ORIGINAL RESEARCH

Association of Early Childhood Caries with Body Mass Index, Dietary Habits, and Socioeconomic Status among Preschool Children of Kelambakkam

Anisha Suresh[1], Daya Srinivasan[2], Senthil Eagappan AR[3], Shruthi Mahadevan[4], Harish Sumathi Suresh Babu[5]

Abstract

Introduction: One of the most prevalent oral diseases affecting preschoolers, early childhood caries (ECC), can significantly lower a child's quality of life. The pain and discomfort that ECC causes will alter the child's eating habits, which will have an impact on both their physical and mental health, as shown by the deviation from the body mass index (BMI). Dental caries and deviation from the normal BMI are both significantly influenced by children's eating habits and socioeconomic status (SES).

Aim: To determine the association of ECC with BMI, dietary habits, and SES among 3–6-year-old preschool children.

Materials and methods: A cross-sectional study was conducted among 375 preschool children of 3–6 years of age. The decayed, missing, or filled teeth (deft) index was used to determine the caries status. Measurement of height (m) and weight (kg) was done using a stadiometer and electronic weighing machine. For each child, the BMI (kg/m^2) was calculated, and the child's body weight status was assessed using Centers for Disease Control and Prevention (CDC)-based classification. Questionnaires were collected with demographic details, 3 days diet diary, and the SES of parents. The dietary habit and SES were obtained from the healthy eating index-2005 (HEI-2005) score and Modified Kuppuswamy's Scale 2018. All the data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) software V 20.0.

Result: The prevalence of ECC was 44.8%. On comparison of mean height, weight, and BMI scores, there was a significant difference in mean weight ($p = 0.006$) and BMI ($p = 0.001$) among the two study groups. Children with ECC had a lower HEI-2005 score and belonged to a lower social class compared to caries-free children ($p = 0.001$).

Conclusion: Children with ECC are significantly associated with BMI being overweight, or risk of being overweight; lower grades of SES and lower total score of HEI-2005 with poor diet and diet that needs improvement.

Keywords: At risk of overweight, Body mass index for age, Decayed, missing, or filled teeth, Early childhood caries, Healthy eating index, Overweight, Socioeconomic status.

International Journal of Clinical Pediatric Dentistry (2023): 10.5005/jp-journals-10005-2606

Introduction

Early childhood caries (ECC) have a major impact on children's physical and mental health.[1,2] The Bangkok Global Summit in 2018 studied the global prevalence of ECC in preschool children for the past 20 years. According to their findings, caries prevalence was 17% in 1-year-olds and significantly raised to 36% in children aged 2 years, 43% in children aged 3 years, and 63% in children aged 5 years.[3,4] The prevalence of ECC varies by population, with far East Asia having the highest incidence and severity of the condition, with prevalence rates in 3-year-old children ranging from 36 to 85%. In India, among 8–48-month-old children, 44% prevalence has been reported. Children under the age of 3 in rural South India were observed to have 40.6% ECC prevalence.[5]

Early childhood caries (ECC) is a multifactorial disease with various risk factors that interrelate to increase the risk of developing the disease. Kirthiga et al. in 2019 listed the risk factors associated with ECC as factors linked to diet, sociodemographic variables, oral hygiene habits, breastfeeding and bottle feeding, bacterial flora, tooth morphology, and other factors such as parent's education level, and perinatal factors.[6] Throughout the last few decades, dietary habits have changed across all age groups and populations which have been associated with a higher risk of obesity, diabetes, and other chronic diseases.[7] Dental caries and variation in weight in children share some common risk factors such as dietary habits, SES, way of living, and other social and environmental factors.[8]

Variance in weight may occur due to an imbalance between calorie consumption and expenditure of energy. Both being underweight and being overweight have detrimental effects on health. Childhood obesity is on the rise globally and can pave the way to adult obesity.[9] Overweight and obese children are more likely to develop systemic medical conditions such as type 2 diabetes mellitus, high blood pressure, cardiovascular disease,

[1–5]Department of Pediatric and Preventive Dentistry, Chettinad Dental College and Research Institute, Chennai, Tamil Nadu, India

Corresponding Author: Anisha Suresh, Department of Pediatric and Preventive Dentistry, Chettinad Dental College and Research Institute, Chennai, Tamil Nadu, India, Phone: +91 9952502469, e-mail: anishasuresh95@gmail.com

How to cite this article: Suresh A, Srinivasan D, AR SE, *et al.* Association of Early Childhood Caries with Body Mass Index, Dietary Habits, and Socioeconomic Status among Preschool Children of Kelambakkam. Int J Clin Pediatr Dent 2023;16(4):565–571.

