Original Article

Role of diet in ECC affected South Indian children assessed by the HEI-2005: A pilot study

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Abstract

Background: "Early Childhood Caries"(ECC) is a serious global oral health problem affecting children of 71 months of age or younger. ECC has a multifactorial model of causation and diet imparts an intricately specific effect. **Aim:** The study aims to determine the protective and harmful role of different dietary consumption in the causation of ECC in South Indian children, assessed by the Healthy Eating Index-2005 (HEI-2005). **Settings and Design:** A pilot study of cross-sectional analytical study design was conducted in a dental college and hospitals in India. **Materials and Methods:** Hundred healthy South Indian children of 3–6 years age were screened for dental caries by the ICDAS II criteria, dmf/dmfs and pufa index. Participants were divided into three groups according to their caries status such as [Group 1:caries-free, group 2:ECC, group 3:severe ECC (S-ECC)]. Questionnaires were collected with demographic details, 24 h previous dietary record, and a subsequent 3-day chart of dietary consumption. Accordingly, the HEI-2005 score was calculated for each participant. Descriptive statistics was used for analysis of sociodemographic data, Kruskal–Wallis test for multivariate analysis, and for interpreting the total effect of HEI on study groups, logistic regression analysis was used. **Results:** Caries experience in South Indian children demonstrated a significant association with age. Caries-free children showed significantly higher association with darkgreen/orange vegetables/legumes, milk, and calories from SoFAAS (solid fat, alcohol, and added sugars) than the other groups. **Conclusions:** The study findings illustrated a prominent protective role played by specific components of the HEI-2005, as healthy dietary intake against dental caries in South Indian children.

Keywords: Dental caries, diet, dietary index, dietary intake, ECC, HEI-2005, index components

Introduction

"Early childhood caries"(ECC) is the most common chronic, infectious oral disease affecting young children till the age of 6 years both in developing as well as in industrialized countries.[1] ECC is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces (dmfs) in any primary tooth, in a child of 71 months of age or younger.[2] In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (S-ECC). From age 3–5, 1 or more dmfs in primary maxillary anterior teeth or a mean dmfs score of >=4 (age 3), >=5 (age 4), or >=6 (age 5) denotes S-ECC.[3]

The etiology behind ECC represents a multifactorial model of causation, mainly attributing to an intricately time-specific interplay of microbes, substrate, oral environment, genomics, and salivary components acting in a vicious cycle on tooth surfaces.[4,5] Studies have accounted for debatable results pertaining to effectiveness in ECC prevention by an efficient prenatal intervention.[6] Pregnancy is considered to be an ideal

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and suitable time frame to promote effective primary prevention of ECC since maternal oral health and behavior exerts profound influence on children's oral health status.[7] Hence, the role of primary health care personnel becomes highly paramount in providing prenatal oral health screening, fluoride supplements, xylitol gum chewing, and oral health education with timely referral for dental treatments, which might result in the prevention of ECC in children at primary level.[6] Numerous studies have demonstrated that maternal untreated caries and greater salivary carriage of Streptococcus mutans, eventually increase the risk of ECC in children. Children's dietary practices and oral hygiene habits strongly rely on parents' or caregivers' oral health knowledge, beliefs, and practices, which have to be imparted at a primary level.[8,9] The previous studies have outlined a positive ECC prevention outcome by imparting prenatal oral health education and intervention.[10,11] ECC is considered to be a "family malady" where the disease is infectious, transmissible, and often associated with poor dietary habits.[12] Children affected with ECC should be screened at the beginning of its occurrence at a primary care level to prevent its fast and progressive stage of tooth decay (rampant caries) apart from its other major consequences including pain, hospitalization, emergency due to abscess/systemic infection, and even death.[13,14] Besides the humongous consequences of ECC, costs associated with its treatment constitute a major public health expenditure.[15]

Among the myriad of food components available, dietary sugar, fruit juices, condensed sugary items, and starchy foods are implicated to possess high cariogenic potential, whereas foodstuffs such as milk, cheese, unrefined plant foods, wholegrain foods, and meat have been investigated for their anticariogenic role.[16-21] The Healthy Eating Index-2005 (HEI-2005) is considered to be a standardized dietary assessment tool consisting of components from My Pyramid and is used in nutrition monitoring, interventions, and research.[22] Its 12 components are classified into two major components: 1) adequate components comprising of nine items and 2) moderate components comprising of three items. The adequate components include total fruit, whole fruit, total vegetables, darkgreen/orange vegetables/legumes, total grains, whole grains, milk, meat and beans, oils and the moderate components include saturated fat, sodium and calories from solid fat, alcohol and added sugars (SoFAAS).[23] Dietary adequacy is estimated by comparing intake with a recommendation.

