

Indian Dietary Habits in Relation to Dental Caries among 12-15 year old School Children in Bangalore City

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ABSTRACT

Aim: To assess the dietary habits in relation to caries experience among 12-15 years old schoolchildren attending government schools in Bangalore city. **Methods:** A cross sectional study was conducted on 400 schoolchildren (192 males and 208 females) aged 12-15 years. These were selected from four government schools in the north zone of Bangalore city using multistage random sampling. A structured, self-administered questionnaire in English / Kannada language was administered to the children after obtaining written informed consent. This included socio-demographic characteristics and dietary habits of schoolchildren (in terms of regularity of meals, in between meal snacking habit and food and drink items commonly consumed). Clinical examination to assess dental caries using DMFT index (WHO modification 1997) was carried out in the school premises under adequate natural light using type III clinical examination as recommended by American Dental Association (ADA) by a calibrated examiner. Descriptive statistics and Chi-square test were employed to analyse data using statistical package for social sciences version 22.0. **Results:** Out of 400 schoolchildren, caries prevalence was 35.8% children. Mean DMFT obtained was 0.93 ± 1.58 . The snacking rate was high at 58.8%. A significant association ($p \leq 0.05$) was obtained between reduction in caries status and regularity of meals, and also with regular consumption of coffee, rice, chapatti and ragi balls. **Conclusion:** Although a high snacking rate was observed in the children, caries experience was relatively low. A further decrease in caries can be obtained by an emphasis on the regularity of meals, decreased in between meal snacking, and consumption of food items which are less or non-cariogenic.

KEYWORDS: Dental Caries, Diet, Food Frequency Questionnaire, India, School Children

INTRODUCTION

Diseases have their roots in a complex chain of environmental and behavioural events which are shaped by broader socioeconomic determinants.¹ Caries is one of the most common diseases of childhood.² It has a multifactorial aetiology. Numerous risk factors such as age, sex, ethnic group, dietary patterns, and oral hygiene habits influence the prevalence and incidence of dental caries in a population.³ The disease is not self-limiting and without adequate intervention, it can lead to pain and discomfort and finally loss of teeth.⁴

Diet has been associated with the prevalence of dental caries for centuries. It is a major modifiable contributing factor in the aetiology of dental caries. A frequent consumption of fermentable carbohydrates is known to play a role in the development of dental caries. Conversely, a lower consumption of cariogenic food prevents the development of new lesions while arresting the active carious lesions.⁵

Many health related habits develop during childhood and adolescence, the period when individuals start becoming independent from their parents.⁶ Healthy eating patterns in children and adolescents promote optimal health, growth, and intellectual development. These dietary

habits influence the current as well as future health status of the children who would grow in to healthy adults. Moreover, young person's having unhealthy habits tend to maintain these habits as they age.⁷ Eating patterns and the frequency of consumption are seen to be the most significant factors which contribute to the cariogenicity of the diet. In between meal snacking especially sugar can increase the incidence of caries in individuals with poor oral hygiene. Eating patterns, nutrient composition, improper oral health related behaviours and dental plaque accumulation; all interact and play an important role in caries development.⁸

The recent approach for prevention of dental caries focuses on individuals' dietary habits and oral health related behaviours. Hence, the description of current habits is crucial. Therefore, this study was undertaken to investigate the dietary habits in relation to dental caries experience among adolescents attending government schools in Bangalore city.

MATERIAL AND METHODS

This was a Cross-sectional study conducted amongst the 12-15 year old school children in government schools in

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Bangalore city. List of the high schools in Bangalore city was obtained from Deputy Director of Public Instructions (DDPI) served as a sampling frame. Sample size was calculated based on the proportion of 12-15 year old government school children having past caries experience. It was found to be 53.7% in the pilot study. A total of 12-15 year old school children were 163342. Using confidence interval of 95%, sample size was estimated to be 382. Considering nonresponse, the final sample size was calculated as 400. The study participants were selected from four government schools in north zone of Bangalore city using multistage random sampling. Subjects with mixed dentition, those suffering from any kind of Physical illness and who were not able to take care of their oral hygiene and those with ongoing orthodontic or fixed appliance therapy were excluded from the study. The study was conducted after the Institutional Review Board, M.R. Ambedkar dental college, and hospital, Bangalore, India gave ethical clearance. The head of the Deputy Director of Public Instructions was approached, the purpose of the study was explained, and the approval was obtained to proceed with the study. Also, permission from the principals of respective selected schools was obtained to conduct the study. Prior to the study, aims and objectives of the study were clearly explained to the study subjects and an informed assent was obtained. The parents/guardians of the children who were willing to participate were requested to give their written informed consent.

