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Original Research Article

Parental influences on children's dietary intake, screen time and its relationship to their weight status

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ABSTRACT

It is important to know more about the influence of parent's actions and behaviours on children's dietary intake, screen time and weight of children in developing countries. This study aimed to understand parental influences on children's dietary intake, screen time and its relationship to children's weight in Bangalore urban district. Data was collected from parents of children aged 6 to 12 through a self administered questionnaire. Sample comprised of 140 children selected among a purposive method from a tertiary hospital and three private schools. BMI Percentile of children was calculated using the IAP application. Data were analysed using SPSS version 25. Pearson's correlation and Spearman's correlation was used to analyze correlation of various parameters. The frequency of consumption of fried foods, processed foods, fast foods and bakery foods was significantly associated with children's BMI ($p<0.05$). Parental screen time was positively associated with child screen time, ($r=0.368$, $p=0.001$). A significant positive relationship was found between screen time and child's BMI, ($r=0.559$, $p= 0.001$). Over one quarter of children aged 6 to 12 who took part in the study were overweight and obese. Healthy diet and lifestyle guidelines were provided to parents to understand the importance of it in preventing chronic diseases in their children. More such intervention programmes must be implemented to encourage parents to take appropriate measures concerning children's unhealthy eating habits, long term screen exposure and reduced outdoor activities.

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1. Introduction

Parents play a pivotal role in their children's health and lifestyle. Parents can help their children develop and maintain healthy eating and physical activity by reducing screen time, which ultimately helps to reduce overweight and obesity in children.

Parents play an important role in children's eating pattern; they can help prevent childhood overweight/obesity by providing healthy meals and snacks and encouraging more physical activity can reduce screen time exposure.

Childhood Obesity is a serious global health problem. It begins early in life during the preschool year and for many the obesity is carried forward into later childhood and adult life.[1] Obesity increases the risk of CKD, hypertension, and DM in children and adolescents and the risk of mortality in children with ESRD.[2]

Over weight and obesity are now on the rise in low and middle income countries, particularly in urban settings.[3] The main reason for being overweight and obese is the energy imbalance between calories consumed and calories spent. Increased consumption of energy rich foods and physical inactivity are the primary causes of overweight or obesity among children.[4,5]

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The modification of dietary risk in terms of nutrients, foods, dietary patterns and dietary behaviours has been applied to changing problematic dietary factors.[6]

The prevalence of overweight and obesity among children and teens aged 5 – 19 has increased dramatically from just 4% in 1975 to slightly more than 18% in 2016. The increase occurred in the same way for both boys and girls.[7]

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. 39 million children under the age of 5 were overweight or obese in 2020. Over 340 million children and adolescents aged 5 – 19 were overweight or obese in 2016.[8]

Children particularly younger will mainly eat what is available at home, therefore it is important to monitor supply line. Parents should focus on the quality of the diet and build a healthy plate by including right amount of whole cereals, fruits, vegetables and good quality protein sources.[9,10] Children cannot be responsible for what they eat, since parents take part in the purchase of groceries, the preparation of food and the service of food.[11]

They must be cautious in selecting food, preparing and serving food for children. Parents must educate on a balanced diet, so it would be beneficial for them to build a healthy plate for their children.[12]

Family meals are a relief for parents and children. Children like to eat with their families and parents have a chance to catch up with their children. Family meals are a way for parents to introduce children to new foods and be role models for healthy eating.[9,13]

Parents can support children in mindful eating by keeping all gadgets away from them. This is a great age to begin listen to their body and understand their inner hunger.[13,14]

A sedentary lifestyle and consumption of high calorie foods with low nutrition value is assumed to be the two most important factors contributing to the increase in childhood obesity.[15] Promoting physical activity and decreasing sedentary behaviour might protect mental health in children.[16] Over weight is related to the socio demographic characteristics of children and parents, as well as the lifestyle of children.[17,18]

2. Materials and Methods

This cross-sectional study was conducted to determine how the attitudes or actions of parents were linked to children's dietary intake and screen exposure and how it impacts on children's weight.

2.1. Sample size

The total sample size was n = 140, Parents of children aged 6 to 12 years participated in the study. Respondents were one of the parents of the child. Children with intellectual disability and chronic health problems were excluded from this study because these problems could affect their body weight. Those who remain far from the parents were also excluded from the study because the questionnaire needs to be completed by the parents.

2.2. Selection of area

This study was conducted in the Bangalore urban District of Karnataka state. Bangalore is Karnataka's capital city. Bangalore urban area widely divided into five zones – North, South, East, west and central. Bangalore urban district was chosen purposely because of rapid urbanization. It was performed in 3 different private schools and one tertiary hospital located in the Bangalore urban district, for a period of 2 months, from November 2021 to January 2022.

2.3. Sample collection

Purposive sampling technique was used to collect samples at schools and hospital and aimed to understand the influence of parents on the weight status of school – aged children.

2.4. Sample collection at hospital

After obtaining permission from Chief Dietician and Chief consultant 35 self-administered questionnaire with an informed consent form were distributed to parents of children aged 6 – 12 who were admitted to hospital. The forms were collected the same day of distribution after they were filled out.

2.5. Sample collection at school

After obtaining permission from school 105 self-administered questionnaire with an informed consent form were distributed to children in standard 1 to standard 5 (children aged 6 to 12). The class teachers provided appropriate instructions on the questionnaire for the children and entered a note in the dairy of the children who participated in the study to make their parents understand. The questionnaires filled out by the parents were collected at the school at the end of 3 days

A total of 140 forms were collected from participants. Once the forms were collected, it was determined whether they were complete or incomplete. Some incomplete forms with unsatisfactory responses were filled out by asking parents by telephone. Children aged 6 to 12 who were studying from Grade 1 to grade 5 were included in the study. Out of 140 participants 84 were between the ages of 6 and 12 and 56 were between the ages of 10 and 12.

2.6. Anthropometric measurements

According to the Centre for Disease Control and prevention (CDC), anthropometry provides a valuable assessment of nutritional status in children and adults.

