

RISK FACTORS FOR DENTAL CARIES IN PAKISTANI CHILDREN

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ABSTRACT

The present study was carried out to determine any possible association of caries with oral hygiene and food habits. This was prospective descriptive study. Total (n= 543) patients with dental caries between 6-9 years were selected from dental OPD of Children's Hospital, PIMS, Islamabad. Questions regarding brushing habits and food habits were asked by interviewing the accompanied adults and caries status of teeth after intra oral examination were recorded in questionnaire. X-ray was not taken to diagnose the caries.

The frequency of caries was higher in age group of eight and nine. Children who ate candies daily had statistically ($p < 0.05$) high caries. Negative correlation was found between mother's education, father's education and caries. Significantly high frequency of caries ($P < 0.05$) was found in children who ate bread in their breakfast with sugar-sweetened tea and patients used fluoride-containing toothpaste had less caries. Surprisingly, in comparison of food habits between male and female subjects no significant difference was found.

Key words: Dental caries, mixed dentition, risk factors, socioeconomic status.

INTRODUCTION

Dental Caries is an infectious disease in which bacterial by-products mainly acids, dissolve the hard tooth surfaces. Pathology of caries is a multifactorial, which depends on four factors, i.e., diet, microorganisms, host defenses and time. To establish caries risk, factors like clinical and microbiological data, food habits, socioeconomic status (SES) and oral hygiene habits could be considered.¹

Streptococcus Mutans (MS) and Lactobacillus (LB) are bacteria known to contribute to caries process. Sugar containing food items, such as candy, honey, pastries and soft drink contribute to acid formation that can destroy mineralized tooth structure¹.

It has also been observed that poor oral hygiene²⁻⁴ has association with increased risk for caries development while increased tooth brushing decreases the prevalence of dental caries.² It is believed that brushing will remove the dental plaque, where micro-organism lives.

At the beginning of this decade, results from epidemiological studies conducted in several western coun-

tries demonstrated that dental caries was rapidly declining among school-age children aged 5-17 years as compared with data collected in an earlier surveys.⁵ Most observers concluded that widespread exposure to fluoride in various forms had played a major role. There is strong evidence for fluoride efficacy and safety from studies spread over many years and fluoridation has been shown to have a particularly beneficial effect on high caries risk, deprived children.⁶⁻⁹

Different studies demonstrated that high sugar specially sucrose, has association with increased risk for caries development. The frequency of using sweets and other sugar products tends to be the primary etiologic factors in dental caries.¹⁰⁻¹¹ It is now widely recognised that the amount of carbohydrate is not important but how often carbohydrate is ingested is the most significant dietary factor in the etiology of dental caries¹² although the increased quantity may cause other pathology.

The continuing increase in soft drink consumption among adolescents raised a national concern about the health effects of soft drinks. Sugar-containing soft drinks can be cariogenic¹³⁻¹⁴ and their low pH can cause

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erosion in teeth. A significant positive association was found between the frequencies of consumption of soft drinks at- and between-meal and high DMFT scores.¹⁵ Heavy consumption of sugar-containing soft drinks can also lead to excessive of sugar intake, and is thus hypothesized to be associated with the dental caries.

Tea is very common drink all over world, especially in our country it is liked by all age groups. Epidemiological surveys have reported that some populations who drink tea without sugar on a regular basis have a reduced number of carious teeth.¹⁶⁻¹⁷

A recent study that investigated the bio-availability of fluoride from tea in relation to its interaction with the tooth surface and oral tissues, demonstrated that after rinsing with tea, 34% of the fluoride was retained in the oral cavity and that some of this showed a strong binding ability to enamel particles on the tooth surface.¹⁶

Socioeconomic status plays a significant role in dental caries and its relation has been demonstrated in various studies.¹⁸ It has been found that children from educated and high socioeconomic status are more conscious about brushing and visiting the dentist regularly, while children from low socioeconomic status exhibit higher levels of caries prevalence fewer sealants and untreated disease.¹⁹

By considering all these factors present study was done to assess the risk factors for dental caries in 6-9 years old children in Islamabad.