Source of support: Nil

Conflict of interest: None

and psychosocial issues than children of normal weight.[9,10] Studies have been conducted to relate dental caries with obesity, and a significant association was reported in the literature between the two, but there is insufficient and inconsistent documentation of such associations. However, some studies with large populations have found no link between BMI and dental caries.[7]

Being underweight can be a sign of malnutrition, which is a syndrome of insufficient protein, energy, and micronutrient intake combined with frequent infections, which impairs growth and development in children. Impaired saliva secretion due to salivary gland hypofunction increases the susceptibility of caries in malnourished children.[11] In 1998, Alverez et al. found that the prevalence of caries in the primary teeth was twice as high in malnourished children as it was in children with adequate nutrition.[12] Dental caries status can be linked to both underweight and overweight conditions, but there is little evidence to support this link, particularly in young children.

Dental caries and deviation from the normal BMI are both significantly impacted by children's eating habits. Evaluating the diet quality of children is important for assessing their nutritional status and oral health. ECC is more prevalent among children with a low SES.[13] The dietary habits and healthy behaviors are dependent on the knowledge of parents. Lower-income can affect the accessibility to dental care leading to negligence of proper oral care. Without having adequate awareness about dental caries and poor maintenance of oral hygiene, appropriate prevention cannot be done, causing higher caries prevalence.[14]

Studies focusing on ECC and its risk factors are limited. In order to provide effective prevention from an early age, it is essential to correctly identify children at high risk. The present study was conducted to assess the association of ECC with BMI, dietary habits, as measured by the HEI-2005, and SES of preschool children of Kelambakkam.

Materials and Methods

In the present study source of data regarding the number of schools was obtained from the "Directorate of School Education—Tamil Nadu," and the schools were selected from the list. The sample size was estimated using G*Power statistical software.

The Institutional Human Ethics Committee granted ethical approval (proposal no: 190/IHEC/1-19). Prior to the start of the study, permission from the school authorities and written informed consent from the parents or other legally accepted representatives of the children were obtained. Oral examinations, anthropometric measurements, a questionnaire, and 3 days diet diary were used to collect the data. All the data were kept completely confidential throughout the study.

Study Population

The study sample included 375 preschool children in the age group of 3–6 years of both genders, of which 207 children were caries-free, and 168 children were affected with ECC. A group of 3–6-year-old healthy preschool children of both genders without any systemic impairments were included in the present study. Children with any syndromes that can affect the oral cavity, children with long-standing medical conditions, physical or intellectual disabilities, or long-term use of antibiotics or other drugs that could affect their nutritional intake or oral health status, and parents/children not willing to take part in the study were excluded.

Clinical Oral Examination

A thorough clinical examination was conducted by a single, trained examiner, with one assistant present to record the findings. The caries status was recorded using the deft index by Gruebbel.[15] The children were examined sitting in chairs in school rooms under visible light using a sterilized mouth mirror, tongue blade, and No.23 explorer (Shepard's hook explorer). To manage moisture and, if necessary, remove plaque from tooth surfaces, cotton swabs, and gauze were utilized. The deft index was used to diagnose dental caries, where a deft score of 0 was caries-free, and a deft score of 1 and above was considered to be ECC.

Anthropometric Measures

Body mass index (BMI) was calculated from children's weight and height. An electronic weighing machine (SAMSO, New Delhi, India) was used to measure the weight (in kilograms) to the nearest 100 gm. Stadiometer (IS IndoSurgicals, New Delhi, India) was used to measure the height to the nearest 0.1 cm. During the measurements, the children were standing straight without shoes, heels together, and their heads positioned so that the line of vision was perpendicular to the body.

The commonly used anthropometric index of weight and height is the BMI, which is defined as body weight in kilograms divided by height in meters squared (Keys et al.).[16] Using the calculated BMI score, the BMI percentiles for age and gender were plotted separately for boys and girls on the CDC growth chart. The BMI-for-age percentile ranking provided by the CDC was used in this study to determine the "relative position of a child's BMI score among children of the same age and gender." Using age and gender-specific criteria, children were divided into four groups based on their BMI percentiles—underweight, normal weight, risk of overweight, and overweight.

Questionnaire

A pretested questionnaire[17] prepared in English and Tamil was handed out to all students and sent to parents through school authorities prior to the examination. There were three main sections in the questionnaire. In the first section, information about the children's demographics, such as name, age, and gender, as well as any relevant medical history and details about their oral hygiene routines, such as how frequently they brush their teeth and previous dental visits, were covered. The second section investigated the SES, assessed by questioning parents about their occupation, educational level, and monthly income. The third section included 3 days diet diary. The questionnaire was collected back from the children by the class teachers after 5 days.