Anthropometric measurements are non-invasive body quantitative measurements. [19]

The application of IAP growth chart was used to compute the BMI percentile of children using the information gathered on children's height and weight. The revised IAP 2015 growth charts are contemporary growth charts for Indian children between the age of 5 and 18 years that truly represents all zones of India and is recommended by Indian academy of Paediatrics for use in children from 5 to 18 years. [20]

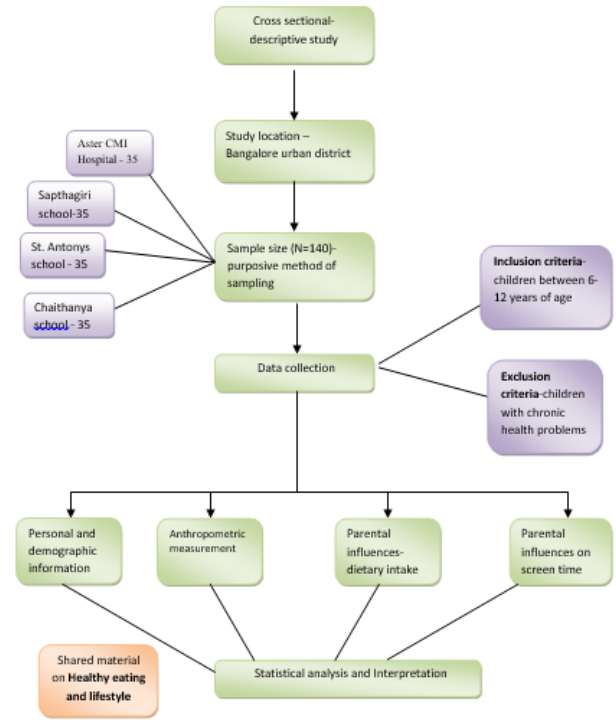

Fig. 1: Schematic representation of Methodology

2.7. *Study tools and validation of the tools*

2.7.1. *Questionnaire*

A variety of methodologies and materials from different research articles on parental measures or actions in Dietary intake, screen exposure and physical activity of children were studied to frame this tool and it was structured by simple words and sentences and the language used was English. With the objectives of study in mind, questions were framed.

The questionnaire included different parts to gather information on parental influences on children's dietary intake and inactive screen exposure, as well as their impact on children's weight.

2.8. *Headings or parts of the questionnaire*

1. Personal and demographic details of child.
2. Personal details of the parents.
3. Parental influences on children's Dietary intake and role in children's healthy and unhealthy food intake.
4. Parental influences in children's inactive screen exposure.

Food Frequency questionnaire: FFQ is used to gather food data and to use a specific list of foods to estimate the usual diet and to understand the link between eating habits and health outcomes.

The first step in this method is to determine and organize the list of foods most commonly consumed by the study population and to estimate the frequency of food consumption varying from "never or less than once a month to daily".

2.9. *Validation of the tool*

The design validity was assessed using the advice of the chief dietician and statistician and few questions were changed according to the suggestions they made

2.10. *Educational material*

Parents should be knowledgeable about healthy eating and lifestyle so that they can raise their children in a healthy way. In that case, it is extremely important to make parents aware. In this study, an attempt was made to increase parent's awareness by sharing educational material on healthy eating and lifestyle of children with parents.

After Collecting the completed questionnaire from parents, the children's healthy eating and lifestyle document was shared with parents through whatsapp and by mail.

The document contained a number of details, outlined below:

1. Introduction to healthy eating and a healthy lifestyle
2. Do's and Don'ts
3. Guidelines to healthy eating and lifestyle
4. Healthy recipes including breakfast, snacks, lunch and dinner for children
5. Balanced plate for children

3. Data Analysis

All data were entered into Microsoft Excel worksheet before being uploaded to SPSS. Frequency numbers were used to determine the overall prevalence of answers to specific research questions among study subjects. Data were analyzed using SPSS for Windows (Version 25, IBM Corporation, Armonk, New York, United State). Data presented as Mean±SD or Median (Minimum-maximum) frequency (%). Cross tabulations were computed according to gender and data was compared using chi-square test for categorical variables. The Independent Sample T test was used to analyze differences in age and anthropometric

parameters when classified according to gender. Mann Whitney U test was used to analyze difference in dietary habits and frequency of food intake when classified according to gender. Pearson's correlation was used to analyze correlation of various parameters and data was presented as Pearson's "r" value. Spearman's correlation was used to analyze correlation of BMI with various frequency intake data and data was presented as Spearman Rho value. $p<0.05$ was considered to be statistically significant. Graphs were plotted using Microsoft Excel.

4. Results and Discussion

Having analyzed the data and obtained the results, it is appropriate to explain the results in the light of the objectives of the current research to understand the actions or attitudes of parents with respect to dietary intake, screening exposure and its impact on the weight of children of both genders (boys and girls).

The study concepts are tested and interpreted, after which appropriate discussions are presented. The results are recorded according to the following order.

Table 1 General information and Demographic data of study participants.

Table 2 Details of parents of children aged 6 – 12 years.

Table 3 Anthropometric details of children and BMI status of study participants.

Table 4 Dietary intake of children.

Table 5 Screen exposure and lifestyle of study participants.

4.1. General information and demographic data of study participants

1. Gender of study participants
2. Demographic data of study participants

4.2. Gender of study participants

This study was undertaken to understand parental influences on children aged 6 to 12. The sample consisted of 140 children, 78 of whom were boys and 62 of whom were girls.

Table 1: Gender distribution of study participants

	Frequency	Percentage
Girls	62	44.3
Boys	78	55.7

Table 1: gives the gender distribution of study participants. Out of the 140 participants, 44.3% were girls and 55.7% were boys.The results show that more boys took part in the study than girls.

4.3. Demographic data

Table 2: gives demographic data of study participants. Most study participants were Hindus (91.4%). Most study participants were from North Bangalore (77.1%). About $3/4^{th}$ participants were from nuclear families and 64.3% had 1 sibling and 8.6% had 2 or more siblings.

Table 2: Demographic data of study participants

	Frequency	Percentage
Religion		
Hindu	Demographic data ofstudy participants 128	91.4
Muslim	9	6.4
Christian	3	2.1
Location in Bangalore		
North	108	77.1
South	15	10.7
East	6	4.3
West	11	7.9
Type of family		
Nuclear	105	75
Joint	33	23.6
Extended	2	1.4
Number of siblings		
None	38	27.1
1	90	64.3
2 or more	12	8.6

This study involved study population composed of more boys than girls between the ages of 6 and 12. Participants were selected from hospital and schools located in Northern Bangalore, which compose the majority of the northern sample.