The study was conducted in dental department of the Children's Hospital, Pakistan Institute of Medical Sciences (PIMS), Islamabad, which is the only hospital providing dental treatment to the children of Islamabad and Rawalpindi. The present study was conducted to answer the following questions;

- 1 What were the associated risk factors with caries?
- 2 How to formulate future policies in management of dental caries?

METHODOLOGY

This prospective descriptive study was done to find out risk factors for caries in this population. Total (n= 543) patients with dental caries between 6-9 years were selected from dental OPD of Children's Hospital, PIMS, Islamabad. Study was started from 01st July 2005 and was continued for 06 months.

There was a questionnaire for each patient. Data was collected from these patients by interviewing the accompanied adults. Demographic information of the patients, the education of parents specially of mother, socio economics status, oral hygiene and food habit of

each child was noted. Family socio economic status in this study was based on family income, and was divided into lower, middle or upper class. If family income was below or equal to Rs.3000/- per month, it was considered lower class, income ranged between Rs.3000/- to 7000/- per month was middle class and income above than Rs 7000/- per month was considered upper class. The type of school in which patient was studying was also noted to give some clue about their family status.

Questions were asked how often these children cleaned their teeth and from where they had the information about oral hygiene i.e. from home, school, electronic media or print media. This information helped in assessing the knowledge of the study population about dental care, and if they need motivation the most effective source would be selected.

The food habits of the children were also evaluated i.e. what type of food they normally ate, especially about sweetened and sour foods /drinks.

At the end of questionnaire, dental caries status was recorded after intra oral examination of the patients. Caries were detected on dental chair by visual examination with the help of mouth mirror, probe and light. X-ray was not taken to diagnose the caries.

INCLUSION CRITERIA: Children between 6-9 years old presented to dental OPD of Children Hospital PIMS, Islamabad, and early mixed dentition stage.

EXCLUSION CRITERIA: Mentally, physically, sensory handicapped, and medically compromised patients, e.g. suffering from leukemia, hemophiliac patients.

DATA MANAGEMENT

Data was entered using the SPSS version 10.0 database program for health statistics. Sample studied was divided into male and female groups. Variables like food habits, cleaning habits etc was compared in a univariate analysis by using Chi square tests for categorical variables and student's t-test for continuous variables to assess their relation with age groups. The p-value along with 95% CI (Confident Interval) was reported in the results. The variables, which were significant in univariate analysis, were then put in multivariate model by forward stepwise logistic regression, to determine the risk factors for dental caries in specific age group.

RESULTS

Total Five hundred forty three (n= 543) children were included in this study, in which two hundred ninety nine (n = 299) 55 percent were male and two hundred forty four (n=244) 45 percent were females. The number of males was significantly (p<0.05) more than the females.

Results of the answers to dental health questions were as following .Out of five hundred forty three children, five hundred thirty eight (99.1%) were studying in school and only five children (0.9%) were not studying. Three hundred eighty six (71%) were studying in government schools while one hundred thirty two (29%) were in private schools. Caries frequency was seen to be significantly more in children from government schools as compared to children from private schools .The difference between school types in caries frequency proved to be highly statically significant($p<0.01$).

In this study, total 72% mothers of the subjects were educated and 28% mothers of the subjects were uneducated (illiterate) in all age groups. Negative correlation was found between mother's education and caries frequency. Similarly the percentage of uneducated (illiterate) fathers of the subjects was low (only 5.6%), while percentage of educated father was higher (94.6%). The relationship between outcome and father's education was less consistent in the present study (Table 1).

As far as socioeconomic status of the studied population was concerned, majority 44% of the children was from higher socioeconomic group family, and only 17.5% were from lower socioeconomic group. By comparing higher and lower social class difference in caries frequencies was found to be significant ($p<0.05$).