Socioeconomic Status (SES)

The modified version of Kuppuswamy's SES Scale (2018) was used to assess the SES by questioning the parents about their occupation, educational level, and monthly income, which evaluated the parent's SES.

Dietary Habits

A diet diary was sent to the parents through the school administration to record children's dietary consumption for 3 days. Parents were told to record every food item consumed by the child at different sessions of the day, starting from breakfast to postdinner, with its corresponding quantity in household measures such as 1 cup, 1 tablespoon, and 1 teaspoon.

The HEI-2005[18] score was used to assess the overall diet quality of children. The HEI-2005 comprises 12 components that cover all of the significant food groups included in the United States Department of Agriculture—MyPyramid food guidance system.[19] All the data were loaded into Statistical Analysis System software, version 8.1 (1999–2000, Cary, North Carolina, United States of America), making it ready for HEI scoring. The standards for scoring were created using a density approach; that is, they are expressed as a percent of calories or per 1000 calories, and scores for individual components range from the lowest score of 0 to the highest score of 5, 10, and 20 points. Higher total scores on the HEI-2005, which has a maximum score of 100, indicate healthier nutrition. The descriptive and inferential statistics were analyzed by IBM SPSS version 20.0 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, New York, United States of America—IBM Corp).

Results

The present study was done to determine the association between BMI, dietary habits, SES, and ECC among 3–6-year-old preschool children of Kelambakkam. A total of 375 preschool children of the age-group of 3–6 years of both genders met the inclusion criteria and were included in this study. The 375 children were split into two groups 207 (55.2%) caries-free children and 168 (44.8%) children with ECC.

A comparison of mean age, height, weight, and BMI scores among caries-free and children with ECC is shown in Table 1. Independent samples *t*-test was used to compare the variables. The test shows that there is a significant difference in weight ($p = 0.006$) and BMI ($p = 0.001$) between the two study groups. The mean weight and BMI scores were significantly higher in children with ECC. The is no statistically significant difference in mean age ($p = 0.29$) and height ($p = 0.38$) observed between the study groups.

A Chi-squared test was done to compare the BMI for age and gender between the two study groups, and there was a significant difference in the distribution of BMI between caries-free children and children with ECC ($p = 0.001$) (Table 2). More children who tend to be at risk of being overweight have ECC. More children who tend to be of normal weight significantly were caries-free.

The dietary habits of the children were evaluated using the HEI-2005, for which the data were obtained from 3 days diet diary from each child. Table 3 shows the comparison of HEI-2005 components score between the caries-free and children with ECC on days 1, 2, and 3. The mean total HEI-2005 scores for the caries-free children were 73.94 ± 5.97 on day 1, 74.51 ± 4.95 on day 2, and 73.40 ± 5.26 on day 3. The mean total HEI-2005 scores for the children with ECC were 62.78 ± 8.32 on day 1, 63.33 ± 5.27 on day 2, and 63.47 ± 6.94 on day 3. Independent sample *t*-test was used for the comparison and demonstrated a significant difference in HEI-2005 total score between the two study groups ($p = 0.001$), with caries-free children having higher HEI-2005 mean total scores than the children with ECC. On comparing the mean total score of HEI-2005 components between the study groups, the total fruit, whole fruit, total vegetable, total grain, milk, oil, sodium, and solid fat, alcohol, and added sugars (SoFAAS) accounted for a significant difference in all observations (days 1, 2, and 3) whereas there was a significant difference in whole grain and milk on days 1 and 2 and saturated fat on days 2 and 3 ($p = 0.001$) among the caries-free children and children with ECC. No statistical difference was observed in the dark green/orange vegetables on all days, whole grain and meat on day 3, and saturated fats on day 1 among the study groups.

The dietary habit of each child was analyzed from the HEI-2005 total score as a good diet, a diet that needs improvement, and a poor diet, as presented in Table 4. A Chi-squared test was done to compare the dietary habit among the two study groups. On day 1, a poor diet was observed in 6.50% of children with ECC, and caries-free children did not have a poor diet, 90.30% of caries-free children, and 92.30% of children with ECC had a diet that needed improvement. A total of 9.70% of caries-free and 1.20% of children with ECC had a good diet that was statistically significant ($p = 0.001$). On day 2, none of the children had a poor diet; 90.80% of caries-free children and 99.40% of children with ECC had a diet that needed improvement. Around 9.20% of caries-free and 0.60% of children with ECC had a good diet which was statistically significant ($p = 0.001$). On day 3, 4.20% of children

Table 1: Comparison of mean age, height, weight, and BMI scores among caries-free and children with ECC