In terms of family size, about 75% of the sample belonged to nuclear family. Just 23.6% of sample was from joint family. Nuclear families predominated in the selected samples.

4.4. Details of parents of children aged 6 – 12 years

1. Parent's education
2. Parent's occupation

4.5. Parents' education

Figure 2 gives parents' educational level. About 27.9% mothers were graduates and 25% were post graduates. About 35.7% fathers were graduates and 18.6% were post-graduates. 0.7% or 1 father was a Ph.D.

There was an important positive relationship between the father's level of education and the child's BMI ($p=0.004$). The mother's education level had no significant relation in children's BMI ($p=0.108$). A retrospective cross sectional study was carried out in Saudi Arabia from May to September with a sample size of 328 children. It was determined that there was no relationship between parent's

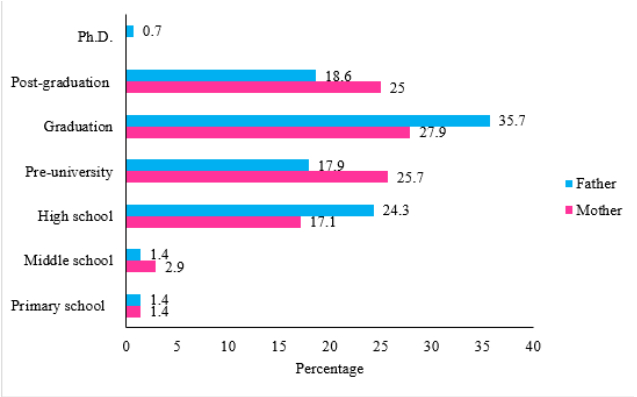

Fig. 2: Parents' education

education and children's BMI.[21]

4.6. *Parents' occupation*

Figure 3 gives parent's occupation details. About 66.4% mothers were homemakers whereas rest 33.6% was working women. Highest percentage (60%) of fathers was in private service and 30% were in business.

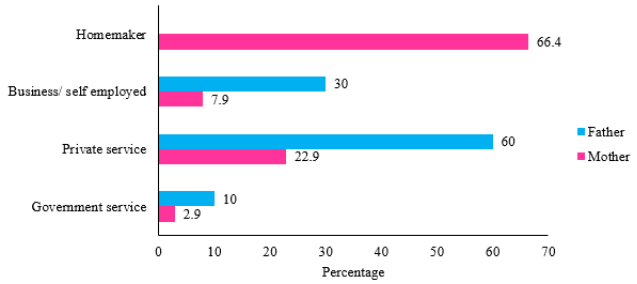

Fig. 3: Parents' Occupation

4.7. *Anthropometric details and BMI status of study participants*

1. Children's age and anthropometry
2. Parent's anthropometry
3. BMI status of children
4. BMI status of parents
5. Correlation of parents' BMI with child's BMI status
6. Correlation of parents' education with child's BMI status

4.8. *Children's age and anthropometry*

Information on children such as birth weight, current age, height and weight was collected. The child's age, height and weight were used to calculate BMI using the IAP application.

Children's age and anthropometric details can be found in Table 3 below.

Table 3: Child's age and anthropometric parameters

	Girls (n=61)	Boys (n=78)	Total (n=140)	P value
Current age (years)	9.1±1.8	9.3±1.6	9.2±1.7	0.341
Birth weight (kg)	3±0.4	3±0.5	3±0.5	0.782
Current Height(cm)	133.6±11.1	135.3±9.6	134.5±10.3	0.321
Current weight (kg)	29.7±8.3	32.2±8.5	31.1±8.5	0.078
Current BMI (kg/m^2)	16.4±2.6	17.4±3.2	17.0±3	0.037

Data presented as Mean±SD

Table 3 gives child's age and anthropometric parameters. The average age of children in the study was 9.2±1.7 years. From the 140 participants, 84 (60%) were aged 6 to 9 years and 56 (40%) were aged 10 – 12 years. The average birth weight was 3±0.5 kg. The average current BMI was 17.0±3 kg/m^2. There was no significant difference in the current age, birth weight or current anthropometric parameters of girls and boys (p>0.05).

4.9. *Parents' anthropometry*

Table 4: Anthropometric parameters of parents

Parents anthropometry	Mother	Father
Height (cm)	158.3±5.9	171.4±6.6
Weight (kg)	63.5±11.4	74.6±10.1
BMI (kg/m^2)	25.4±4.2	25.8±6

Table 4 gives parents' anthropometric parameters. The average weight of mothers was 63.5±11.4 kg and average weight of fathers was 74.6±10.1 kg. The average BMI of mothers' was 25.4±4.2 kg/m^2 and average BMI of fathers was 25.8±6 kg/m^2.

Table 5 gives the BMI status of study participants.6 children were underweight (BMI <3rd percentile), 84 children had normal BMI (3rd Percentile to adult equivalent of 23 kg/m^2), 30 were overweight (adult equivalent of 23 – 27 kg/m^2) and 20 children were obese (>adult equivalent of 27 kg/m^2). Highest percentage of boys was obese whereas higher percentage of girls had normal BMI. However, this difference was not significant (p>0.05).

This study found that 21.4% of children were overweight and 14.3% of children were obese. r one in four children (26%) in the grades 1 – 5 at private schools in lalithpur Metropolian city were either overweight or obese.[22]

This study shows that the percentage of overweight and obese boys in comparison with girl is higher. The findings

Table 5: BMI status of study participants

Weight status category	Girls (n=61)		Boys (n=78)		Total (n=140)		P value
	Freq.	%	Freq.	%	Freq.	%	
Underweight (<3^{rd} percentile)	2	3.2	4	5.1	6	4.3	0.073
Normal (3^{rd} percentile to adult equivalent of 23 kg/m^2)	42	67.7	42	53.8	84	60	
Overweight (adult equivalent of 23 – 27 kg/m^2)	14	22.6	16	20.5	30	21.4	
Obese (>adult equivalent of 27 kg/m^2)	4	6.5	16	20.5	20	14.3	

of the comparison of BMI among boys and girls were supported by the results of the study, which showed that boys had higher rates of overweight and obesity than girls.[23]

Table 6: BMI status of parents

Weight status of parents	Mother		Father	
	Frequency	Percentage	Frequency	Percentage
Underweight (<18.5 kg/m^2)	3	2.1	2	1.4
Normal BMI (18.5 – 23 kg/m^2)	36	25.7	30	21.4
Overweight (23 – 27 kg/m^2)	56	40	68	48.6
Obese (>27 kg/m^2)	45	32.1	40	28.6

BMI status of parents is given in Table 6. From the 140 mothers, 3 were underweight, 56 were overweight and 45 were obese. From the 140 fathers, 2 were underweight, 68 were overweight and 40 were obese.