The rationale behind conducting this study is to explore a close insight into the dietary practices found among the South Indian children and how the role of different dietary intake influences either in a protective or harmful way on the causation of ECC.

Hence, the present study aims to assess the protective as well as unhealthy (harmful) relationship of different dietary intake in the causation of ECC among South Indian children measured by the HEI-2005.

Materials and Methods

Study design

A pilot study with cross-sectional analytical study design was carried out on 100 healthy South Indian children attending the out-patient department of Pediatric and Preventive Dentistry of a Dental Institute in India either for treatment of dental caries or routine check-up from September, 2017 to march, 2018. The study participants were recruited by convenient sampling method. Recruitment of participants was based on the preset inclusion and exclusion criteria of the study. Healthy South Indian children of both gender in an age group of 3–6 years (36–71 months) with only primary dentition of comparable socioeconomic status and being residents of the same place were included for the study. Children with special healthcare needs, under prolonged antibiotic regimen or other medications which might affect their oral health status or dietary intake, and those undergoing any current myofunctional orthodontic treatment were excluded from the study.

According to the American Academy of Pediatric Dentistry (AAPD)[3] guidelines for ECC and S-ECC, recruited participants were divided into three groups of caries status: Group 1: caries-free, group 2: ECC, and group 3: S-ECC. Oral examination was done following the International Caries Detection And Assessment System (ICDAS II criteria)[24] for assessment of non-cavitated carious lesions since the dmf/dmfs index based on the WHO criteria[25] considers caries only at the dentine level (true cavitation), which is actually a known limitation of the index leading to underestimation of caries experience. Therefore, both the criteria were used to ensure maximum accuracy in caries diagnosis. The dmf/dmfs index was also undertaken despite the use of ICDAS II criteria to segregate participants into their caries status. Finally, the pulpal involvement, ulceration, fistula, and abscess index (pufa index)[26] were recorded to estimate the severity or progression of untreated dental caries and for devising a subsequent effective treatment plan.

Ethical considerations

The present study was approved by the Institutional Scientific Review Board and Human Ethics Committee (SRB/MDS/PEDO/17-18/0037, Date of approval: 18/08/2017) in accordance to the ethical standards laid down in the 1964 declaration of Helsinki and its later amendments. Prior to the beginning of the study, written informed consent was obtained from the parents/caregiver of the recruited participants only after the detailed explanation provided regarding the purpose and objectives of the present study.

Examiner calibration

Prior to the main study, training and calibration sessions were conducted. Both the authors (PP and DG) underwent caries diagnosis and standardization protocol exercises. Twenty children with dental caries were examined successively on the same day and were not included in the main study. The calculated

inter-examiner agreement for pufa was 97%, ICDAS II was 62%, and dmf/dmfs index was 65%. The kappa value for intra-examiner reliability was 0.93.

Clinical dental examination

Clinical examination for assessment of ICDAS II criteria was performed after cleaning (toothbrushing the teeth with toothpaste) and drying the teeth (three-way syringe air drying) using sterile dental mouth mirror and ball-tipped probe, i.e. CPITN probe under proper dental chair light (Kavo, Germany). For examination of dmf/dmfs index, a blunt explorer with mouth mirror was used. Finally, pufa index was recorded through direct visualization technique. Necessary treatment was provided thereafter to all the recruited participants.

Study tools

Questionnaire

A face-to-face structured interview in English was conducted by author (PP) with the parents/caregiver of the recruited participants. A validated and reliable questionnaire model tested in the previous study "the role of feeding practices as a determinant of the pufa index in children with early childhood caries" was adopted for the present study.[27] The questionnaire was first tested on 20 parents/care-giver to interpret their clarity of understanding and was then filled out. However, those 20 parents/care-giver were not included in the main study. No specific modifications were required except few minor changes based on the positive feedback provided by the parents/care-giver. The interview focused basically on demographic details, feeding pattern, type of snack intake, oral hygiene measures, frequency of dental visits, etc., Information was mainly gathered on dichotomous responses (yes/no) except for recording the diet history, contents of bottle-feeding and frequency of bottle feeding which were open-ended queries.