Variable	*Group*	*Mean*	*Standard deviation (SD)*	*t*	*p-value*
Age	Caries-free	4.24	1.13	1.05	0.29
	ECC	4.36	1.18		
Height	Caries-free	100.30	7.22	0.88	0.38
	ECC	100.94	6.79		
Weight	Caries-free	16.17	3.27	2.7	0.006
	ECC	17.12	3.30		
BMI	Caries-free	15.95	1.82	3.7	0.001
	ECC	16.69	2.01		

Table 2: Comparison of BMI for age according to caries-free and ECC children

	Caries free children		*Children with ECC*		
BMI	*N*	*%*	*N*	*%*	*p-value*
Underweight	32	15.5	27	16.1	0.001
Normal weight	138	66.7	63	37.5	
Risk of overweight	21	10.1	43	25.6	
Overweight	16	7.7	35	20.8	

Table 3: Comparison of the HEI-2005 components scores between the two study groups on days 1, 2, and 3

		Caries-free		*ECC*		
Variable	*Day*	*Mean*	*SD*	*Mean*	*SD*	*p-value*
Total fruit	1	2.60	1.11	1.30	1.11	0.001
	2	2.84	0.65	1.59	0.71	0.001
	3	2.72	0.65	1.35	1.01	0.001
Whole fruit	1	3.79	1.58	1.89	1.62	0.001
	2	4.23	0.83	1.62	1.18	0.001
	3	4.18	0.92	1.82	1.46	0.001
Total veg	1	3.18	1.13	2.05	1.16	0.001
	2	3.38	0.93	2.06	0.66	0.001
	3	3.33	0.94	2.10	1.14	0.001
DG/O veg	1	3.31	1.47	3.41	1.20	0.49
	2	3.05	1.34	3.14	0.59	0.42
	3	3.41	1.52	3.18	1.05	0.09
Total grain	1	4.61	0.68	3.96	0.81	0.001
	2	4.68	0.44	4.12	0.31	0.001
	3	4.61	0.63	4.06	0.73	0.001
Wholegrain	1	0.80	0.70	0.46	0.76	0.001
	2	0.99	0.56	0.40	0.15	0.001
	3	0.68	0.54	0.58	0.77	0.143
Milk	1	5.81	1.51	4.75	2.12	0.001
	2	6.15	1.91	4.99	1.55	0.001
	3	5.61	1.54	5.12	1.89	0.005
Meat	1	4.12	2.12	2.21	2.59	0.001
	2	3.51	1.53	2.31	1.39	0.001
	3	2.84	1.65	2.59	2.41	0.24
Oil	1	8.56	2.21	6.05	2.14	0.001
	2	8.73	1.84	6.16	1.29	0.001
	3	8.60	1.71	6.12	2.11	0.001
Sat fat	1	8.84	1.87	8.50	2.70	0.15
	2	9.49	0.45	9.71	0.31	0.001
	3	9.40	1.83	8.38	2.91	0.001
Na	1	8.67	0.79	9.43	1.24	0.001
	2	8.41	0.75	8.85	1.37	0.001
	3	8.80	0.68	9.38	1.06	0.001
SoFAAS	1	19.66	1.06	18.79	2.33	0.001
	2	19.07	1.82	18.39	2.14	0.001
	3	19.21	1.70	18.79	2.21	0.041
Total	1	73.94	5.97	62.78	8.32	0.001
	2	74.51	4.95	63.33	5.27	0.001
	3	73.40	5.26	63.47	6.94	0.001

with ECC and none of the caries-free children had poor diets. A total of 94.20% of caries-free children and 95.80% of children with ECC had a diet that needs improvement, and 5.80% of caries-free and no children with ECC had a good diet which was statistically significant ($p = 0.001$).

The modified version of Kuppuswamy's SES scale (2018) was used to assess the SES. A Chi-squared test was done to compare the different socioeconomic classes with caries-free children and children with ECC, as represented in Table 5. Among the caries-free children, 30.9% were upper class, 44.4% were in the upper middle, 18.8% were lower middle, and 5.8% were in the upper lower class. Of children with ECC, 10.7% were upper class, 38.7% were in the upper middle, 34.5% were lower middle, 14.9% were in the upper lower class, and 1.2% were in the lower class. A statistically significant difference was observed in the distribution of social class between the two study groups, with children with ECC associated with lower socioeconomic class and children belonging to the upper class being significantly caries-free ($p = 0.001$).

