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Effect of Cariogenic Food Exposure on Prevalence of Dental Caries among Fee and non-fee Paying School Children, Udaipur, India

Efeito da Exposição a Alimentos Cariogênicos na Prevalência de Cárie Dentária Entre Estudantes de Escolas Públicas e Privadas, Udaipur, Índia

Manish JAIN¹, Leena JAIN², Anmol MATHUR¹, Kapil PAIWAL³, Prabu D⁴, Suhas KULKARNI⁴, Pradeep S. TANGADE⁴

¹M. D. S., Senior Lecturer, Department of Public Health Dentistry, Peoples Dental Academy, Bhopal, Madhya Pradesh, India.

²Lecturer, Department of E. N. T, People's College of Dental Science and Research Centre, Bhopal, Madhya Pradesh, India.

³Postgraduate student, Darshan Dental College and Hospital, Udaipur, Rajasthan, India.

⁴Professor and HoD, Department of Preventive & Community Dentistry, Kothiwal Dental College, Mooradabad, Uttar Pradesh, India.

RESUMO

Objetivo: Determinar o efeito da exposição a alimentos cariogênicos na prevalência de cárie dentária entre estudantes de escolas públicas e particulares de Udaipur, Índia.

Método: Realizou-se um estudo transversal com 281 crianças de escolas públicas e particulares. A taxa de resposta foi de 93,6%. Para o registro dos dentes cariados, perdidos e obturados, utilizou-se o índice CPO-D. Foram aplicados os testes de Análise de Regressão Múltipla Stepwise, ANOVA e Qui-quadrado, sendo as análises feitas com o uso do Software SPSS.

Resultados: Uma elevada frequência de consumo de alimentos açucarados foi registrada para os estudantes das escolas particulares, os quais apresentaram maior prevalência de cárie quando comparado aos estudantes de escolas públicas ($P=0,000$). Entretanto, verificou-se diferença estatisticamente significativa ($P=0,000$) no método de higienização dos dentes entre os escolares.

Conclusão: Verificou-se que estudantes de escolas particulares têm maior prevalência de cárie dentária quando comparado àqueles de escolas públicas em decorrência de consumirem maior quantidade de doces e de alimentos açucarados entre as refeições por possuírem maior status sócio-econômico.

ABSTRACT

Objective: To find out the effect of cariogenic food exposure on prevalence of dental caries among fee and non fee paying school children in Udaipur, India.

Method: A cross sectional study was conducted in non-fee paying and fee paying school children in Udaipur. A total of 281 children were examined. Response rate was 93.6%. An examination was performed using Type III examination procedure. To record the caries experience decayed, missing, filled (DMF) caries index was used. Stepwise Multiple Regression Analysis and ANOVA and Chi square analysis was applied by using S.P.S.S. software.

Results: The highest frequency of sweet consumption was recorded in fee paying subjects, who also had statistically significant higher caries prevalence than in non fee paying subjects ($P=0.000$). However there was significant difference ($P=0.000$) in method of cleansing of the teeth between fee and non fee paying subjects.

Conclusion: It was found that fee paying subjects in India are having more dental caries prevalence as compared to non fee-paying because fee-paying subjects are consuming more sweets, more in between sugary meal, bakery products as they belong to high socio-economic status.

DESCRIPTORES

Epidemiologia; Cárie dentária; Estudantes; Dieta cariogênica.

KEYWORDS

Epidemiology; Dental caries; Students; Diet, cariogenic.

INTRODUCTION

Dental caries has been called as scourge of modern civilization and is without doubt, one of mankind's most prevalent chronic diseases. Incidence of dental decay is on the rise in many developing countries that previously had very low or low caries prevalence has now been accumulated¹.

During these two decades largely as a result of WHO activities in oral epidemiology², comparable data on the prevalence of caries for ages 6 and 12 has been acquired. These recent data have been used to re-examine and reassess the association of sugar and dental caries.

The increased rate of dental caries among school children in recent years has been one of the major health problems in developing countries³. Among the etiologies of disease in school children, environmental factors, particularly intake of refined carbohydrate and socio economic status of parents have been strongly implicated⁴.