Dietary recall form

A 24-h food recall form was formulated to capture the preceding days' dietary intake.[23,28] Similar form was also filled on 3 successive days including one of the weekend days, through telephonic conversation both with the parents/caregiver and child. The form captured food items with its corresponding quantity at different sessions starting from breakfast to postdinner. The form was thoroughly explained to both the child whenever appropriate and their parents/care-giver. After completing all the forms and questionnaires, it was thoroughly revised both with children and their parents/care-giver to clarify and fill-up any necessary details through neutral questioning.

Healthy Eating Index-2005 (HEI-2005)

Each food item with its corresponding quantity obtained in the 24-h and 3-day dietary recall form was transposed into the corresponding components of HEI-2005.[22,23] Each of the components was assigned appropriate score according to the HEI-2005 scoring system and criteria ranging from a maximum score of 5, 10, and 20 points for the individual components, respectively, to a minimum score of zero.[29] The scores of all twelve components were then summed up to obtain the final score for each participant, which ranged from 0–100, and the dietary habit of each child was then accordingly analyzed.

Statistical analysis

Data was tabulated and analyzed using IBM.SPSS statistics software 23.0 Version. The software (SPSS) stands for Statistical Package for the Social Sciences and the version (2015) was named as IBM SPSS statistics, which provides a wide variety of analytical abilities such as descriptive statistics, univariate and multivariate statistical tools with graphical representation. Descriptive statistics for categorical variables, i.e. age and gender, was expressed by frequency and percentage analysis, whereas for continuous variable, i.e. quantity of diet, mean and standard deviation (S.D.) were used. Kruskal–Wallis test was used for multivariate analysis, while univariate logistic regression analysis was carried out to assess the effect of total HEI score on ECC and S-ECC model. In all the above statistical tools, a probability value of 0.05 was considered to be statistically significant.

Results

Age of participants in the present study ranged from 3 to 6 years with a mean age of 6.46 ± 1.98 in the caries-free group, 5.15 ± 1.73 in ECC group, and 3.50 ± 0.79 in S-ECC group showing a statistically significant difference between the groups (*P* value 0.0005), while the mean age of total sample was 5.86 ± 1.82. The recruited sample consisted of males (46%) and females (54%) with no significant difference in gender distribution between the groups [Table 1].

The mean total HEI-2005 components scores for the caries-free group were 80.38 ± 7.21 at 24 h, 79.23 ± 5.34 on day 1, 76.15 ± 7.68 on day 2, and 82.69 ± 8.07 on day 3 demonstrating a highly significant difference than the other two groups (*P* value 0.0001) [Table 2]. On comparing the mean scores of HEI-2005 components between the study groups only "dark green/orange vegetables/legumes," "milk," and "SoFAAS" accounted for highly significant differences at all observations (24 h, day1, day2, and day3) among the study groups. The mean scores of above three components were significantly higher among the caries-free group than the other two groups, while other components such as "sodium," "meat and beans," "whole fruit," "total grains," and "total fruit" were also found to be significant in caries-free group than the other two groups but did not show a regular pattern of significance at different time-intervals [Table 2]. The dietary

Table 1: Comparison of the demographic data between the three study groups

Variables	Caries-free	ECC	S-ECC	Total	*P*
Age Mean±SD	6.46±1.98	5.15±1.73	3.50±0.79	5.86±1.82	0.0005*
Gender *n* (%)	**Caries-free**	**ECC**	**S-ECC**	**Total**	***P***
Male	6 (46.2%)	26 (44.1%)	14 (50.0%)	46 (46.0%)	0.874
Female	7 (53.8%)	33 (55.9%)	14 (50.0%)	54 (54.0%)	

Table 2: Comparison of the HEI-2005 components scores between the three study groups at 24 h, day 1, day 2, and day 3