Discussion

Dental caries and variations in body weight have similar etiological causes, such as diet and SES. In many Asian nations, including India, the adoption of a modern diet packed with processed foods has

Table 4: Comparison of dietary habits among two study groups

		Caries-free children		*Children with ECC*		
Day	*HEI total score*	*N*	%	*N*	%	*p*-value
Day 1	**≤50** (poor diet)	0	0	11	6.5	0.001
	51–80 (diet needs improvement)	187	90.3	155	92.3	
	>80 (a good diet)	20	9.7	2	1.2	
Day 2	**≤50** (poor diet)	0	0	0	0	0.001
	51–80 (diet needs improvement)	188	90.8	167	99.4	
	>80 (a good diet)	19	9.2	1	0.6	
Day 3	**≤50** (poor diet)	0	0	7	4.2	0.001
	51–80 (diet needs improvement)	195	94.2	161	95.8	
	>80 (a good diet)	12	5.8	0	0	

Table 5: Comparison of caries-free and children with ECC with socioeconomic class (modified Kuppuswamy's scale 2018)

	Caries-free children		*Children with ECC*		*Total*	
Socioeconomic class	*N*	%	*N*	%	%	*p-value*
Upper	64	30.9	18	10.7	21.8	0.001
Upper middle	92	44.4	65	38.7	44.8	
Lower middle	39	18.8	58	34.5	22.7	
Upper lower	12	5.8	25	14.9	5.6	
Lower	0	0	2	1.2	0.5	

resulted in a rising rate of dental caries and obesity, both of which have an impact on children's nutritional status and overall health.[20]

The prevalence of ECC in the current study was 44.8%, which is comparable to the 49.6% prevalence of ECC observed by Ganesh et al. in 2019[5] in a systematic review that included 54 studies conducted in India. The prevalence of ECC in this study was more compared to North America (31.7%) and less compared to the African population (66.2%).[21] The difference may be attributed to the SES of the countries where the prevalence is low in developed countries with high SES. Developed countries have good oral health care and preventive measures compared to countries with lower SES.

The best way to evaluate a child's nutritional status is by calculating their BMI for age based on their height and weight. In the present study, the mean weight in kilograms of caries-free children was 17.29 ± 2.57, and for children with ECC was 17.87 ± 2.56, showing a statistically significant difference ($p = 0.006$), which reveals that children with ECC had a higher mean weight than caries-free children. The findings of the present study are in contrast to Bhoomika et al.[11] in Mathura city and Kurian et al.[22] in Puducherry, where the mean weight of caries-free children and children with ECC did not differ statistically. Caries-free children have better oral health and can have a better diet. Children with ECC tend to consume more refined and soft food due to their poor oral health status and thus gain weight which is reflected in their BMI.

The present study did not show any significant difference in mean height among the two study groups ($p = 0.38$), which is similar to the report by Bhoomika et al.[11] In the present study, mean BMI scores of caries-free and children with ECC were 16.13 ± 1.79 and 16.8 ± 2.04 respectively showing a significant difference ($p = 0.001$) which reveals that the children with ECC have a higher BMI score compared to caries-free children. Bangash et al.[2] (20.34 ± 3.75) also reported higher BMI scores among children with ECC in Peshawar, similar to the present study. In contrast, a low BMI score was observed in children with ECC (15.49 ± 1.87) by Gaur and Nayak 2011 in Karnataka. Children with ECC tend to have increased weight which is not reflected in gain in height. This results in increased BMI. Weight gain is more determined by the dietary intake. The diet gain is more determined by genetic and growth factors. Thus, emphasizing the poor dietary habits in children with ECC.

The findings of this study show an association between ECC and being overweight, which is similar to the study by Davidson et al.[23] in Canada, Marshall et al.[24] in Iowa, and Vazquez-Nava et al.[25] in Mexico, where ECC was associated with overweight. Studies done by Sharma and Hegde[26] in Bangalore, in Udupi District, and Reddy et al.[27] in Bhopal also found an association between dental caries and being overweight in children.

The probable reason for obesity/overweight associated with dental caries may be due to the consumption of food rich in refined carbohydrates. Vázquez-Nava et al.[25] reported in their study that the risk for developing caries was 2.34 times greater in children who consume fermentable carbohydrates than the children who do not consume these. Sharma and Hegde in their study reported that children who preferred to eat sweet and fatty food had increased body weight and caries experience.[25] Moreover, the carious tooth may affect the mastication of the child and limit the intake of food that needs to be chewed, like meat, and fibrous and unprocessed food, which are known to have a protective effect on teeth as well as body weight status. They may prefer eating soft processed food and juices which are high in fat and sugar content. In the present study, the children are probably fed cariogenic and obesogenic food, that is, food high in fat and sugar content, accounting for ECC and obesity.

Sharma et al.[28] in Haryana, Zhou et al.[29] in China, Hong et al. in the United States of America,[30] Alm et al.[31] in Sweden, and Sheller et al.[32] reported no relationship between dental caries status and variation in weight among preschool children.