4.10. Correlation of parents' BMI with child's BMI status

There was a significant positive correlation of child's BMI with mother's BMI (r = 0.340, p=0.001), i.e. mother's who had higher BMI tended to have children with higher BMI. There was also a significant positive correlation of child's BMI with father's BMI (r=0.176, p=0.038), i.e. father's who had higher BMI also tended to have children with higher BMI. However, from results in the current study we can infer that mother's BMI had a stronger influence on child's BMI as compared to that of father's BMI as r value was higher for correlation of mother as compared to father.

Parental BMI was positively associated with children's BMI and the BMI of the mother had a greater impact on the BMI of the child than that of the father.

A study reported that older boys and girls showed a stronger positive association between %BMI and parental BMI, compared to the preschool children.[24]

4.11. Correlation of parents' education with child's BMI status

There was a significant positive correlation of fathers' educational level and child's BMI (Spearman Rho = 0.170, p=0.044), indicating BMI of the child increased with educational level of father. There was no significant correlation of mothers' educational level of child's BMI (Spearman Rho = 0.136, p=0.108). This indicates that father's weight status had significant influence on child's BMI whereas no influence of mother's weight status was found.

5. Dietary Intake of Child

1. Dietary preferences of children
2. Dietary habits of children
3. Food frequency intake.

Food frequency intake of essential food group

Frequency intake of Fruits and vegetable preparations..

Frequency intake of packaged foods/ Ready to Eat foods/ Fast foods.

Frequency intake of other foods.

Water intake

5.1. Dietary preference

Table 7: gives diet preference of children in the current study. Out of 140, 40 were vegetarians/vegans, 91 were non-vegetarians and 9 were ova-vegetarians. No significant gender-based differences were observed.

5.2. Dietary habits

Table 8: gives dietary habits of children. Out of 140 children, 41 ate fried foods 2-3 times/ week and 6 ate fried foods daily. Out of 140 children, 34 ate take away 2-3 times/ week and 1 are take away daily. Overall, 99 children ate family meal together daily.

Table 9 gives dietary habits of children when classified according to gender. There was no significant difference in frequency intake of fried foods or frequency of eating meals together with the family when classified according to gender (p>0.05). Boys had higher frequency intake of take away foods as compared to girls (p<0.05).

Table 7: Dietary preference of children

Dietary preference	Girls (n=61)		Boys (n=78)		Total (n=140)		P value
	Frequency	%	Frequency	%	Frequency	%	
Vegan/ vegetarian	19	30.6	21	26.9	40	28.6	0.648
Non-vegetarian	38	61.3	53	67.9	91	65	
Ova-vegetarian	5	8.1	4	5.1	9	6.4	

Table 8: Dietary habits of children

Dietary habbits	Never	Occasionally	Monthly	Fortnight	Weekly once	Weekly 2-3 times	Daily 5-6 servings
Fried foods	0 (0)	7 (5)	11 (7.9)	16 (11.4)	59 (42.1)	41 (29.3)	6 (4.3)
Take away	12 (8.6)	23 (16.4)	22 (15.7)	9 (6.4)	39 (27.9)	34 (24.3)	1 (0.7)
Family eats meal together	1 (0.7)	2 (1.4)	7 (5)	12 (8.6)	11 (7.9)	8 (5.7)	99 (70.7)

Data presented as frequency (percentage)

Table 9: Dietary habits of children when classified according to gender

Dietary Habits	Girls (n=62)	Boys (n=78)	P value
Fried foods	4 (1-6)	4 (1-6)	0.419
Take away	2.5 (0-5)	4 (0-6)	0.033
Family eats meal together	6 (0-6)	6 (1-6)	0.722

Data presented as Median (Minimum-maximum)

Table 10: Correlation of dietary habits with BMI

Dietary Habits	Spearman Rho Value	P value
Fried foods	0.191	0.024
Take away	0.355	0.001
Family eats meal together	0.084	0.326

Table 10 gives correlation of dietary habits with BMI. There was a significant positive correlation of frequency of fried food intake and BMI ($p<0.05$), BMI increased with an increase in frequency intake of fried foods. There was a significant positive correlation of frequency intake of take away and BMI ($p<0.05$), BMI increased with an increase in frequency intake of take away. There was no significant correlation of frequency of eating meals together with the family and BMI ($p>0.05$).

From the table it can be incurred that frequent consumption of fried foods and outdoor foods positively associated with children's BMI. And there was no relationship between the incidence of family meals and BMI. This study found that school aged children often have poor eating habits particularly when it comes to eating takeaway and fried foods. Childhood is a vitally important time for the growth and development of children. Healthy eating habits can lower the risk of being overweight and obese.

6. Food Frequency Intake

6.1. Food frequency intake of essential food groups

Most children ate whole cereals and millets, cereal flours, dhals, milk and milk products on daily basis. Highest frequency intake for whole pulses was weekly once (35.7%) or weekly 2-3 times (42.1%). Egg and meat were not consumed by 22.9% children. Nuts and oilseeds were consumed in highest frequency nuts and oil seeds were weekly 2-3 times (33.6%). Highest frequency for oils and fats as well as sugar, jaggery and honey was daily.