HEI-2005 Components with Maximum score	Dietary analysis at different time-intervals	Caries-free Mean±SD	ECC Mean±SD	S-ECC Mean±SD	X^2 of kruskal-Wallis test (*P*)
Total fruit (5)	24 h	1.54±2.40	1.02±2.03	0.18±0.95	5.733 (0.057)
	Day 1	1.54±2.40	0.42±1.40	0.18±0.95	7.592 (0.022*)
	Day 2	1.92±2.53	0.00±0.00	0.36±1.31	23.966 (0.0005*)
	Day 3	1.92±2.53	0.68±1.73	0.00±0.00	11.535 (0.003*)
Whole fruit (5)	24 h	1.54±2.40	0.85±1.89	0.36±1.31	3.746 (0.154)
	Day 1	2.69±2.59	1.02±2.03	0.18±0.95	13.895 (0.001*)
	Day 2	2.69±2.59	0.93±1.96	0.71±1.78	8.951 (0.011*)
	Day 3	2.31±2.59	1.69±2.39	2.32±2.54	1.559 (0.459)
Total vegetables (5)	24 h	5.00±0.00	5.00±0.00	4.46±1.58	7.873 (0.020*)
	Day 1	5.00±0.00	4.75±1.11	5.00±0.00	2.128 (0.345)
	Day 2	5.00±0.00	4.83±0.91	4.64±1.31	1.306 (0.521)
	Day 3	5.00±0.00	4.24±1.81	3.93±2.09	3.173 (0.205)
Darkgreen + orange vegetables + legumes (5)	24 h	3.85±2.19	1.86±2.44	0.54±1.58	17.264 (0.0005*)
	Day 1	4.62±1.39	2.12±2.49	0.18±0.95	30.531 (0.0005*)
	Day 2	4.23±1.88	2.46±2.52	1.07±2.09	14.697 (0.001*)
	Day 3	4.23±1.88	1.61±2.36	0.89±1.95	17.708 (0.0005*)
Total grain (5)	24 h	5.00±0.00	4.83±0.91	4.64±1.31	1.306 (0.521)
	Day 1	3.46±2.40	5.00±0.00	5.00±0.00	27.606 (0.0005*)
	Day 2	5.00±0.00	4.92±0.65	4.82±0.95	0.640 (0.726)
	Day 3	4.23±1.88	4.75±1.11	5.00±0.00	4.382 (0.112)
Whole grain (5)	24 h	4.23±1.88	4.83±0.91	4.64±1.31	2.779 (0.249)
	Day 1	5.00±0.00	5.00±0.00	5.00±0.00	0.000 (1.000)
	Day 2	5.00±0.00	5.00±0.00	5.00±0.00	0.000 (1.000)
	Day 3	5.00±0.00	5.00±0.00	5.00±0.00	0.000 (1.000)
Milk (10)	24 h	10.00±0.00	5.93±4.95	8.21±3.90	10.797 (0.005*)
	Day 1	9.23±2.77	4.24±4.98	3.93±4.97	11.707 (0.003*)
	Day 2	7.69±4.39	3.90±4.92	2.86±4.60	8.734 (0.013*)
	Day 3	10.00±0.00	3.90±4.92	3.57±4.88	17.447 (0.0005*)
Meat + beans (10)	24 h	6.15±5.06	2.20±4.18	2.14±4.18	8.957 (0.011*)
	Day 1	1.54±3.76	2.71±4.48	1.43±3.56	2.181 (0.336)
	Day 2	2.31±4.39	3.39±4.77	5.71±5.04	5.846 (0.054)
	Day 3	8.46±3.76	9.49±2.22	10.00±0.00	4.382 (0.112)
Oil (10)	24 h	10.00±0.00	9.66±1.83	10.00±0.00	1.404 (0.496)
	Day 1	10.00±0.00	10.00±0.00	9.29±2.62	5.195 (0.074)
	Day 2	10.00±0.00	9.83±1.30	9.64±1.89	0.640 (0.726)
	Day 3	10.00±0.00	10.00±0.00	10.00±0.00	0.000 (1.000)
Saturated fat (10)	24 h	8.46±3.76	9.15±2.81	7.50±4.41	4.287 (0.117)
	Day 1	9.23±2.77	8.98±3.05	9.29±2.62	0.241 (0.886)
	Day 2	8.46±3.76	9.15±2.81	7.86±4.18	2.864 (0.239)
	Day 3	6.15±5.06	6.78±4.71	5.36±5.08	1.645 (0.439)
Sodium (10)	24 h	7.69±4.39	3.05±4.64	1.79±3.90	14.269 (0.001*)
	Day 1	6.92±4.80	0.85±2.81	0.71±2.62	31.213 (0.0005*)
	Day 2	3.85±5.06	1.21±3.29	2.14±4.18	5.196 (0.074)
	Day 3	6.92±4.80	2.71±4.48	0.36±1.89	19.787 (0.0005*)
SoFAAS (20)	24 h	16.92±7.51	6.10±9.29	0.00±0.00	30.720 (0.0005*)
	Day 1	20.00±0.00	5.76±9.14	2.14±6.30	32.820 (0.0005*)
	Day 2	20.00±0.00	5.42±8.97	0.71±3.78	39.481 (0.0005*)
	Day 3	18.46±5.55	4.41±8.36	1.43±5.25	34.126 (0.0005*)
Total score (100)	24 h	80.38±7.21	54.49±9.72	44.46±5.50	49.875 (0.000*)
	Day 1	79.23±5.34	50.85±8.26	42.32±7.76	48.169 (0.000*)
	Day 2	76.15±7.68	51.02±8.80	45.54±8.75	38.563 (0.000*)
	Day 3	82.69±8.07	55.25±10.81	47.86±8.21	39.344 (0.000*)