ORAL HYGIENE

Although 91% ($n = 490$) children studied, cleaned their teeth either regularly or irregularly. Out of 91% only 18% ($n = 101$) were regular in brushing twice a day

and 9% ($n = 49$) cleaned their teeth rarely (Table 2). The children brushed their teeth once a day had higher frequency (45%) of caries than those brushed their teeth twice a day (18%). Majority of subjects 91.7% ($n = 498$) used both brush and tooth paste for cleaning of their teeth.

Regarding questions of fluoride containing toothpaste, children used high fluoride pastes 37% ($n=203$) had statistically less caries then those children ($n=340$) who used ordinary toothpaste ($p<0.05$). Similarly the frequency of caries in children who used miswak was significantly low ($p<0.05$) in all age groups. It was observed that 52.9% ($n= 287$) children got awareness about oral hygiene from their schools rather than from their homes or electronic media in all age groups.

FOOD HABITS

Association between caries and different food habits being investigated in present study. Results are given in table 3. Children ($n=306$) who ate candies daily had statistically high caries than those children who ate candies rarely. In this study difference between daily and weekly consumed bakery products was not significant but difference between daily and rarely consumed bakery products was highly significant. Children who consumed bakery products rarely, were found to be less than other groups, therefore association between caries and bakery products was found to be statistically significant ($p<0.05$).

In the present study higher frequency of caries was found in children who ate bread in their breakfast and association with bread was found to be highly significant ($P<0.05$). Similarly the association between sugar

TABLE 1: DEMOGRAPHIC INDICATORS OF CHILDREN IN DIFFERENT AGE GROUP

Demographic Indicators		6 Years	7 Years	8 Years	9 Years	Total
Sex	Male	62(47.7%)	73(55.3%)	91(61.1%)	73(55.3%)	299(55.1%)
	Female	68(52.3%)	59(44.7%)	58(38.9%)	59(44.7%)	244(44.9%)
Studying	Yes	127(97.7)	132(100%)	147(98.7%)	132(100%)	538(99.1%)
	No	3(2.3%)	Nil	2(1.3%)	Nil	5(0.9%)
School	Govt	76(59.8%)	93(70.4%)	109(74.1%)	108(81.8%)	386(71.7%)
	Private	51(40.1%)	39(29.6%)	38(25.9%)	24(18.2%)	152(28.3%)
Mother's Education	Uneducated	22(16.9%)	34(25.8%)	51(34.2%)	37(28%)	144(26.5%)
	Educated	108(83%)	98(74%)	82(65%)	95(72%)	399(73.5%)
Father's Education	Uneducated	5(3.8%)	5(3.8%)	11(7.4%)	8(6.1%)	29(5.3%)
	Educated	125(96%)	127(96%)	138(92%)	124(93.9%)	514(94%)
Family Income	Low	18(13.8%)	19(14.4%)	31(20.8%)	27(20.5%)	95(17.5%)
	Middle	46(35.4%)	55(41.7)	54(36.3)	54(40.9%)	209(38.5%)
	Higher	66(50.8%)	58(43.9%)	64(43%)	51(38.6%)	239(44%)

TABLE 2: BRUSHING HABITS OF CHILDREN IN DIFFERENT AGE GROUPS

Oral hygiene habits		6 Years (n=130)	7 Years (n=132)	8 Years (n=149)	9 Years (n=132)	Total 6-9 yrs
Brushing habits	Twice a day	18(13.8%)	29(22%)	28(18.8%)	26(19.6%)	101(18.1%)
	Once a day	69(53%)	59(44.7%)	65(43.6%)	51(38.6%)	244(44.9%)
	Not regular	31(23.5%)	31(23.5%)	40(26.8%)	43(32.6%)	149(27.4%)
	Rare	8(6.2%)	13(9.8%)	16(10.7%)	12(9.1%)	49(9%)
Use of paste & brush	Yes	115(88%)	124(93.9%)	137(91.9%)	122(92.4%)	498(91.7%)
	No	15(11.5%)	8(6.1%)	12(8.1%)	10(7.6%)	45(8.3%)
Paste containing fluoride	Yes	48(36.9%)	43(32.6%)	58(38.9%)	54(40.9%)	203(37.4%)
	No	82(63.1%)	89(67.4%)	91(61.1%)	78(59%)	340(62.6%)
Brush only	Yes	9(6.9%)	4(3%)	4(2.7%)	7(5.3%)	24(4.4%)
	No	121(93%)	128(97%)	145(97.3%)	125(94.7%)	519(95.6%)
Miswask	Yes	25(19.2%)	25(89.9%)	40(26.8%)	30(22.7%)	120(22%)
	No	105(80%)	107(81.1%)	109(73.2%)	102(77.3%)	423(77.9%)
Source of awareness about oral hygiene	Home	56(43%)	60(45.5%)	55(36.9%)	50(37.9%)	221(40.7%)
	School	70(53.8%)	64(48.5%)	85(57%)	68(51.5%)	287(52.9%)
	Electronic media	4(3.1%)	8(6.1%)	9(6%)	14(10.6%)	35(6.4%)

