ORIGINAL RESEARCH PAPER

Dental Science

IMPACT OF SCREEN TIME, GREEN TIME, EXPOSURE OF CARIOGENIC FOODS AND ITS ASSOCIATION WITH DENTAL CARIES IN CHILDREN UPTO 13 YEARS: A CROSS-SECTIONAL STUDY

KEY WORDS: Screen time, green time, diet and dental visit

Dr. Parita Gadhia Post Graduate Student, Department Of Pediatric And Preventive Dentistry, Darshan Dental College And Hospital, Udaipur, Rajasthan

Dr. Ruchi Arora Head Of Department, Department Of Pediatric And Preventive Dentistry, Darshan Dental College And Hospital, Udaipur, Rajasthan

Dr. Parul Rawat Professor, Department Of Pediatric And Preventive Dentistry, Darshan Dental College And Hospital, Udaipur, Rajasthan

ABSTRACT

Background: Screen time refers to prolonged viewing time of various screens like computers, televisions, videogames, smartphones, tablets, I-Pads etc. According to recent recommendations of American Academy of Pediatrics, children and adolescents should spend not more than 2 hours of sedentary screen time daily. The modernization of society has produced ill effects in oral and general health by increasing sedentary behaviour which refers to low levels of energy expenditure by sitting and lying, particularly in children and adolescents. This influences young children's physical, social, emotional and cognitive development. A high-sugar diet is an important risk factor for dental caries, which is considered as most prevalent chronic non-communicable disease in children and has second-highest incidence in the world. Hence, emphasis has been laid to introduce green time which refers to time spent by children in outdoor games and activities which can further decrease the incidence of dental caries by reducing the intake of cariogenic foods while using screen time. **Aim:** The aim of this survey was to evaluate the association between screen time and green time and its effects of cariogenic foods in children upto 13 years. **Methodology/study design:** Online questionnaire survey of 40 questions regarding screen time exposure, outdoor activities and number of visits to dentist were recorded through google form. Statistical analysis was done using SPSS (21.0 version). Shapiro Wilk test was used to check variables following normal distribution. Level of statistical significance was set at p-value < 0.05 **Result:** 67.2% of children used screen time of 2 hours, consumed chips/packaged foods. 43.5% children spends 1 – 2 hours in outdoor activity and 38.4% insisted to buy sweetened products by viewing advertisements. **Conclusion:** Increase in screen time leads to increase in consumption of cariogenic foods leading to dental caries and frequent dental visits.

INTRODUCTION:

Dental caries is the most common non-communicable disease and considered as international public health challenge, especially in children. The prevalence of caries in primary and permanent teeth in children was estimated to be 46.2% and 53.8%, respectively. Consequences of the disease includes poor food intake, deficient school performance and presence of mental health disorders, which can affect the quality of life of children and their families.[7]

Screen time refers to the time spent using screen media such as televisions (TVs), smartphones, computers, tablets etc. In recent years, children have tended to spend more time in front of screens for entertainment and learning purposes. Children are being introduced to screen media at increasingly younger ages and are easily exposed to screen media because of the advances in information and communication technology followed by expansion of the internet.[1]

Numerous studies have demonstrated the harmful effects of screens on the cognitive development of children and their academic success. An association between time spent in front of mobile screens and behavioural difficulties (attention disorders, hyperactivity) has been shown in preschool children which favours sedentary behaviour, obesity and impacts sleep quality, language development and vision.[2]

According to the AAP and World Health Organization (WHO) guidelines (2023), children under two years should have no screen exposure aside from video calls with family members. However, children aged 1.5 to 2 years engage in viewing high-quality educational content together for less than one hour per day when accompanied by an adult. For children aged 2 to 4 years, screen time should be kept under one hour daily. For those aged 5 and older, screen time should not exceed 2 hours per day.[17,21]

Till date limited literature is available regarding screen time, green time and its association with frequency of dental visits. Hence this study is aimed to evaluate the association between screen time, green time and its effects of cariogenic foods in children upto 13 years.

MATERIALS AND METHODS:

Online questionnaire survey of questions regarding screen time exposure, outdoor activities and number of visits to dentist was recorded through google form.