Chi-square test, Kruskal–Wallis test $P<0.05$ *Statistically significant values, Highly Significant at $P\leq0.01$, Significant at $0.011<P\leq0.050$

intake of ECC and S-ECC group on day 3 found 34 (57.6%) and 8 (28.6%) of children, respectively, showing a total HEI-2005 score ranging from 51–80 as compared to a range of 30–50 on day 1 and day 2 [Table 3]. The logistic regression analysis for the effect of total HEI-2005 scores showed a significant effect on S-ECC group than on ECC group with *P* values 0.0005 and 0.18, respectively. Slightly greater preventive effect was attributed to HEI in relation to S-ECC group as compared to ECC group where odd's ratio (OR) accounted for 0.903 and 0.994, respectively [Table 4].

Table 3: Comparison of the total HEI-2005 scores between the three study groups

Dietary analysis at different time-intervals	Range of HEI-2005 Score	Caries-free *n* (%)	ECC *n* (%)	S-ECC *n* (%)	Total *n* (%)	X^2 (*P*)
24 h	30-50	0 (0.0%)	29 (49.2%)	27 (96.4%)	56 (56.0%)	62.236
	51-80	8 (61.5%)	30 (50.8%)	1 (3.6%)	39 (39.0%)	(0.0005*)
	>80	5 (38.5%)	0 (0.0%)	0 (0.0%)	5 (5.0%)	
Day 1	30-50	0 (0.0%)	37 (62.7%)	25 (89.3%)	62 (62.0%)	52.640
	51-80	8 (61.5%)	22 (37.3%)	3 (10.7%)	33 (33.0%)	(0.0005*)
	>80	5 (38.5%)	0 (0.0%)	0 (0.0%)	5 (5.0%)	
Day 2	30-50	0 (0.0%)	32 (54.2%)	24 (85.7%)	56 (56.0%)	41.096
	51-80	10 (76.9%)	27 (45.8%)	4 (14.3%)	41 (41.0%)	(0.0005*)
	>80	3 (23.1%)	0 (0.0%)	0 (0.0%)	3 (3.0%)	
Day 3	30-50	0 (0.0%)	25 (42.4%)	20 (71.4%)	45 (45.0%)	47.352
	51-80	8 (61.5%)	34 (57.6%)	8 (28.6%)	50 (50.0%)	(0.0005*)
	>80	5 (38.5%)	0 (0.0%)	0 (0.0%)	5 (5.0%)	

Chi-square test, $P<0.05$ *Statistically significant values

Discussion

The recruited children in the present study accounted for decreased caries occurrence with advancing age, which is not in accordance with the findings of Nadine *et al.*, Ollila, and Kumarihamy *et al.*, whose study findings demonstrated a steady rise in occurrence of ECC with increasing age.[30-32] However, the present study findings that children with advancing age have decreased caries incidence perhaps can be attributed to effective oral hygiene habits practiced by children and with subsequent development of improved manual dexterity on growing older. Reduced caries incidence can also be attributed to certain factors like increased awareness regarding its etiology and prevalence among parents, sorting to more conservative or preventive treatment protocols and thereby halting its serious rapid progression.[33] Several epidemiological studies have revealed increased consumption of energy, inadequate intake of fibrous food, excessive intake of fats and refined sugar with lower consumption of fruits and vegetables, especially in children, do not actually reflect an overall quality of diet.[34] Thus, HEI-2005 analyzes diet quality along with an accurate measure for adherence of an individual's diet to dietary recommendation.