A proforma was used to record the data consisting of three sections one consisted of informed consent and socio-demographic information such as age, sex, and socioeconomic status. Section two included provision to record DMFT index (WHO modification 1997) ¹⁷ Section three consisted of a food frequency questionnaire (FFQ) consisting of commonly eaten food items which were designed using the results of pilot study. The dietary habits were assessed in terms of the regularity and contents of breakfast, lunch, dinner and snacking habit. The subjects were required to recall how often, on an average, they have consumed the food items in the past month (5 points, 0-4, categories ranging from “never” to “daily”). Before the questionnaire was finally established, the questions were pretested in a pilot study on 30 school children, to assess the children’s ability to understand. The questionnaire was translated into Kannada language and was also back-translated to English to ensure correctness. The questionnaire was comprehensible and was therefore finalized with no modification. Its respective psychometric properties (reliability and validity) were assessed and were found to be satisfactory.

In order to ensure intra-examiner consistency, a randomly selected ten subjects were examined for DMFT and were re-examined. Using kappa statistic, intra-examiner reliability was 0.84. The score implied high degree of reproducibility. An assistant who was trained to assist the recording procedure helped the examiner in recording the findings. The oral cavity of the subjects was examined while they were seated on a chair under natural light in

the school premises. The type III clinical examination recommended by American Dental Association was followed throughout the study using plane mouth mirrors and dental explorer.

The responses were coded, and data was transferred to the computer for analysis using SPSS version 22.0 statistical software. For the purpose of the study, Food items consumed once or more than once a week were considered as commonly consumed items for the purpose of the study. Following the computation of the initial descriptive statistics, association between DMFT and socio-demographic characteristics, dietary habits was measured using chi-square test.

RESULTS

A total of 400 school children in the age group of 12-15 years were assessed for their dietary practices and caries experience. About half (48%) were males, and half (52%) were females. Most of the study participants were 14 years of age (27.5%) and belonged to the upper lower class (73.2%) of socioeconomic status.

More than half of the schoolchildren in the study population were caries free (64.2%) (Figure 1). Caries experiences among different age groups, and gender was similar, showing no statistical significance (p=0.41 and p=0.45 respectively) (Table 1). Caries experience was

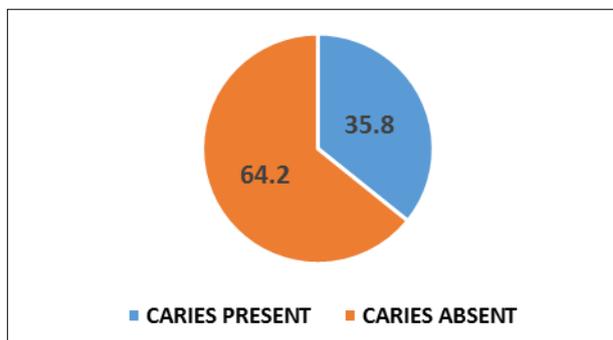


Figure 1: Distribution Of Study Participants According To Caries Experience

AGE in years	CARIES PRESENT(n)	CARIES ABSENT(n)	p value
12	34	63	0.415
13	29	65	
14	46	64	
15	34	65	
GENDER			
Males	65	127	0.447
Females	78	130	
Socioeconomic Status			
Upper middle	7	12	0.855
Lower middle	32	49	
Upper lower	102	191	
lower	2	5	

Table 1: Association Between Sociodemographic Characteristics Of The Study Population And Caries Experience, *p≤0.05 significant, Chi square test

maximum in the upper lower segment of the socioeconomic status which was proportionate to the

increased number of study subjects in the same socio economic class in comparison to other classes. However, no statistically significant relationship was obtained between socioeconomic status and caries experience. (Table 1)

The study population showed high regularity in the consumption of breakfast (86%), lunch (98.5%), dinner (97.5%). In between meal snacking habits was present in about more than half of the study population (58.8%). Statistically, significant results were obtained between regularity of meals as well as in between meal snacking habit and caries experience of the school children. (Table 2)

Caries Experience	Breakfast Regularity		Lunch Regularity		Dinner Regularity		Snacking	
	Yes	No	Yes	No	Yes	No	Yes	No
Caries Present	115	28	138	5	136	7	94	49
Caries Absent	229	28	256	1	254	3	141	116
P Value (Chi Square Test)	0.016*		0.024*		0.039*		0.034*	

Table 2: Association Between Regularity of Meals And Caries Experience, * $p \leq 0.05$ significant

Among breakfast items, maximum daily consumption was of tea, coffee, milk, vegetables and rice. However, the daily consumption of fruits and fruit juices was low. Most commonly consumed items for lunch and dinner daily were- rice, sambhar, vegetables. Among those, consuming in between meal snacks, biscuits were most commonly consumed item and coffee, and soft drinks were least commonly consumed. The daily consumption of chocolates and cake, chips was low at 23.8%, 12%, and 17.8% respectively. Among the study population, consumption of various food items during meals (coffee for breakfast, rice, chapatti and ragi balls for lunch, chapatti and ragi balls for dinner and in between meals (homemade sweets for snacks) showed statistically significant results with decreased caries experience. (Table 3)

DISCUSSION

The prevalence of dental caries observed in this study was 35.8% which was similar to the findings by Praveena et al⁹ and Shailee F et al.¹⁰ Decreasing trends in caries can be explained by improved oral hygiene with increased age in the sample schoolchildren and also due to the regular dental checkups performed routinely in the schools of the city by the dental colleges in the vicinity.