TABLE 3: FOOD HABITS OF CHILDREN BETWEEN 06 TO 09 YEARS OLD

Food habits		Total (%age)
Candies/ Chocolate	Rarely	62(11.4%)
	Daily	306(56.4%)
	Weekly	175(32.2%)
Bakery products	Rarely	70(12.9%)
	Daily	214(39.4%)
	Weekly	259(47.7%)
Soft drinks	Rarely	334(61.5%)
	Daily	24(4.6%)
	Weekly	185(34.1%)
Citrus fruits	Rarely	460(84.7%)
	Daily	25(4.6%)
	Weekly	58(10.7%)
Sugar sweeten tea	Rarely	146(26.9%)
	Daily	359(66%)
	Weekly	38(7%)
Bread/Chapatti in break fast	Rarely	75(13.8%)
	Daily	456(84%)
	Weekly	12(2.2%)
School lunch	High sucrose	214(39.4%)
	Low sucrose	329(60%)

sweetened tea and caries was studied in subjects and it was found that there is highly significant co-relation between them ($P < 0.05$). It was interesting to note that children on high sucrose diet in their school lunch were less (39.4%) as compared to those who consumed less sucrose diet (60.6%) therefore no consistent correlation was found between caries and high sucrose diet in this study.

The comparison of food habits between male and female subjects was performed (table 4). More male patients (71.3%) used sugar-sweetened tea daily as compare to female patients (59.8%), therefore significant difference was found ($P < 0.05$). It was interesting in the present study that no other food habit was found to be significantly different between male and female in all age groups.

DISCUSSION

The present study demonstrates the risk factors for caries in 6-9 years old children in Children Hospital, PIMS Islamabad.

It must be pointed out that decalcifications were not considered as carious lesion in this study, which is early evidence that the disease process is active and such teeth may be remineralized by appropriate preventive measures. Similarly radiographs were also not used in this study, which may have decreased the number of untreated proximal lesions undiagnosed. Its

TABLE 4: COMPARISON OF FOOD HABITS OF ALL MALE WITH FEMALE CHILDREN

Food habits		Male (n = 299)	Female (n = 244)
Candies/Chocolate	Rarely	37 (12.4%)	25 (10.2%)
	Daily	165 (55.2%)	141 (57.8%)
	Weekly	97 (32.4%)	78 (32%)
Bakery products	Rarely	42 (14%)	28 (11.5%)
	Daily	115 (38.5%)	99 (40.4%)
	Weekly	142 (47.5%)	117 (48%)
Soft drinks	Rarely	181 (60.5%)	153 (62.7%)
	Daily	17 (5.7%)	7 (2.9%)
	Weekly	101 (33.8%)	84 (34.4%)
Citrus fruits	Rarely	259 (86.6%)	201 (82.4%)
	Daily	12 (4%)	13 (5.3%)
	Weekly	28 (9.4%)	30 (12.3%)
Sugar sweeten tea	Rarely	71 (23.7%)	75 (30.7%)
	Daily	213 (71.3%)	146 (59.8%)
	Weekly	15 (5%)	23 (9.4%)
Bread/Chapatti in break fast	Rarely	36 (12%)	39 (16%)
	Daily	255 (85.3%)	201 (82.4%)
	Weekly	8 (2.7%)	4 (1.6%)
School lunch	High sucrose	121 (40.5%)	93 (38%)
	Low sucrose	178 (59.5%)	151 (61.9%)

mean true carious lesion could be higher than reported as caries were diagnosed entirely on visual examination.