21 closed-ended and 19 multiple choice questions based on screen time exposure, outdoor and indoor activities, number of visits to dentist were provided to the parents of children of age 1 to 13 years.

Responses among parents of 333 children were received residing in Udaipur city, Rajasthan Out of them 323 responses were accepted

Inclusion Criteria

Parents of children of age 1 to 13 years residing in Udaipur city of Rajasthan state were included in the study.

Exclusion Criteria

1. Parents of children above 13 years were not part of the study.
2. Parents who were reluctant to participate
3. Incomplete questionnaires were excluded from the study

The Questionnaire Consisted Of Three Parts

Part I : Demographic details, such as, age, gender, education level, working status of mother, number of electronic screens in family, type of family and previous dental visit were recorded

Part II: Questions related to frequency of meal consumption, duration, type, influence of TV advertisements and difficulties in chewing food were designed and evaluated

Part III : Attitude of Parents toward increase of screen time

and willingness to decrease was assessed.

Statistical Analysis:

Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables and Graphs. The data was analysed by SPSS (21.0 version). Shapiro Wilk test was used to check which all variables were following normal distribution. For comparison of categorical data chi square test was used. Level of statistical significance was set at p-value less than 0.05.

RESULTS:

Table 1 and 2 describes the background of participants and description of questionnaire items respectively. Table 3 and graph 1 shows the association between type of cariogenic food and screen time while graph 2 demonstrates association between type of cariogenic food and dental visit.

Table 1: Background Details Of Study Subjects

		N =333	%
AGE GROUPS	1 to 3 yrs	48	14.4
	11 to 13 yrs	69	20.7
	4 to 6 yrs	154	46.2
	7 to 10 yrs	62	18.6
GENDER	Female	175	52.6
	Male	158	47.4
RESIDENCE	Rural area	65	19.5
	Urban area	268	80.5
EDUCATION	Basic school	94	28.2
	Graduate	105	31.5
	High school	40	12.0
	Post graduate	94	28.2
TYPE OF FAMILY	Joint	155	46.5
	Nuclear	178	53.5

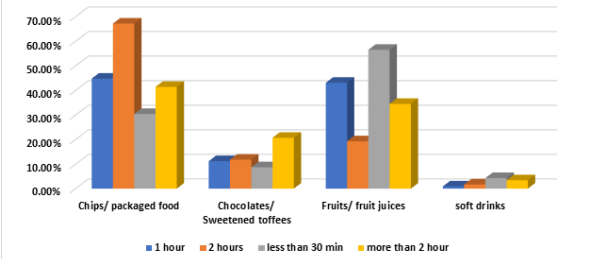
Table 2: Description Of Questionnaire Items

Question and Answer	N	%
Are you working woman? / Is the mother of child working? (YES)	130	39%
Number of electronic screen devices in the family. (MORE THAN 1)	147	44.1
Parents screen time (MORE THAN 2 HRS)	76	22.8
Which type of activity your child often does? (OUTDOOR))	205	61.6
Is any device like tablet included in your child's education system? (YES)	61	18.3
Select the activity, your child often does. (WATCHING TV)	136	40.8
Choose the time your child spent in watching TV in a day. (MORE THAN 2 HRS)	116	34.8
At what time of day, mostly your child watches TV? (NIGHTTIME)	148	44.4
Do your child avoid playing games just to see television? (YES)	72	21.6
Choose the gadget your child uses more (MOBILES)	230	69.1
Does your child have habit of eating while watching TV? (YES)	193	58
Where does your child take the meal? (IN FRONT OF TV)	178	53.5
Select the mealtime your child mostly utilizes by watching TV/ Electronic Gadget. (DINNER)	156	46.8
Choose the duration of meal chewing while watching TV (30 MIN)	147	44.1
Which type of food your child eats while watching TV? (CHIPS/PACKED FOOD)	164	49.2
Choose the feeding difficulties faced by your child during watching TV or any (HOLDING FOOD IN MOUTH)	118	35.4
Select the type of products your child insists to buy after watching advertisement in TV.(CHOCOLATES/SWEETENED ITEMS)	128	38.4
Does your child ask to buy food/products that he/she sees on TV? (YES)	131	39.2
Choose the time spent by your child for outdoor activity in a day. (1-2 HR)	145	43.5
Has your child visited dentist?-(YES)	104	31.2
Do you want to decrease the screen time and increase the green time (time spent in other activities) of your child?- (YES)	229	68.8