Table 12 gives comparison of frequency intake of essential food groups when classified according to gender. No significant gender-based differences were observed in frequency consumption of essential food groups ($p>0.05$)

Table 11: Frequency intake of essential food groups

Essential Food Groups	Never	Rarely	Monthly	Weekly once	Weekly 2-3 times	Daily 1-2 servings	Daily 2-4 servings	Daily 5-6 servings
Whole cereals and millets	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.7)	10 (7.1)	76 (54.3)	53 (37.9)
Cereal flours	0 (0)	0 (0)	0 (0)	1 (0.7)	22 (15.7)	56 (40)	58 (41.4)	3 (2.1)
Whole pulses	0 (0)	5 (3.6)	9 (6.4)	50 (35.7)	59 (42.1)	12 (8.6)	3 (2.1)	2 (1.4)
Dhals	0 (0)	1 (0.7)	1 (0.7)	8 (5.7)	34 (24.3)	73 (52.1)	23 (16.4)	0 (0)
Milk & products	0 (0)	0 (0)	1 (0.7)	3 (2.1)	8 (5.7)	81 (57.9)	42 (30)	5 (3.6)
Egg & meat	32 (22.9)	3 (2.1)	4 (2.9)	34 (24.3)	50 (35.7)	14 (10)	1 (0.7)	2 (1.4)
Nuts & Oilseeds	0 (0)	10 (7.1)	12 (8.6)	34 (24.3)	47 (33.6)	36 (25.7)	1 (0.7)	0 (0)
Oils & fats	0 (0)	0 (0)	1 (0.7)	4 (2.9)	4 (2.9)	60 (42.9)	68 (48.6)	3 (2.1)
Sugar, jaggery & Honey	2 (1.4)	4 (2.9)	4 (2.9)	9 (6.4)	5 (3.6)	84 (60)	29 (20.7)	3 (2.1)

Data presented as frequency (percentage)

Table 12: Frequency intake of essential food groups when classified according to gender

Food groups	Girls (n=61)	Boys (n=78)	P value
Whole cereals and millets	6 (4-7)	6 (5-7)	0.056
Cereal flours	5 (3-7)	5 (4-7)	0.128
Whole pulses	4 (1-7)	4 (1-6)	0.522
Dhals	5 (1-6)	5 (3-6)	0.785
Milk & products	5 (2-7)	5 (3-7)	0.888
Egg & meat	3 (0-7)	4 (0-6)	0.066
Nuts & Oilseeds	4 (1-5)	4 (1-6)	0.130
Oils & fats	5.5 (2-7)	6 (3-7)	0.861
Sugar, jaggery & Honey	5 (2-7)	5 (0-7)	0.459

Data presented as Median (Minimum-maximum)

6.2. Correlation of essential food groups with BMI

Table 13: Correlation of essential food groups with BMI

Food groups	Spearman Rho Value	P value
Whole cereals and millets	0.505	0.001
Cereal flours	0.401	0.001
Whole pulses	-0.033	0.700
Dhal	0.150	0.077
Milk & products	0.200	0.018
Egg & meat	-0.047	0.579
Nuts & Oilseeds	-0.029	0.738
Oils & fats	0.450	0.001
Sugar, jaggery & Honey	0.164	0.053

There was a significant positive correlation of frequency intake of whole cereals and millets, cereal flours, milk and milk products and oils & fats with BMI ($p<0.05$). No other significant correlations were found of BMI with other essential food groups ($p>0.05$).

In this study the frequency of consumption of cereals, cereal meal, milk and dairy products and oils and fats was positively associated with BMI. This study showed that children who consume more food lead to overweight/obesity in children. Overeating remains an important factor in weight gain.

6.3. Frequency intake of fruit and vegetable preparations

Table 14 gives frequency intake of fruit and vegetable preparations. Only 30.7% children ate whole fruits daily whereas only 47.9% children are vegetable curries daily and 12.8% ate salads daily. Smoothies' intake was daily in 0.7% children and fresh fruit juice intake was daily in 4.3% children. Vegetable-dhal preparation was daily in 40.7% children and soup was consumed daily by 3.5% children.

Table 14: Frequency intake of fruit and vegetable preparations

Fruits and Vegetable Preparations	Never	Rarely	Weekly once	Weekly twice	Weekly 4 times	Daily 1-2 servings	Daily 3-4 servings
Whole fruit	0 (0)	5 (3.6)	20 (14.3)	30 (21.4)	42 (30)	42 (30)	1 (0.7)
Fresh fruit juice	2 (1.4)	49 (35)	39 (27.9)	35 (25)	9 (6.4)	6 (4.3)	0 (0)
Smoothies	19 (13.6)	88 (62.9)	18 (12.9)	9 (6.4)	5 (3.6)	1 (0.7)	0 (0)
Vegetable curries	0 (0)	10 (7.1)	6 (4.3)	24 (17.1)	33 (23.6)	63 (45)	4 (2.9)
Salads	4 (2.9)	43 (30.7)	34 (24.3)	18 (12.9)	23 (16.4)	16 (11.4)	2 (1.4)
Veg-dhal preparation	2 (1.4)	8 (5.7)	11 (7.9)	29 (20.7)	33 (23.6)	47 (33.6)	10 (7.1)
Soups	21 (15)	72 (51.4)	24 (17.1)	13 (9.3)	5 (3.6)	2 (1.4)	3 (2.1)

Data presented as frequency (percentage)

Table 15: Frequency intake of fruit and vegetable preparations when classified according to gender

Fruits and vegetable preparations	Girls (n=61)	Boys (n=78)	P value
Whole fruit	4 (1-5)	4 (1-6)	0.735
Fresh fruit juice	2 (0-5)	2 (1-5)	0.016
Smoothies	1 (0-4)	1 (0-5)	0.483
Vegetable curries	4 (1-6)	4 (1-6)	0.892
Salads	2 (0-6)	2 (0-5)	0.399
Veg-dhal preparation	4 (0-6)	4 (1-6)	0.646
Soups	1 (0-6)	1 (0-5)	0.888

Data presented as Median (Minimum-maximum)

Frequency intake of fruit and vegetable preparations when classified according to gender is given in Table 15. Frequency intake of fresh fruit juices was higher in boys as compared to girls ($p<0.05$). No other significant gender-based differences were observed in frequency consumption of fruit and vegetable preparations ($p>0.05$).

6.4. Correlation of fruit and vegetable preparations with BMI

Table 16: Correlation of frequency intake of fruits and vegetables with BMI

Fruits and vegetable preparations	Spearman Rho Value	P value
Whole fruit	-0.057	0.505
Fresh fruit juice	0.030	0.724
Smoothies	0.031	0.718
Vegetable curries	-0.141	0.096
Salads	0.073	0.394
Veg-dhal preparation	0.017	0.840
Soups	0.060	0.481

No significant correlation of frequency intake of fruits and vegetables preparation with BMI were observed ($p>0.05$).

The current study found that increase in the frequency of fruits and vegetable intake is not associated with an increase in BMI among children. Bayer et al. reported that BMI gain tended to be lower in children with increasing fruit consumption compared to those with decreasing fruit consumption. And no significant tendency was observed for vegetable consumption and BMI status.