On evaluating the mean HEI-2005 component scores of the three groups, the caries-free children demonstrated the highest score at all observations (i.e., 24 h, day1, day2, and day3) when compared to ECC and S-ECC group. Higher score probably reflects closer adherence of caries-free children with healthy dietary practices. Such findings were also supported by Nunn *et al.*[35] who reported a significant association between adherence to healthy dietary recommendation such as fruit, dairy products, sodium, and thereby reduced likelihood of S-ECC. On extracting information regarding dietary intake of children in preceding 24 h, an adequate diet counseling pertaining to healthy dietary practices was provided to parents. As a result, an improved total HEI score in the range of 51–80 on day3 was observed in ECC and S-ECC groups compared to a range of 30–50 on day 1 and 2. According to HEI-2005 criteria, a range of <30 or 30–50 total HEI score signifies poor dietary intake, score of 51–80 needs dietary improvement, and >80 indicates good dietary habits.[34] Mean HEI scores for components such as "dark green/orange vegetables/legumes," "milk," and calories from "SoFAAS" were found to be significantly higher in the caries-free group at all observations compared to the other two groups, whereas other components such as "meat and beans," "sodium," "whole fruits," "total grains," and "total fruits" also demonstrated a higher significance in caries-free group but did not follow a regular pattern of intake in caries-free group. Such indifferent accountability of certain components at different time-periods can perhaps be attributed to inclusion of weekend days while assessing the dietary pattern, where children generally like consuming more of processed food products and which might explain the higher "sodium" score in the caries-free group. In the present study, HEI component "dark green/orange vegetables/legumes" was found to be significantly associated with reduced caries experience in caries-free group compared to other two groups, which was not in accordance with the results reported by Nadine *et al.*[30] and Dowidar and Tantawi[21] who found no significant difference in the mean number of vegetable servings between caries-free and caries affected children. However, the role of raw vegetables against dental caries can be effectively attributed to its fibrous nature, self-cleansing action, and thereby on mastication stimulates increased salivary flow thus promoting higher buffering action against oral microbes.[19,36] Dairy products such as "milk" and cheese were reported to reduce caries level in the present study findings which were again in accordance with similar findings shown by Nadine *et al.*[30] The protective role of milk and cheese reduces the effect of metabolic acids as well as plaque acidity, thereby contributing to its anticariogenic action.[20] The "SoFAAS" component includes all sugar such as ingredients in processed and prepared food items, table sugar added to food while eating, medicinal syrups, etc., which roughly reflects the total sugar intake in children. Its scoring has been set in a way that higher value reflects lower intake and vice-versa.[23] The mean scores of "SoFAAS" in the present study reflected higher value in caries-free children, signifying its lower intake which is in accordance with the cariogenic role of sugars reported in numerous studies.[37-39] Other food components such as "fruits" also demonstrated a protective effect on the study population by their possible mechanism of interfering with plaque formation, acid production as well as by their action of polyphytates and phosphate contents, which

Table 4: Logistic regression analysis for the effect of total HEI-2005 on ECC and S-ECC model

Outcome	Wald	*P*	OR	95% C.I.		% of cases correctly classified
ECC	1.797	0.18	0.994	0.985	1.003	72
S-ECC	22.512	0.0005 **	0.903	0.866	0.942	85

promote enamel remineralization.[35] Caries-free children in the present study also demonstrated a high score of "meat and beans" similar to findings of Dowidar and Tantawi.[21] The reason for its apparently protective role can be attributed to fewer intake of snacks and cariogenic food in children who have regular meals intake consuming meat.[21] Intake of "total grains" also had a protective role to play, as intake of adequate complex carbohydrates and avoidance of starchy food items contributes to reduced caries incidence.[16] Thus, a diet which is low in free sugars, saturated fat and salts, high in fresh fruits, vegetables, nuts and seeds, wholegrain carbohydrates with modest amount of legumes, fish, poultry, and lean meat, plenty of fluids such as water, milk, and modest intake of sugar-sweetened beverages is indeed beneficial to both general and oral health.[40,41] To the best of the authors' knowledge, it is the first study conducted on Indian population assessing their dietary pattern and its role in causation of ECC by HEI-2005. However, the small sample size and recall bias both in children and parents form the major limitation of the study. Hence, the authors strongly recommend that multi-centered studies with large population size and an effective way of data extraction to avoid recall bias to be conducted to provide substantial evidence to the existing literature.

Conclusions

The present study highlighted the importance of diet in the causation of ECC and not merely emphasizing the role of sugar in occurrence of caries. Hence, the present study findings aptly illustrated the protective role of healthy dietary habits in protection against ECC.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients/parents/guardians have given their consent for their images and other clinical information to be reported in the journal. The patients/parents/guardians understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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