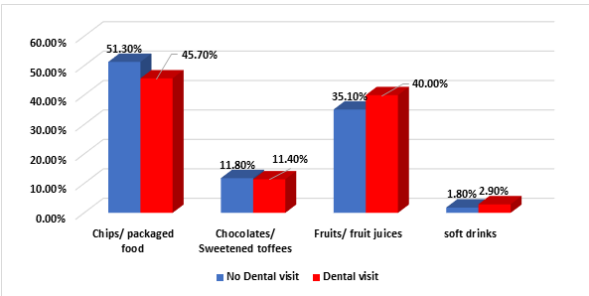
*Significant association was seen between type of cariogenic food and screen time.

Table 3 Association between type of cariogenic food and screen time

			Type of food				Total
			Chips/ packaged food	Chocolates/ Sweetened toffees	Fruits/ fruit juices	soft drinks	
Screen time	1 hour	N	52	13	50	1	116
		%	44.8%	11.2%	43.1%	0.9%	100.0%
	2 hours	N	80	14	23	2	119
		%	67.2%	11.8%	19.3%	1.7%	100.0%
	Less than 30 minutes	N	21	6	39	3	69
		%	30.4%	8.7%	56.5%	4.3%	100.0%
	More than 2 hours	N	12	6	10	1	29
		%	41.4%	20.7%	34.5%	3.4%	100.0%
Total		N	165	39	122	7	333
		%	49.5%	11.7%	36.6%	2.1%	100.0%
P value							0.001*



Graph 1: Association between type of cariogenic food and screen time



Graph 2: Association between type of cariogenic food and dental visit

DISCUSSION:

This study was conducted to evaluate association between screen time, green time and its effects of cariogenic food in children upto 13 years and showed that majority of children spends screen time of above 2 hours consumed packaged foods and had more frequent dental visits.

Age/Sex Of Patient And Screen Time

In our study, parents of 42.6% children of age 4 to 6 years (47.1% boys and 52.9% girls) with average screen time of more than 2 hrs participated. This trend was also seen in the

study conducted by Akbayin M et al (2023). According to them, 45% boys and 55% girls aged 4 to 6 years participated and for children over 2 years of age, the average screen time was 103 minutes on weekends and highlighted that children of parents with Bachelor's degree or above education level were less exposed to screens. [2] Tripathi, M., & Mishra, S. K (2020) include 40 studies in their systemic review out of which twenty-six studies (65%) demonstrated that children and adolescents spent more than 2 h onscreens per day during typical weekdays and weekends, whereas 16 of the studies (40%) reported that participants viewed screen-based devices for less than 2 h per day.[19]

Residential Area And Screen Media Exposure

In our study, 81.9% children residing in urban area are exposed to electronic gadgets such as mobiles, laptops, I pads etc than rural area which was similarly seen in study conducted by Huo, J et al (2022) and stated that 93.9% children residing in urban area utilizes more screen time consumed vegetables and fruits less frequently, while having a higher consumption of snacks and sweetened beverages.[3] Similarly in population based study by Varadarajan, S et al (2021) 77.2% children in urban field practice area of South India, showed excessive screen time.[18]

Screen Time Exposure During Meal Time

In our study, out of 323 children 58.2% children were exposed to screen media during meals and 34.9% for two hours or more daily during dinner time with 30 minutes of mean chewing time and 35% children tends to hold food in the mouth while watching TV. Also this was seen in study by Li, P et al (2022) among chinese children whose screen time reached 1h/d were more likely to eat snack foods more frequently.[13] In the study by Naik et al (2024), 37.2% incidents of unknowingly snacking while viewing screens, especially among children aged 10- 12 years were noted.[16]