WHO recommends the consumption of over 400g of fruits and vegetables per day to improve overall health and reduce the risk of illness. Low vegetable consumption is a persistent issue in particular. Fruits and vegetables are an essential part of healthy eating.[25]

6.5. Frequency intake of packaged foods/ ready to eat foods/ fast foods

Table 17: gives frequency intake of packagedfoods/ ready to eat foods/ fast foods. Biscuits and cookies were consumed on daily basis by 42.9% children whereas chocolates were consumed daily by 13.6% children and deep-fried snacks were consumed daily by 12.1% participants. Most other foods were consumed on monthly or weekly basis.

Table 18: gives frequency intake of packaged foods/ ready to eat foods/ fast foods when classified according to gender. No significant gender based differences were observed in frequency intake of packaged foods/ ready to eat foods/ fast foods when classified according to gender ($p>0.05$).

6.6. Correlation of packaged foods/ ready to eat foods/ fast foods with BMI

There was a significant positive correlation of frequency consumption of deep fried snacks, bakery sweets and cakes, pizza/ burger and chat with BMI ($p<0.05$). No other significant correlations were observed ($p>0.05$).

Statistically significant results were obtained for the intake of snacks, pastries and cakes, pizza/burgers and chaats with BMI.

Packaged food, Ready to eat foods and fast foods are high in salt, sugar and fat, frequent consumption of these foods leads to overweight and obesity and that causes many health issues in children.

A prospective study of 541 preschoolers, kids who ate fast food more frequently over a one year period were more likely to increase their weight over that time. Children with the highest BMI percentile in the beginning were more likely to be overweight because of the more frequent use of fast food.[26]

6.7. Frequency intake of other foods

Highest frequency intake of instant noodles/ cornflakes was weekly. Highest frequency food intake for most other foods was monthly or fortnight.

Frequency intake of instant noodles/ cornflakes was significantly higher in boys as compared to girls ($p<0.05$). Frequency intake of milkshakes was also significantly higher in boys as compared to girls ($p<0.05$). No other significant differences were observed.

6.8. Correlation of other foods with BMI

There was a significant positive correlation of frequency intake of instant noodles/ cornflakes and soft drink with BMI ($p<0.05$). No other significant correlations were observed ($p>0.05$).

From the table it can be incurred that consumption of carbonated beverages positively associated with BMI

Table 17: Frequency intake of packaged foods/ ready to eat foods/ fast foods

Packaged/RTE Past foods	Never	Rarely	Monthly	Weekly once	Weekly 2-3 times	Daily
Ice cream	4 (2.9)	17 (12.1)	72 (51.4)	38 (27.1)	8 (5.7)	1 (0.7)
Chocolates	0 (0)	7 (5)	8 (5.7)	35 (25)	71 (50.7)	19 (13.6)
Deep fried snacks	0 (0)	7 (5)	18 (12.9)	45 (32.1)	53 (37.9)	17 (12.1)
Bakery sweets and cakes	1 (0.7)	10 (7.1)	49 (35)	56 (40)	21 (15)	3 (2.1)
Biscuits/ cookies	1 (0.7)	1 (0.7)	6 (4.3)	23 (16.4)	49 (35)	60 (42.9)
Puffs/ toasts	9 (6.4)	44 (31.4)	47 (33.6)	34 (24.3)	5 (3.6)	1 (0.7)
Pizza/ burger	41 (29.3)	51 (36.4)	41 (29.3)	6 (4.3)	1 (0.7)	0 (0)
Chaats	2 (1.4)	17 (12.1)	64 (45.7)	51 (36.4)	6 (4.3)	0 (0)

Data presented as frequency (percentage)

Table 18: Frequency intake of packaged foods/ ready to eat foods/ fast foods when classified according to gender

Packaged/RTE/Past foods	Girls (n=61)	Boys (n=78)	P value
Ice cream	2 (0-4)	2 (0-5)	0.889
Chocolates	4 (1-5)	4 (1-5)	0.953
Deep fried snacks	3 (1-5)	3 (0-5)	0.761
Bakery sweets and cakes	3 (1-4)	3 (0-5)	0.959
Biscuits/ cookies	4 (0-5)	4 (1-5)	0.460
Puffs/ toasts	2 (0-5)	2 (0-4)	0.299
Pizza/ burger	1 (0-3)	1 (0-4)	0.584
Chaats	2 (0-4)	2 (0-4)	0.586

Data presented as Median (Minimum-maximum)

Table 19: 1Correlation of packaged foods/ ready to eat foods/ fast foods with BMI

Packaged/RTE/Past foods	Spearman Rho Value	P value
Ice cream	0.090	0.288
Chocolates	0.134	0.115
Deep fried snacks	0.243	0.004
Bakery sweets and cakes	0.219	0.009
Biscuits/ cookies	0.096	0.260
Puffs/ toasts	0.101	0.236
Pizza/ burger	0.166	0.050
Chaats	0.200	0.018

in children. Consumption of soft drinks was associated with a mean weight gain of 0.10 kg/year/serving. The amount of weight gain associated with the consumption of carbonated beverages was similar for those who participated in recreational physical activity at low and high levels.[27]

The findings suggest that parents need to take appropriate measures regarding the more frequent consumption of packaged foods, ready to eat foods, fast foods and sweetened drinks like carbonated beverages etc. by children, otherwise this affects children's weight.

6.9. Water intake

Data presented as Median (Minimum-maximum)

The minimum water intake in children was $\frac{1}{2}$ liter and maximum water intake in children was 2.5 liters. Median water intake in children was 1.3 liters. Boys had significantly higher water intake as compared to girls ($p<0.05$).

6.10. Correlation of water intake and BMI

A significant positive correlation of water intake was observed with BMI of the child ($r=0.170$, $p=0.044$).

Table 20: Frequency intake of other foods

Other foods	Never	Occasionally	Monthly	Fortnight	Weekly once	Weekly 2-3 times	Daily
Instant noodles/ cornflakes	8 (5.7)	22 (15.7)	21 (15)	19 (13.6)	49 (35)	19 (13.6)	2 (1.4)
Soft drinks	36 (25.7)	44 (31.4)	51 (36.4)	7 (5)	1 (0.7)	1 (0.7)	0 (0)
Fruit based drinks	11 (7.9)	37 (26.4)	57 (40.7)	32 (22.9)	3 (2.1)	0 (0)	0 (0)
Milkshakes	16 (11.4)	51 (36.4)	44 (31.4)	21 (15)	5 (3.6)	3 (2.1)	0 (0)
Chocomilk/ bournvita/ coffee/ tea	9 (6.4)	13 (9.3)	5 (3.6)	11 (7.9)	8 (5.7)	94 (67.1)	0 (0)

Data presented as frequency (percentage)

Table 21: Frequency intake of other foods when classified according to gender.