Diet, nutrition and oral health and disease can be described as a two-way street. However, more than the amount of sugar, the frequency of its consumption, the consistency of the food, and oral hygiene practices that determine the cariogenicity.

The current study showed high regularity in the consumption of the three main meals of the day especially lunch in the study population. This is due to the successful implementation of mid-day meal scheme

BREAKFAST ITEM	CARIES EXPERIENCE AMONG THOSE CONSUMING THE ITEM		P VALUE (CHI SQUARE TEST)
	CARIES FREE(n)	CARIES PRESENT(n)	
TEA	77	51	0.24
COFFEE	164	66	0.001*
MILK	193	104	0.60
FRUITS	190	97	0.19
FRUIT JUICE	150	71	0.09
IDLI/VADA	190	109	0.61
DOSA	188	115	0.10
UPMA	145	68	0.09
CHAPATI	201	113	0.85
VEGETABLES	204	117	0.56
RICE	247	136	0.63
CURD	197	105	0.47
LUNCH ITEM			
RICE	256	138	0.02*
CHAPATI	220	97	0.00*
RAGI BALLS	172	76	0.01*
DAL	219	112	0.08
SAMBHAR	223	119	0.33
VEGATABLES	229	124	0.48
MEAT/FISH	167	93	0.99
CURD	205	107	0.25
SWEETS	201	86	0.07
FRUIT/FRUIT JUICE	194	105	0.65
DINNER ITEM			
RICE	252	138	0.29
CHAPATI	227	114	0.02*
RAGI BALLS	177	80	0.01*
DAL	211	113	0.45
SAMBHAR	232	124	0.28
VEGATABLES	218	112	0.10
MEAT/FISH	171	95	0.98
CURD	209	108	0.17
SWEETS	192	95	0.08
FRUIT/FRUIT JUICE	196	109	0.99
SNACK ITEM			
TEA	77	51	0.24
COFFEE	64	35	0.92
MILK	106	61	0.78
FRUIT/JUICE	88	57	0.26
SOFT DRINKS	69	41	0.67
BISCUIT	105	72	0.07
CAKE	83	55	0.21
CHIPS	96	53	0.95
JAM	84	49	0.75
BREAD	72	49	0.18
CHOCOLATES	103	69	0.11
HOME MADE SWEETS	79	58	0.05*

Table 3: Association Between Commonly Consumed Food Items and Caries Experience

and food security bill in the state. This was similar to the findings of Bruno Ambrosius et al.¹¹ He reported that omitting main meals led to an increase in caries risk. Skipping main meals could lead to an increase in consumption of light meals and snacks rich in sugar during the day and lead to an increase in caries risk. Among the commonly consumed food items during meal times were rice, sambhar, and vegetables. This again can be justified by the introduction of the food security bill in the country which makes rice and pulses affordable for

the people belonging to the low socioeconomic status. Statistically, significant reduction in caries occurred with the regular consumption of items such as coffee, rice, chapatti, and ragi balls. Consumption of starchy staple food is associated with low levels of dental caries. Also, ragi balls are swallowed rather than chewed which can also lead to caries reduction. Coffee and tea contain polyphenols such as tannins which may reduce the cariogenic potential of food.⁸ Traditional starchy staple food is less cariogenic as compared to a diet rich in refined carbohydrates as seen in the modern times.⁶ Biscuits were the most commonly consumed snack item, while the consumption of cakes, chips and chocolates was low in the study population. This could be because children stay for about 10 hours in schools and with their minimum money they could only afford to buy these. Therefore, in spite of a snacking rate of almost 58.8% the caries prevalence was low due to the decreased consumption of cariogenic food items such as cakes, pastries, chips, etc.

A limitation of this study was that the amount of total sugar in the diet was not evaluated. Further research can be conducted to investigate detailed contents and quantity the diet to assess its nutritional adequacy, total amount of exposed sugar, intake of caries protective elements such as calcium, phosphate, and fluoride. Further research is needed into anti-cariogenic strategies to such as the use of sugar alcohols and dairy products to prevent caries. The cariogenicity of different starches and starch-sugar combinations should also be determined. Longitudinal studies are needed to explore the effect of sugars on plaque pH and decay patterns in mixed diets.

CONCLUSION

The following conclusions can be derived from the current study. Firstly, caries prevalence observed in this study was lower than the WHO recommended values. Secondly, caries experience increases when people switch from a dependence on traditional starchy staple food to a dependence on refined carbohydrates. Thirdly, regularity of main meals can help reduce dental caries prevalence. Finally, Adequacy and moderation in diet with appropriate oral hygiene behavior can help further reduce the disease burden of dental caries. The author recommends further improvement the nutritional status and regularity of meals of school going children and also

to promote regular and appropriate oral hygiene habits with regular use of toothbrush, toothpaste, and interdental aids. Regular visits to the dentist are also recommended.

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