Influence of TV advertisements and purchase of sweetened products

In our study, 35.1 % children insisted chocolates/sweetened items to buy after watching TV advertisements. According to study by Doitchinova L (2021), this could be due to attractive advertising with color and music with most commonly purchased advertised foods such as sweet treats - chocolate, candies, cookies, cakes, soft drinks and fruit juices, which have a high cariogenic potential.[4] Similarly, in a study by Naik et al (2024), 32.6% of parents acknowledged that children often craved sugary or salty foods after viewing advertisements.[16]

Parents And Screen Time

Our study showed that 22.8% parents had screen time of more than 2 hours which encourages the children in the family for more screen time. According to Matsuyama Y et al (2020), parental screen time upto 2 hours along with lack of supervision causes increase in screen time among children of age 6 to 7 years and associated poor oral health.[5] Interestingly, the study by Moitra, P., & Madan, J. (2022) stated that the role of parents in limiting the sedentary screen time by setting ground rules for screen media usage and encouraging children and adolescents to participate in fun indoor activities such as dancing, rope skipping, playing with hoops and online fitness classes is of key importance.[11]

Outdoor Activity And Screen Time

In our study, 21.6% children avoid to play outdoor games in order to watch TV and 43.5% children spends 1-2 hrs in outdoor activities. Sugiyama, M (2023) stated that higher screen time at age 2 years (more than 2 hrs)was significantly associated with infrequent outdoor play children neurodevelopmental outcomes such as communication (receptive, expressive, and written language skills), daily living skills (skills entailing personal, domestic, and community life),and socialization(interpersonal relationships, play, and coping skills).[6] The review article by Panjeti-Madan et al (2023) also stated that the negative influence of excessive screen time in children includes technology addiction, stress level increase, reduced physical activities, lack of sleep, emotional distress, relationship issues, and behavioral problems. Hence, emphasis should be made by parents to decrease screen time and increase green time (Outdoor activity time).[20]

Association Between Frequency And Reason For Dental Visit

In our study out of 323 children, 104 children had visited dental clinic due to pain in their teeth, had chips/packaged items while watching TV for 2 hours. According to Engberg, E (2021), this could be due higher abundances of Veillonella, Prevotella and Streptococcus, all belonging to the core bacteria present in the saliva contributing to increase in dental caries and thereby increasing dental visits.[9]

Limitation:

Further study comprising of change in posture, presence of parafunctional habits such as nail biting, chewing on non-food items such as pen, pencil, straw etc while using any electronic screen gadgets need to be evaluated.

CONCLUSION:

The basal findings of this study concludes that

- Increase in screen time leads to increase in consumption of cariogenic foods leading to dental caries and frequent dental visits.
- Positive influence of TV advertisements is seen in children
- Children tend to eat more of chips/packaged foods and have habit of holding food while watching TV.
- Other than TV, mobile/smart phones are used widely by children

Our findings emphasize a need for encouragement to spend more time in outdoor activities in green environment and steps should be taken by schools and parents to reduce screen time.

REFERENCES:

1. Han, Y. H., Shin, S., Woo, E. Y., Park, H. K., & Hyun, T. (2023). Screen time, mealtime media use, and dietary behaviors in Korean preschoolers: a cross-sectional study. 28(3), 206-219.
2. Akbayin, M., Mulliez, A., Fortin, F., Vicard Olagne, M., Laporte, C., & Vorilhon, P. (2023). Screen exposure time of children under 6 years old: a French cross-sectional survey in general practices in the Auvergne-Rhône-Alpes region. BMC Primary Care, 24(1), 58.
3. Huo, J., Kuang, X., Xi, Y., Xiang, C., Yong, C., Liang, J., ... & Lin, Q. (2022). Screen time and its association with vegetables, fruits, snacks and sugary sweetened beverages intake among Chinese preschool children in Changsha, hunan province: a cross-sectional study. Nutrients, 14(19), 4086.
4. Doitchinova, L., Kirov, D., Bakardjiev, P., Nikolova, M., & Hristov, D. (2021). Television advertising and development of dental caries in children aged 6 to 12 years. Folia Medica, 63(4), 533-540.
5. Matsuyama, Y., Isumi, A., Doi, S., & Fujiwara, T. (2020). Poor parenting behaviours and dental caries experience in 6 To 7 year old children. Community Dentistry and Oral Epidemiology, 48(6), 493-500.
6. Sugiyama, M., Tsuchiya, K. J., Okubo, Y., Rahman, M. S., Uchiyama, S., Harada, T., ... & Nishimura, T. (2023). Outdoor play as a mitigating factor in the association between screen time for young children and neurodevelopmental outcomes. JAMA pediatrics, 177(3), 303-310.
7. Shqair, A. Q., Fernandez, M. D. S., Costa, F. D. S., Jansen, K., Motta, J. V. D. S., SILVA, R. A. D., ... & Goettems, M. L. (2023). Mediating effect of eating pattern on the relationship between television exposure and caries in children. Brazilian Oral Research, 37, e075.
8. McArthur, B. A., Volkova, V., Tomopoulos, S., & Madigan, S. (2022). Global prevalence of meeting screen time guidelines among children 5 years and younger: a systematic review and meta-analysis. JAMA pediatrics, 176(4), 373-383.
9. Engberg, E., Raju, S. C., Figueiredo, R. A., Weiderpass, E., Rounge, T. B., & Viljakainen, H. (2021). Saliva microbiota differs between children with low and high sedentary screen times. Human Microbiome Journal, 20, 100080.
10. Priftis, N., & Panagiotakos, D. (2023). Screen time and its health consequences in children and adolescents. Children, 10(10), 1665.
11. Moitra, P., & Madan, J. (2022). Impact of screen time during COVID-19 on eating habits, physical activity, sleep, and depression symptoms: A cross-sectional study in Indian adolescents. PloS one, 17(3), e0264951.
12. Bomfim, R. A., Frias, A. C., Cascaes, A. M., Mazzilli, L. E. N., Souza, L. B. D., Carrer, F. C. D. A., & Araújo, M. E. D. (2021). Sedentary behavior, unhealthy food consumption and dental caries in 12-year-old schoolchildren: a population-based study. Brazilian Oral Research, 35, e041.
13. Li, P., Ren, Z., Zhang, J., Lan, H., Szeto, I. M. Y., Wang, P., ... & Zhang, Y. (2022). Consumption of added sugar among Chinese toddlers and its association

with picky eating and daily screen time. Nutrients, 14(9), 1840.
14. Silva, R. D. N. M. T., Duarte, D. A., & de Oliveira, A. M. G. (2020). The influence of television on the food habits of schoolchildren and its association with dental caries. Clinical and Experimental Dental Research, 6(1), 24-32.
15. Shqair, A. Q., Pauli, L. A., Costa, V. P. P., Cenci, M., & Goettems, M. L. (2019). Screen time, dietary patterns and intake of potentially cariogenic food in children: A systematic review. Journal of dentistry, 86, 17-26.
16. Naik, S. S. (2024). Influence of Screen Time on Oral Health. International Journal, 7(4), 463.
17. Mustulo lu, ., Tezol, Ö., & Yalcın, S. S. (2024). Problematic screen exposure and oral health in preschool children: a comparison study. BMC Oral Health, 24(1), 1200.
18. Varadarajan, S., Govindarajan Venguidesvarane, A., Ramaswamy, K. N., Rajamohan, M., Krupa, M., & Winfred Christadoss, S. B. (2021). Prevalence of excessive screen time and its association with developmental delay in children aged< 5 years: A population-based cross-sectional study in India. Plos one, 16(7), e0254102.
19. Tripathi, M., & Mishra, S. K. (2020). Screen time and adiposity among children and adolescents: a systematic review. Journal of Public Health, 28, 227-244.
20. Panjeti-Madan, V. N., & Ranganathan, P. (2023). Impact of screen time on children's development: cognitive, language, physical, and social and emotional domains. Multimodal Technologies and Interaction, 7(5), 52.
21. Poonia, Y., Khalil, S., Meena, P., Shah, D., & Gupta, P. (2024). Parental education for limiting screen time in early childhood: a randomized controlled trial. Indian Pediatrics, 61(1), 32-38.