Underdeveloped countries still show dental caries as a common problem. It is well known that this pathology is a multifactor disease that depends on diet, microorganisms and host defenses for certain time. To establish caries risk, factors like clinical and microbiological data, socio economic status and oral hygiene habits could be considered. The present study investigated potential risk factors for caries in children.

There is consistent evidence to support a strong association between **socio demographic** factors including income and caries prevalence. Children from low socioeconomic status (SES) family were more likely to have caries.^{11, 20-22}

In present study SES of children were divided into lower, middle and high class according to income of their parents. Children from higher SES exhibit increase caries frequency and untreated teeth as compared to other groups. This result was in contrary to many previous studies. A link between socioeconomic factor and the disease was widely accepted and has been shown by **Reisine**. There was a fairly strong

evidence for an inverse relationship between SES and the prevalence of caries among children less than twelve years of age.^{20, 22} Another study reported lowest level of both caries and rampant caries in children from high SES. The pattern of disease was less extensive among high SES class. Difference in caries prevalence in relation to social class was statically significant ($p < 0.05$).²³

Iqbal in a survey of school going boys in Peshawar found that 53 percent of permanent teeth in low-income group were affected from caries.²⁴ The mean dmft values found were 5.10, 6.05 and 10.10 for the high, middle and lower socioeconomic levels, respectively in Spolidorio's results.²⁵ SES has been considered as a determinant factor in caries risk assessment studies.^{26, 27}

Evans studied Brazilian students aged 6-8 years, of different socioeconomic levels, for dental caries, and stated that low family income might affect food selection and nutrient intake by mothers and also infants during the tooth development period. It may also affect the degree of education, health values, life-style and access to health care information. As a consequence, family income can be an indirect factor for tooth susceptibility to caries.²⁷

The present study results were not consistent as seen in others studies; the reason may be less patients from low SE group visited hospital for their treatment. As lower socioeconomic group have less resources to fulfill their primary needs (i.e. food, clothes, house etc) they do not give importance or consideration to dental disease and dental problem is secondary for them. So fewer patients visited hospital for their treatment and their percentage was less in this study population. It might be possible that they could not even afford the dental treatment even in public sector hospital.

Demographic factors e.g. mother's education and father's education were not associated with caries in the present study, which is contrary to **Mariri's** results. Mariri concluded that mother's education was inversely related to severe caries experience. While the other investigators have also found that such social environmental factors influence dental health and lowest levels of disease were seen among children of highly educated mothers.²⁸

In present study the difference in result was due to lack of awareness of mothers about dental education or oral hygiene practices. They were not regular to bring their children for regular check up and early detection of caries in their teeth. This result is similar to other study done by **Casanova**.²²

A significantly higher proportion of government school children 71.7% had caries than children studying in private school (28%) in the present study. No significant difference was found between male and female in oral hygiene practices. This means that majority of government school children needs dental health education.

Haleem reported a significant ($p < 0.05$) difference between government and private school children with regard to oral hygiene status. Children from private schools cleaned their teeth more regularly. No significant difference was found between male and female in oral hygiene practice. Untreated carious teeth were higher in government school children than children from private schools.²

The reason for less caries in private schools is that in private schools the numbers of students in each class are limited and teacher can give full attention to each child regarding their education or other habits. Many private schools have facility for regular dental check-ups, so caries can early be detected and treated. They also develop awareness in children about oral hygiene and dental education by special lectures, videos or celebrating the health week. On the other hands government schools have limited resources therefore authorities cannot provide dental checkups for their students. The numbers of students in each class are

almost triple as compared to private schools and teachers cannot give attention to each child.

In a recent study by **Malik M** it was observed that children from private schools had 77% caries as compared to children from government schools, and difference between school types in prevalence of caries was statistically significant ($p < 0.05$).²³ His results were in disagreement to the present and many previous studies.