With increasing availability or assorted and appealing Cariogenic food stuffs to the public in the forms of candy, biscuits, sticky toffee, it is paramount to investigate the prevalence of dental caries among children from different socio economic groups such as fee verses non-fee paying schools. In the current literature sugar consumption has been implicated as one of major contributors to dental caries⁵.

The individual drive for the consumption of sweet food is controlled by a variety of biologic, psychologic and sociologic factors. Some investigators assume that taste preference may be one of major factors responsible for the amount of sugar or salt consumed by the individual under normal metabolic conditions⁶. Different individuals may prefer different intensities of sweet or salty taste. This relative stability suggests that taste preference is more the individual's personal characteristic than a biologic variable primarily dependent on actual fluctuations of the metabolic status⁷. The latter is presumably more dominant in dietary habits of man.

Consumption of sugar containing foods is believed to be on the increase in developing countries particularly among urban residents from higher socio-economic background⁸. It has been suggested that variation in dietary and oral hygiene habits might account for the social and regional distribution of caries experience in Ghanian school children⁹.

Based on previous finding it was hypothesized that rural residents, males and subjects of lower socio-economic status would be less likely than their urban, female and higher socio-economic status counter parts

to consume sugary products and to take preventive actions.

Dental caries is most commonly seen oral disease showing striking geographic variation, socio economic patterns and severity of distribution all over the world^{10,11}.

Numbers of factors have been put forward to explain the variation in prevalence and severity of dental caries found between developing and developed countries but also between rural and urban communities. Additionally there is marked variability in the pattern of many diseases between different socio-economic groups in same country.

Research in industrialized countries has revealed that children of high social class families experience less caries than those of lower social classes¹². However this relationship appears to be reversed in the developing countries. Hence an attempt has been made to determine the relationship of oral hygiene status and dental caries experience with socio-economic status in Udaipur, India.

The aim of the present study was to find out the effect of Cariogenic food exposure on prevalence of dental caries among fee and non fee paying school children in Udaipur, India.

MATERIALS AND METHODS

A cross sectional study was conducted in non-fee paying and fee paying school children with 150 students each between age group of 11-18 years in Udaipur City located in the south-east zone of Rajasthan, India. Data collection was conducted in the month of January and February in the year 2010.

A total of 4 schools (2 Government and 2 Private) were selected by stratified random sampling method. A total of 281 children were examined. Out of which 10 were absent on that day and rest 9 were not willing for their checkup to be done, so they were excluded. Response rate was 93.6%.

Ethical clearance was been obtained from the ethical committee of Darshan Dental College and Hospital before the study. Informed consent was taken from their parents before starting the examination.

A Performa was prepared to collect the data about the oral health status of the subjects and sugar consumption by the subjects. The Performa consisted of frequency of sweet consumption per week, type of meal taken at lunch time, method of tooth cleansing and material for tooth cleansing in the children.

The samples were examined using a plane mouth mirror and CPI probe where necessary according to WHO

caries diagnostic criteria (World Health Organization, 1993). Instruments were sterilized; Examinations were performed using Type III examination procedure. To record the caries experience decayed, missing, filled (DMF) caries index was used. Both DMFT and DMFS were recorded.

There were two examiners who were calibrated before the survey for inter examiner variability and the reliability was tested by means of weighted Kappa statistics which was 90.3%.

Chi square analysis was undertaken to estimate whether significant association between the prevalence of dental caries and type of school or sex distribution. Data on different methods of cleansing teeth as reported by subjects were also analyzed for any significant relationship with the type of school. A probability (P) less than 0.05 was chosen as significant.

Stepwise Multiple Regression Analysis and ANOVA and Chi square analysis was applied by using S.P.S.S. software (version 11.0).

RESULTS

Figure 1 shows that among non fee paying 8.6% of subjects were between 11-12 years of age, likewise 22.9% were between 13-14 years, 32.9% were between 15-16 years and 35.7% were between 17-18 years of age. Whereas in fee paying subjects 46.1% were between 11-12 years of age, 16.3% were between 13-14 years, 14.9% were between 15-16 years and 22.7% were between 17-

18 years of age.