In some studies (Vania et al.[33] in Italy and Oliveira et al.[34] in London), dental caries were linked to being underweight and malnutrition, which contrasts with the findings of the present study. Similar findings were also reported by Reddy et al.[20] in Nellore among 6–12-year-old children. In this study, the lesser prevalence of the underweight category may be due to the ethnic background of the population, which was done in the suburban region of Tamil Nadu. The state has various programs to improve the nutritional status and well-being of the children under the Integrated Child Development Scheme.[35] The schemes include Balwadis, preschool education, supplementary nutrition, immunization, health check-ups, chief minister Nutritious Meal Programem, etc. These programs enhanced the nutritional, social, and economic condition of children owing to the lesser prevalence of underweight children in the present study. But every underweight child is a cause of severe concern and needs to be monitored and taken care of.

Dental caries and BMI are significantly impacted by diet. This study shows that caries-free children had higher HEI mean total scores than the children with ECC. A higher HEI score indicates that caries-free children have healthy dietary habits compared to children with ECC. The findings were similar to Priyadarshini and Gurunathan.[36]

In the present study, consumption of total fruit, whole fruit, total vegetable, total grain, and milk was high, and oil, sodium, and SoFAAS were low in caries-free children. The findings are contrary to Nadine et al.[37] in Egypt, who reported no significant difference in consumption of total vegetables, total grain, oil, and SoFAAS between children with ECC and without caries. Grain and meat consumption were also significantly different on days 1 and 2 among the study groups. There was a statistically significant difference in saturated fat consumption on days 2 and 3, suggesting low intake of saturated fat among caries-free children. No difference was observed in the dark green/orange vegetable consumption on all days among the two study groups. The dark green and orange vegetables (spinach, beans, drumstick, carrot, and pumpkin) are cultivated locally in fields, making them easily available for both groups, so there was no significance in the consumption of these foods between the two study groups.

The overall score, which ranges from 0 to 100, was calculated by adding the mean total scores of the 12 components. A total score of ≥80 suggests a good diet, 50–80 suggests a diet that needs improvement, and ≤50 suggests a poor diet. On all 3 days of diet recording, children with ECC had a high prevalence of poor diet and diet that needs improvement compared to caries-free children. The present study shows that children with ECC consumed less fibrous foods (fruits and vegetables), milk, meat, and whole grain. Their diet had more saturated fat and SoFAAS content—solid fat present in meat, milk, and junk food and trans fats present in packed food items. They preferred eating refined food rich in sugar, saturated fat, and sodium which are obesogenic as well as cariogenic. Thus, the children with ECC had a low total HEI-2005 score compared to the caries-free children, and they tend to have a diet that needs improvement and a poor diet.

Socioeconomic status (SES) is another contributing factor to ECC and variation in BMI. In India, Kuppuswamy's scale and its modifications are used to classify socioeconomic class. In the present study, the SES was evaluated using a modified version of Kuppuswamy's SES Scale (2018). The two study groups showed a statistically significant difference in the distribution of social class, where children with ECC were associated with the lower socioeconomic class (p = 0.001). Chopra et al.[8] in Haryana, Sharaddha and Ashwin[38] in Mumbai, and Abbass et al.[1] in Egypt also reported similar findings where the prevalence of dental caries was high in low socioeconomic categories. Sridevi et al.[39] in Sangili reported that children in lower middle SES were at three times higher risk of developing ECC. Low parental education levels may be a contributing factor to the high caries prevalence in poor socioeconomic category children, which in turn may have an impact on dietary habits and oral hygiene practices. So, the children are fed more cariogenic food like refined carbohydrates and sugars, which may increase caries prevalence as well as body weight status. The low family income is attributed to the negligence of dental treatment, which increases dental caries prevalence. Lower economic status is also related to an unhealthy lifestyle.

In the present study, we found that increased BMI score, overweight, lower HEI, poor dietary habit, and lower SES are associated with increased risk of ECC.

Conclusion

The present study concluded that ECC is associated with being overweight, having a poor diet and diet that needs improvement, and having lower SES. Obesity and dental caries are two conditions that can affect the overall health and well-being of an individual, and they share common risk factors like diet and SES. Pediatric dentists can identify these risk factors during routine examinations by taking anthropometric measurements and analysis of diet. By finding these risk factors at an early stage, both the disease can be prevented by using appropriate preventive measures.

It is important to provide children with nutritional counseling to motivate them to consume a balanced diet containing whole grains, vegetables, and fruits as well as minimal amounts of fat, cholesterol, and saturated (particularly transsaturated) fat and moderate intake of sugars and salt (sodium). Children should be encouraged to eat good, nutrient-dense, and low-sugar snacks that promote an optimal intake of key nutrients without consuming additional calories or developing dental caries. Thus, the anticipatory guidance and diet counseling given to the child and the parent instil healthy habits from childhood. Preventive measures at the community level can be implemented to help the disadvantaged population who cannot access proper oral health care.