Other foods	Girls (n=61)	Boys (n=78)	P value
Instant noodles/ cornflakes	3 (0-6)	4 (0-6)	0.034
Soft drinks	1 (0-4)	1 (0-5)	0.320
Fruit based drinks	2 (0-3)	2 (0-4)	0.089
Milkshakes	1 (0-4)	2 (0-5)	0.032
Chocomilk/ bournvita/coffee/ tea	5 (0-5)	5 (0-5)	0.962

Data presented as Median (Minimum-maximum)

Table 22: Correlation of other foods with BMI

Other foods	Spearman Rho Value	P value
Instant noodles/ cornflakes	0.289	0.001
Soft drinks	0.196	0.020
Fruit based drinks	0.098	0.251
Milkshakes	0.138	0.103
Chocomilk/bournvita/ coffee/ tea	0.012	0.890

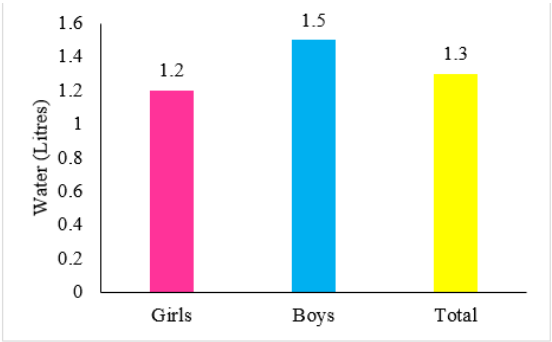

Fig. 4: Water intake

6.11. Screen exposure and lifestyle of study participants:

1. Number of hours slept
2. Physical activity
3. Time spent playing by children
4. Child use mobile while eating
5. Parents eat in front of screen
6. Screen time of parents and child

Number of hours slept

Table 23: Number of hours slept

Sleeping hours	Girls (n=61)	Boys (n=78)	Total (n=140)	P value
Sleeping hours	9 (8-10)	9 (7.5-11)	9 (7.5 – 11)	0.488

Data presented as Median (minimum-maximum)

The minimum hours slept by a study participant was 7.5 hours and maximum time slept was 11 hours. On an average, children slept for 9 hours. There was no significant difference in the number of hours slept between boys and girls ($p<0.05$).

6.12. Correlation of sleep hours and BMI

No significant correlation of number of hours slept was observed with BMI of the child ($r=0.041$, $p=0.631$).

6.13. Physical activity

Most parents allowed children to play outside either on weekly or daily basis. Most parents encouraged child to do physical activity on daily basis.

There was no significant difference in frequency of allowing child to play outside or encouraging child to do physical activity when classified according to gender ($p>0.05$).

6.14. Time spent playing

The minimum time spent playing was 20 minutes and maximum time spent playing was 150 minutes. Average time spent playing was 60 minutes. There was no significant difference in time spent playing between males and females ($p>0.05$).

6.15. Correlation of time spent playing and BMI

A significant negative correlation of time spent playing was observed with BMI of the child ($r=-0.224$, $p=0.008$). This indicates that more time the child spent playing games, lesser was his BMI. That is activity levels were indirectly proportional to BMI of the child.

There was a significant negative correlation of parent allowing child to play outside or encourage child to do physical activities with actual time spent playing by children ($p<0.05$), i.e. the more the parents encouraged children to play or allowed them to play, lesser the time they spent playing.

In this study there was no relationship was found in the frequency of allowing the child to play outdoors or encouraging the child to engage in physical activity when classified according to gender and this could indicate that there was no gender discrimination.

An important negative connection was found between playing time and the BMI of children. This suggests that the longer the child spent playing games, the lower the BMI. This study found that the more parents encouraged and allowed children to play, the less time children spent playing.

Table 24: Parents attitude towards child's physical activity

Physical Activity	Never	Occasionally	Monthly	Fortnight	Weekly once	Weekly 2-3 times	Daily
Allow child to play outside	2 (1.4)	9 (6.4)	2 (1.4)	8 (5.7)	16 (11.4)	47 (33.6)	56 (40)
Encourage child to do physical activities	4 (2.9)	7 (5)	7 (5)	6 (4.3)	26 (18.6)	42 (30)	48 (34.3)

Data presented as frequency (percentage)

Table 25: Parents' attitude towards physical activity when classified according to gender

Parent's attitude	Girls (n=61)	Boys (n=78)	P value
Allow child to play outside	5 (1-6)	5 (0-6)	0.453
Encourage child to do physical activities	5 (0-6)	5 (0-6)	0.150

Data presented as Median (Minimum-maximum)

Table 26: Time spent playing by children

Playing	Girls (n=61)	Boys (n=78)	Total (n=140)	P value
Time spent playing (minutes)	60 (20-150)	60 (20-120)	60 (20-150)	0.675

Data presented as Median (Minimum-maximum)

Table 27: Correlations of parents' attitude with actual time spent playing daily

Parent's attitude	Spearman Rho	P value
Allow child to play outside	-0.178	0.035
Encourage child to do physical activities	-0.205	0.015

6.16. Child use mobile while eating

Table 28 gives the percentage of children who were allowed to use mobile while eating. Out of 140 children, only 27 were allowed to use mobile while eating always. No significant gender-based differences were observed (p>0.05).

6.17. Parents eat in front of screen

Table 29 gives the percentage of parents who ate in front of screen. Out of 140 parents, about 43 parents ate in front of screen always.

Table 30 gives the amount of time spent in front of screen by both children and parents. The average time spent by children on screen was 2 hours and that by parents was 1 hour. Boys spent significantly higher time on screen as compared to girls (p<0.05). Parents of girl child and parents of boy child did not have any significant difference in amount of time spent in front of screen.

6.18. Correlation of screen time and BMI of child

A significant positive correlation of screen time was observed with BMI of the child (r=0.559, p=0.001). This indicates that more time child spent using screen time, then more his BMI was.