Table 1 shows that in fee paying, 63.8% consuming sweet 1-4 times per week, while 22.7% were consuming sweet 5-8 times per week and only 0.7% were not consuming any sweets. There is greater consumption of sweet in fee-paying as compare to non fee-paying. In fee-paying there are 12.8% who take sweet more than 8 times in place of non fee-paying who are only 2.1%.

There are higher consumption of fruit/cake/biscuit/ fast food in fee-paying than non fee-paying subjects. In this group 82.9% of subjects had biscuit/fast-food/fruit/ cake as a midday meal. The majority of non fee paying subjects (78.7%) bought their midday meal at the school premises under the supervision of school teacher. Table 1 shows that 47.5% fee-paying subjects consume sweet or other sugary meal 3-5 times in between meal. While in non fee-paying 66.4% subjects take 1-2 times sugary meal in between meal and 28.6% was not consuming any sugary meal in between food.

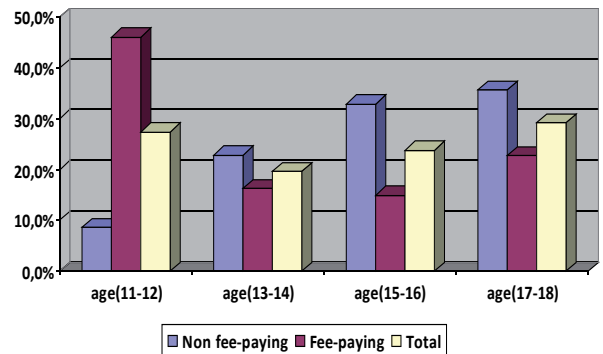


Figure 1. Sample size distribution according to age groups.

Table 1. Frequency distribution of subjects.

Variable	Non Fee Paying		Fee Paying		Total	
	n	%	n	%	n	%
Frequency of Sweet Consumption per week*						
1-4 times	102	72.9	90	63.8	192	68.3
5-8 times	30	21.4	32	22.7	62	22.1
Greater than 8 times	3	2.1%	18	12.8	21	7.5
None	5	3.6%	1	0.7	6	2.1
Type of lunch taken**						
School Meal (Rice, Dal, Chapatti etc.)	25	17.1	110	78.7	135	48.0
Fruit / Cake / Biscuits / Fast Food	115	82.9	30	21.3	145	52.0
In between meal sugary intake frequency***						
1-2 times	93	66.4	38	27.7	131	47.0
3-5 times	6	4.3	67	47.5	73	26.0
Greater than 5 times	1	0.7	26	18.4	27	9.6
None	40	28.6	9	6.4	49	17.4

Chi square*: 14.192; df-3; P=0.003; Chi square**: 106.722; df-1; P=0.000; Chi square***: 115.822; df-3; P=0.000

Table 2 shows that about 17.1% of non fee-paying schoolchildren used Chewing stick compared to 1.4 % of the fee-paying schoolchildren. There were 97.2% subjects

of fee-paying used tooth brush where as 65% in non fee-paying. In non fee-paying 17.9% cleaned their teeth with the help of finger. It also shows that about 75.7% subjects

of fee-paying cleaned their teeth once a day while 56.7% subjects in non fee-paying. In non fee-paying there was no subjects who cleaned teeth more than twice but

14.3% subjects were cleaned their teeth more than twice in fee paying.

Table 2. Frequency distribution of subjects.

Variable	Non Fee Paying		Fee Paying		Total	
	n	%	n	%	n	%
Mode of cleaning teeth*						
Tooth Brush	91	65.0	137	97.2	288	81.1
Finger	25	17.9	2	1.4	27	9.6
Chewing stick	24	17.1	2	1.4	26	9.3
Frequency of cleaning teeth**						
Once	106	75.7	80	56.7	186	66.2
Twice	14	10.0	61	43.3	75	26.7
More than Twice	20	14.3	0	0.0	20	7.1

Chi square*: 47.486; df-2; P=0.000; Chi square**: 53.085; df-2; P=0.000

Table 3 depicts that there was a significant difference between the prevalence of dental caries in both the type of schools the subjects attended ($P<0.001$). In non fee paying 31.4% subjects had no caries while only 9.9%

fee-paying subjects were caries free. But high caries prevalence was shown by fee-paying, having 19.1% where in non fee-paying only 2.9% having higher score of DMFT.