It is believed that behavioral factors rather than social environment factors may be directly influential on dental health. Of these behavioral factors brushing, snaking were identified in present study as risk factors.

Results of the present study were consistent in showing importance of oral hygiene. No attempt was made to determine when child had started brushing his teeth. Majority of children used brush for cleaning their teeth, although only 18 % were regular in brushing twice a day. Children who brushed twice a day had less caries than those who were not regular in brushing.

Dentifrices and good oral hygiene are caries preventive as found in studies of **Akhtar** in Pakistan and **Cortelli** in Brazil.^{29,30} In another study in **Kerala (India)** the statistically significant association was found with dental caries and oral hygiene status.³¹ All these studies are consistent with the present study.

Naturally, any alteration in oral habits such as oral hygiene, topical fluoride and changes in dietary habits will influence the cariogenic indices in any of the socioeconomic population categories, but it is uncertain whether the effects of tooth-brushing are due to use of a fluoride dentifrice or from mechanical removal of plaque.³²

Study of **Reisine** showed weak evidence between the associations of the prevalence of dental caries and tooth brushing i.e. the tooth-brushing prevents dental caries.^{20, 33}

The benefits of using fluoride to prevent caries have been known but complete understanding of this mechanism is still unknown. The present study also showed significant association of less caries and fluoride, as children brushed their teeth with fluoride toothpaste had significantly ($p < 0.05$) less caries prevalence. Similar results was found by **Malik**²³

The regular use of fluoridated toothpastes has been described to play a major role in the observed decline in caries prevalence in industrialized countries during the last 20 to 25 years, but only indirect evidence supports this claim. Regardless of analytical approach, no evidence was found to support the hypothesis.³⁴

Miswak is very popular in our society. Miswak (chewing sticks) contain reasonable amount of fluoride. Some chewing stick plants, *S. Persica* have been used in commercial manufacture of tooth pastes in Egypt, India, Pakistan, Switzerland and United Kingdom.^{35,36} The relationship of miswak and caries was significant in the present study as children used Miswak had less caries.

Tapias studied that preventive program using with help of fluoride had been effective and had a clear protective effect.³⁷ The prevalence of dental decay in children in the UK has fallen significantly since the 1970's mainly as a result of the introduction of fluoridated toothpaste and fluoridation of water supplies. Nevertheless dental caries still remains a significant problem.³⁸⁻³⁹

In the present study the association between caries and different food habits were analyzed. In today's modern life style, the food habits have changed. People are using more refined food rather than rough and course food. Due to busy life style they prefer to use frozen, canned or artificially preserved food as compared to fresh fruits or vegetable. In the present study, it was found that people used bakery products had more caries, and association with caries was found to be significant ($p < 0.05$). Similarly children who used bread in their breakfast had more carious lesions. Results were consistent with **Touger** in showing importance of diet factor.⁴⁰

Akhtar in her study in Peshawar found that lower caries were found in children who ate fresh fruits and vegetables especially raw vegetables.³⁰ A link between food habits and caries was widely accepted and has been shown in previous studies.^{40, 41}

In present study the strongest determinant for caries was the use of sweets. These were well recognized as an important determinant of caries in the present study. Out of 543 children 306 (56.6%) of children used candies daily. It is very common that whenever a child demands something to eat, the caregivers provide sweetened snacks or candies to their children. Parents also give these items as a reward to their child that is why toffees, candies or chocolates consumption is increasing daily. Instructions to influence caregivers to change these habits may not be successful until community wide efforts are under taken to alter the behaviors.

