Additionally, the guidelines recommend designating screen-free times and screen-free areas in the home, such as bedrooms. In April 2019, WHO released guidelines which proposed that children under 2 years should not be exposed to any screen time at all. Children aged 2 to 5 years should also be limited to no more than an hour of sedentary screen time each day.

So, parents should develop a family screen plan that takes into account the health, education and entertainment needs of each child as well as the whole family. Parents of young children should watch screen with their child, to help children understand what they are seeing. Parents need to be educated about the negative effects of screen. Pediatricians should encourage the development of screen literacy and should guide the parents how to make healthy screen environment for their children. Parents should be fully informed about the content of the screen which their child is using just in the way as parents know the ingredients in food which their child is taking. Indian guidelines should be formulated and implemented to help parents and children to develop healthy screen habits. We need to find ways to optimize the role of screen in our society, taking advantage of their positive attributes and minimizing the negative ones.

CONCLUSION

All screen and no outdoor play makes Jack an irritable, angry and a stout fellow. So, to promote child health and development in a digital era, we should counsel parents and children on the appropriate use of screen time. Develop a family screen plan for when, how and where

screens should be used. Limit routine or regular screen time to less than 1 hour per day. Maintain daily screen-free times, especially for playing, family meals and book-sharing. Parents should encourage more interactive activities such as playing and talking. Screen device has negative effects on children's healthy development, including weight status, aggressive feelings, sleep disturbances and social isolation. It also has potential for positive effects on child health so we should find ways to optimize the role of screen in our society. The limitation of this study was, only patients coming to outpatient department were interviewed. So, there is a need to replicate similar study with large sample size with multiple settings i.e. both hospital and population based.

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