Orcid

Anisha Suresh https://orcid.org/0000-0002-4812-1595
Daya Srinivasan https://orcid.org/0000-0001-5453-4380
Senthil Eagappan AR https://orcid.org/0000-0003-2933-6272

References

1. Abbass MMS, Mahmoud SA, El Moshy S, et al. The prevalence of dental caries among Egyptian children and adolescences and its association with age, socioeconomic status, dietary habits and other risk factors. A cross-sectional study. F1000Res 2019;8:8. DOI: 10.12688/f1000research.17047.1
2. Bangash M, Mustafa L, Idrees S, et al. Association of weight, height and body mass index with early childhood caries among primary school children of Peshawar. TPMJ 2019;26(9):1592–1596. DOI: 10.29309/TPMJ/2019.26.09.3863
3. Tinanoff N, Baez RJ, Diaz Guillory C, et al. Early childhood caries epidemiology, aetiology, risk assessment, societal burden, management, education, and policy: global perspective. Int J Paediatr Dent 2019;29(3):238–248. DOI: 10.1111/ipd.12484

4. American Academy of Pediatric Dentistry. Policy on early childhood caries (ECC): Classifications, consequences, and preventive strategies. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2020:79–81.
5. Ganesh A, Muthu MS, Mohan A, et al. Prevalence of early childhood caries in India – a systematic review. Indian J Pediatr 2019;86(3): 276–286. DOI: 10.1007/s12098-018-2793-y
6. Kirthiga M, Murugan M, Saikia A, et al. Risk factors for early childhood caries: a systematic review and meta-analysis of case control and cohort studies. Pediatr Dent 2019;41(2):95–112.
7. Bener A, Al Darwish MS, Tewfik I, et al. The impact of dietary and lifestyle factors on the risk of dental caries among young children in Qatar. J Egypt Public Health Assoc 2013;88(2):67–73. DOI: 10.1097/01.EPX.0000430962.70261.8e
8. Chopra A, Rao NC, Gupta N, et al. The predisposing factors between dental caries and deviations from normal weight. N Am J Med Sci 2015;7(4):151–159. DOI: 10.4103/1947-2714.156011
9. Bagherian A, Sadeghi M. Association between dental caries and age-specific body mass index in preschool children of an Iranian population. Indian J Dent Res 2013;24(1):66–70. DOI: 10.4103/0970-9290.114956
10. Aluckal E, Anzil K, Baby M, et al. Association between body mass index and dental caries among anganwadi children of Belgaum City, India. J Contemp Dent Pract 2016;17(10):844–848. DOI: 10.5005/jp-journals-10024-1941
11. Bhoomika W, Ramakrishna Y, Munshi A. Relationship between severe early childhood caries and body mass index. J Clin Pediatr Dent 2013;37(3):235–242. DOI: 10.17796/jcpd.37.3.u56q1554r67g4g31
12. Alverez JO, Lewis CA, Saman C, et al. Chronic malnutrition, dental caries, and tooth exfoliation in Peruvian children aged 3-9 years. Am J Clin Nutr 1998; 48(2):368–372. DOI: 10.1093/ajcn/48.2.368
13. Bhardwaj A, Bhardwaj SV. Early childhood caries and its correlation with maternal education level and socioeconomic status. J Orofac Sci 2014;6(1):53–57. DOI: 10.4103/0975-8844.132582
14. Gibson S, Williams S. Dental caries in pre–school children: associations with social class, toothbrushing habit and consumption of sugars and sugar–containing foods. Further analysis of data from the National Diet and Nutrition Survey of children aged 1.5-4.5 years. Caries Res 1999;33(2):101–113. DOI: 10.1159/000016503
15. Peter S. Essentials of Public Health Dentistry. 5th Edition. New Delhi: Arya Medi Publishing House. 2013
16. Centers for Disease Control and Prevention. Using the BMI-for-age growth charts (2001).
17. Saleem SM. Modified Kuppuswamy scale updated for year 2018. Indian J Res 2018;7(3):6–7.
18. Guenther PM, Reedy J, Krebs-Smith SM, Reeve BB, Basiotis PP. Development and Evaluation of the Healthy Eating Index-2005 Technical Report.:41.
19. Britten P, Marcoe K, Yamini S, et al. Development of food intake patterns for the MyPyramid food guidance system. J Nutr Educ Behav 2006;38(6 Suppl):S78–92. DOI: 10.1016/j.jneb.2006.08.007