Tinanoff reported that dental caries in preschool children was due to a combination of factors, including colonization of teeth with cariogenic bacteria, type of foods, frequency of intake of these foods and susceptible teeth. Caries risk was greatest if sugars were consumed at high frequency and were in a form that is retained in the mouth for long periods. Sucrose was

found to be the most cariogenic sugar because it can form glucan that enables firm bacterial adhesion to teeth and limits diffusion of acid and buffers in the plaque.⁴²

Many factors in addition to sugars affect the caries process, including the form of food or fluid, the duration of exposure, nutrient composition, sequence of eating, salivary flow, presence of buffers, and oral hygiene. Studies have confirmed the direct relation between intake of dietary sugars and dental caries across the life span.⁴⁰⁻⁴¹

Tea is very common drink all over the world, especially in our country it is liked by all age groups. Epidemiological surveys have reported that some populations who drink tea without sugar on a regular basis have a reduced number of carious teeth.⁴³⁻⁴⁴

Recent study demonstrated that after rinsing with tea, 34% of the fluoride was retained in the oral cavity and that some of this showed a strong binding ability to enamel particles on the tooth surface.¹⁷

Tea used by subjects in the present study was sugar sweetened, so it seems they could not gain beneficial effects of tea, it does not prevent the caries. However **Linke** concluded that a frequent intake of black tea could significantly decrease caries formation, even in the presence of sugars in the diet.⁴⁴

The continuing increase in soft drink consumption among adolescents raised a national concern about the health effects of soft drinks in many parts of the world including Pakistan. Sugar-containing soft drinks can be cariogenic and their low pH can cause erosion in teeth.⁴⁵ Phosphorus (phosphoric acid) content of soft drinks may reduce calcium absorption. Heavy consumption of sugar-containing soft drinks can also lead to excessive sugar intake, and is thus hypothesized to be associated with caries.

A recent analysis of the third National Health and Nutrition Examination (NHANES III) suggested an association between sugared soda consumption and permanent tooth caries. Persons who consumed sugared soda three or more times daily had 17-62% higher dental caries than those who consumed no sugar soda.¹⁷

In a study of school children in England, a 3% higher risk of caries with an average increase of one can of soft drink per week was reported.¹⁹ It showed that soft drinks increased the risk of caries. Non-nutritive sweeteners found in diet soft drinks may not be directly cariogenic because tooth decay producing bacteria cannot ferment aspartame, saccharine, acesulfame-K, cyclamate and sucralose to produce acids.¹⁹

Many soft drinks also contain significant amounts of caffeine. Regular caffeine ingestion may lead to increased, even habitual, usage. It is suggested that the combination of the consumption of highly sweetened soft drinks and habitual usage of caffeine may significantly increase a susceptible adolescent's potential for developing dental caries.¹⁷ In present study only n=24 (4.6%) of children used soft drinks daily and n=334 (61.5%) used it rarely, so the association between these two was not significant as in previous studies.

CONCLUSION

In present study high risk for dental caries was poor oral hygiene and high sucrose diet. Fluoride toothpaste and miswak were very effective in controlling caries. The relationship between outcome and parents education was less consistent in the present study. Majority 44% of the children were from higher socioeconomic group and in children from government schools. Since the etiology and prevention of dental caries is very simple, prevention seems to be the most practical approach. The need of the time is to develop an accessible, low-cost, sustainable primary preventive program using the existing health infrastructure and resources.

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CORRIGENDUM

The following is the correct version of the tables published in the article written by Dr Saeeda Abdullah (in Vol 28, No 1, page 107).

Age Group	dmft	d(±SD)	m(±SD)	F(±SD)
Six Years	7.45	6.18(±3.91)	0.58(±1.61)	0.69(±1.79)
Seven Years	6.52	5.14(±3.8)	0.64(±1.25)	0.74(±1.63)
Eight Years	5.74	4.54(±3.01)	0.74(±1.10)	0.44(±1.12)
Nine Years	5.33	4.02(±2.64)	1.22(±1.55)	0.46(±1.26)
Six to Nine Years	6.33	4.95(±3.45)	0.80(±1.40)	0.58(±1.47)

TABLE 1: AGES OF SUBJECTS EFFECTED BY CARIES WITH dmft

Age Group	DMFT	D(±SD)	M(±SD)	F(±SD)
Six to Nine Years	0.39	0.36(±0.88)	0.0	0.29(±0.25)

TABLE 2: SUBJECTS EFFECTED BY CARIES WITH dmft