Table 28: Percentage of children who were allowed to used mobile while eating

Mobile usage while eating	Girls (n=61)		Boys (n=78)		Total (n=140)		P value
	Frequency	%	Frequency	%	Frequency	%	0.691
No	34	54.8	39	50	73	52.1	
Sometimes	18	29	22	28.2	40	28.6	
Always	10	16.1	17	21.8	27	19.3	

Table 29: Percentage of parents who ate in front of screen

Screen time	Frequency	Percentage
Never	27	19.3
Sometimes	70	50
Always	43	30.7

Table 30: Screen time of parents and child

Screen time of parent and child	Girls (n=61)	Boys (n=78)	Total (n=140)	P value
Child (hours)	2 (0.5-7)	3 (0.5-6)	2 (0.5-7)	0.007
Parent (hours)	1 (0.25-6)	1 (0.25-8)	1 (0.25-8)	0.248

Data presented as Median (Minimum-maximum)

6.19. Correlation of parents' screen time with child's screen time:

There was a significant positive correlation of the time that parents spent on screen and amount of time child spent on screen (r=0.368, p=0.001). This indicates that if the parent spent more time on screen then the child also tended to spend more time on screen.

This study examined the relationship between parental screening time, child screening time and the percentile of BMI in children. This study found that parental screen time spent by parents was related to screen time spent by children. This suggests that if the parent spends more time onscreen, the child also has a tendency to spend more time onscreen.

In this study children's screen time was positively associated with their BMI. Thus, if children spend more time inactively in front of the screen that impacts their weight.

Found similar results that time spent on the parent screen was positively associated with time spent on the child's screen and child's screen time was associated with higher BMI percentiles of children.[28] this suggests that the education of parents about limiting their own onscreen behavior, It is important to have positive impact on the reduction of screen time of children.

7. Conclusion

In this study over one quarter of children aged 6 to 12 who took part in the study in the Bangalore urban district were overweight/obese. The children who frequently ate fast food, processed food and packaged foods were overweight/ obese and this was associated with parental influences. Parental screen time was associated with screen time of children and children exposed to screen for long time had a higher BMI percentile. The results indicate that if parents don't take appropriate actions on child's dietary intake with long term screen exposure and decreased outdoor activities, children tend to become overweight or obese. Healthy diet and lifestyle guidelines were provided to parents to understand the importance of it in preventing chronic diseases in their children. More such intervention programmes must be implemented to encourage parents to take appropriate measures concerning children's unhealthy eating habits, long term screen exposure and reduced outdoor activities.

7.1. Summary

This study was conducted with the following objectives:

1. To learn about parental actions regarding children's food consumption and the time spent in front of screens.
2. To learn about unhealthy food habits in children and its impact on their weight.
3. To understand about screen exposure and low levels of physical activity and its impact on children's weight.
4. To raise awareness among parents about the health and lifestyle of children.

The location chosen for this cross sectional study was the Bangalore urban district. This study was carried out in three schools and one hospital after authorization by the authority. In total, 140 children (Boys = 78, Girls = 62) from the 6 – 12 age group were selected using a purposive sampling method.

Only children without chronic health conditions were included in the study. Self administered questionnaire with an informed consent forms were distributed to parents with children from 6 to 12 years old.

Anthropometric measurements such as the height and weight of all children were checked to calculate their BMI Percentile. IAP growth chart application (Developed by IAP growth chart committee) was used to calculate BMI Percentile of children. Other information such as personal and demographic information, dietary intake, screen exposure and physical activity of children and associated parental influences was obtained through completed questionnaire.

After collecting questionnaire forms, document on "healthy eating and lifestyle" was shared to all parents via Whatsapp or in the mail within 24 hours to raise awareness about children's health.

Data were analyzed using SPSS for windows (version 25). The independent sample T test was used to analyze differences in age and anthropometric parameters. Pearson's correlation was used to analyze correlation of various parameters and data was presented as Pearson's "r" value.

Spearman's correlation was used to analyze correlation of BMI with various frequency intakes. $P<0.05$ was considered to be statistically significant.

This study found that 21.4 % of the children were overweight and 14.3 % of children were obese and this study shows that the % of overweight and obese boys in comparison with girl is higher.

The result shows that parental BMI was positively associated with children's BMI and the BMI of the mother had a greater impact on the BMI of the child than that of father.

The result shows that there was a significant positive correlation of frequency intake of takeaway and BMI (P<0.05). BMI increased with an increase in frequency intake of takeaway foods.

This study found that school aged children often have poor eating habits, particularly when it comes to eating takeaway and fried foods. Healthy eating habits can lower the risk of being overweight and obese.

In this study the frequency of consumption of cereals, cereal meal, milk and dairy products and oils and fats was positively associated with BMI (P<0.005). This study showed that children who consume more food lead to overweight/obesity in children. Overeating remains an important factor in weight gain.

The result shows that there was no significant correlation of frequency intake of fruits and vegetables preparation with BMI were observed (p>0.05).

The current study found that increase in the frequency of fruits and vegetable intake is not associated with an increase in BMI among children

Statistically significant results were obtained for the intake of snacks, pastries, cakes, pizza/burgers and chaats with BMI. (P<0.05)

Packaged food, Ready to eat foods and fast foods are high in salt, sugar and fat, frequent consumption of these foods leads to overweight and obesity and that causes many health issues in children.

There was a significant positive correlation of frequency intake of instant noodles/ cornflakes and soft drink with BMI (p<0.05).

A significant negative correlation of time spent playing was observed with BMI of the child (r=-0.224, p=0.008). This indicates that more time the child spent playing games, lesser was his BMI. That is activity levels were indirectly proportional to BMI of the child.

An important negative connection was found between playing time and the BMI of children. (P>0.05) This suggests that the longer the child spent playing games, the lower the BMI. This study found that the more parents encouraged and allowed children to play, the less time children spent playing.

The result shows that there was a significant positive correlation of the time that parents spent on screen and amount of time child spent on screen (r=0.368, p=0.001). This indicates that if the parent spent more time on screen then the child also tended to spend more time on screen.

This study found that parental screen time spent by parents was related to screen time spent by children. This suggests that if the parent spends more time onscreen, the child also has a tendency to spend more time onscreen. In this study children's screen time was positively associated with their BMI. Thus, if children spend more time inactively in front of the screen that impacts their weight.

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10. Conflict of Interest

None.

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