20. Reddy VP, Reddy VC, Krishna Kumar RVS, et al. Dental caries experience in relation to body mass index and anthropometric measurements of rural children of Nellore district: a cross-sectional study. J Indian Soc Pedod Prev Dent 2019;37(1):12–17. DOI: 10.4103/JISPPD.JISPPD_52_18
21. El Tantawi M, Folayan MO, Mehaina M, et al. Prevalence and data availability of early childhood caries in 193 United Nations countries, 2007–2017. Am J Public Health 2018;108(8):1066–1072. DOI: 10.2105/AJPH.2018.304466
22. Kurian J, Renganathan S, Gurusamy K, et al. Association between early childhood caries and age and gender specific height, weight and mid upper arm circumference of school children in Puducherry-"a comparative study". Biol Eng Med Sci Rep 2016;2(1):13–17. DOI: 10.5530/BEMS.2016.1.3
23. Davidson K, Schroth RJ, Levi JA, et al. Higher body mass index associated with severe early childhood caries. BMC Pediatr 2016;16(1):137. DOI: 10.1186/s12887-016-0679-6
24. Marshall TA, Eichenberger-Gilmore JM, Broffitt BA, et al. Dental caries and childhood obesity: roles of diet and socioeconomic status. Community Dent Oral Epidemiol 2007;35(6):449–458. DOI: 10.1111/j.1600-0528.2006.00353.x
25. Vázquez-Nava F, Vázquez-Rodríguez EM, Saldívar-González AH, et al. Association between obesity and dental caries in a group of preschool children in Mexico. J Public Health Dent 2010;70(2):124–130. DOI: 10.1111/j.1752-7325.2009.00152.x
26. Sharma A, Hegde AM. Relationship between body mass index, caries experience and dietary preferences in children. J Clin Pediatr Dent 2009;34(1):49–52. DOI: 10.17796/jcpd.34.1.17364206hqm0477h
27. Reddy KV, Thakur AS, Moon N, et al. Association between overweight and dental caries among 8-13 year old school children in central India. J Indian Assoc Public Health Dent 2018;16(1):22–25. DOI: 10.4103/jiaphd.jiaphd_91_17
28. Sharma B, Indushekar KR, Saraf BG, et al. Are dental caries and overweight/obesity interrelated? A cross-sectional study in rural and urban preschool children. J Indian Soc Pedod Prev Dent 2019;37(3):224–231. DOI: 10.4103/JISPPD.JISPPD_140_18
29. Zhou N, Zhu H, Chen Y, et al.Dental caries and associated factors in 3 to 5-year-old children in Zhejiang Province, China: an epidemiological survey. BMC Oral Health 2019;19(1):9. DOI: 10.1186/s12903-018-0698-9
30. Hong L, Levy SM, Warren JJ, et al. Association between enamel hypoplasia and dental caries in primary second molars: a cohort study. Caries Res 2009;43(5):345–353. DOI: 10.1159/000231571
31. Alm A, Isaksson H, Fåhraeus C, et al. BMI status in Swedish children and young adults in relation to caries prevalence. Swed Dent J 2011;35(1):1–8.
32. Sheller B, Churchill SS, Williams BJ, et al. Body mass index of children with severe early childhood caries. Pediatr Dent 2009;31(3): 216–221.
33. Vania A, Parisella V, Capasso F, et al. Early childhood caries underweight or overweight that is the question. Eur J Paediatr Dent 2011;12(4): 231–235.
34. Oliveira LB, Sheiham A, Bönecker M. Exploring the association of dental caries with social factors and nutritional status in Brazilian preschool children: dental caries and nutritional status. Eur J Oral Sci 2008; 116(1):37–43. DOI: 10.1111/j.1600-0722.2007.00507.x
35. Shiny S. Child welfare schemes in Tamil Nadu (1975-1987). Sparkl Int J Multidiscipl Res Studies 2019;2(3):30–36.
36. Priyadarshini P, Gurunathan D. Role of diet in ECC affected South Indian children assessed by the HEI–2005: a pilot study. J Family Med Prim Care 2020;9(2):985–991. DOI: 10.4103/jfmpc.jfmpc_851_19
37. Nadine AAZ, Dowidar KML, Wafaa EEA. Assessment of the healthy eating index–2005 as a predictor of early childhood caries. Inter J Paed Dent 2014;25(6):436–443. DOI: 10.1111/ipd.12150
38. Shraddha N, Ashwin J. Prevalence of factors predisposing and association of childhood obesity and dental conditions in Indian urban preschool children. Oral Health Dental Sci 2018;2(3):1–8. DOI: 10.33425/2639-9490.1021
39. Sridevi T, Pranoti S, Anand S, et al. Factors associated with early childhood caries among 3 to 6 year old children in India: a case control study. J Neonatal Perinatal Med 2018;11(1):45–50. DOI: 10.3233/NPM-181723