Table 3. Comparison of incidence of dental caries in fee and non fee paying subjects.

Type of school	DMFT									
	0		1-2		3-4		5-6		7-8	
	n	%	n	%	n	%	n	%	n	%
Non fee paying (count)	44	31.4	65	46.4	22	15.7	5	3.6	4	2.9
Fee paying (count)	14	9.9	28	20.6	42	29.8	29	20.6	27	19.1
Total	58	20.6	94	33.5	64	22.8	34	12.1	31	11.0

Chi square: 69.557; df-4; P=0.000

Table 4 shows the mean value of DMFT. The highest mean DMFT values of 3.91 were recorded for the subjects attending the fee-paying school while mean DMFT value of 1.64 was recorded for the subjects attending the non fee-paying school. Total mean DMFT for both fee-paying and non fee-paying was 2.78.

Table 4. Mean DMFT in fee and non fee paying subjects.

Fees	N	Mean	Std. Deviation
Non fee paying	140	1.64	1.71
Fee paying	141	3.91	2.41
Total	281	2.78	2.38

t value: 82.71; P=0.000

which provided a variance of 24.0% in DMFT but Brushing frequency carried a less weight (7.3%) when compared to the inbetween sugary meal intake (16.7%).

Table 5. Multiple Regression Analysis with DMFT as a dependent variable.

Model	R	R ²	Standard Error	F	P
DMFT					
1	.167 (a)	.028	1.70	3.967	.048 (a)
2	.240 (b)	.057	1.68	4.176	.017 (b)

(a) Predictors: (Constant) - In between sugary meal; (b) Predictors: (Constant) - in between sugary meal, Brushing frequency.

Table 5 show multiple regression analysis in which depending variable is DMFT and all such as in between sugar consumption, brushing technique, type of food taken, frequency of sweet consumption are independent variable. Multiple regression revealed that the best predictors in the descending order for debris scores were inbetween sugary meal intake and brushing frequency,

DISCUSSION

While dental practitioners in developed countries are becoming concerned about unemployment due to effective dental care program that has yielded a decreasing incidence of dental caries in population, the converse is the case in developing countries. There is an

increasing need of dental practitioner to combat the high prevalence of dental caries, particularly among school children³.

Dental caries is a post eruptive destructive disease of mineralized tissues of the teeth, initiated by acids produced in dental plaque by bacterial fermentation of carbohydrate substrates. A rapid increase in caries probably is because of change to modern diet and dietary habits dominated by imported industrial sugar containing products. A similar trend has also been reported from Canada¹³, Alaska¹⁴ and Asian countries¹.

Toverud's documentation¹⁵ of the decrease in caries increment in Norwegian school children during World War II emphasizes the close association between intake of refined carbohydrates and occurrence of caries.

The difference in prevalence of dental caries between both schools was highly significant ($P < 0.001$), the fee paying have more caries than non-fee paying school subjects. Obviously, the exposure of the school children from the fee-paying school to Cariogenic foodstuff is exacerbated by the chains of birthday parties the children attend both at home and at school, and of the sweet snack they buy at the lunch break. On the other hand, the exposure of the subjects to Cariogenic food stuffs is minimized by the compulsory midday meal bought under the supervision of the school authority. It is interesting to note that there was a significant difference ($P < 0.001$) in the methods of cleaning teeth and the types of school.

The comparison of incidence of dental caries among fee-paying and non fee-paying Nigerian school children conducted by some authors¹⁶ shows that 51.66% and 75.83% fee and non fee-paying were having no caries respectively. The highest caries Prevalence was found to be 1.66% in fee-paying and 0% in non fee-paying subjects. Whereas in Indian school children 9.9% of fee paying and 31.4% of non fee-paying were having no caries while highest caries percentage was found to be 19.1% in fee-paying and 2.9% in non fee-paying Indian school children. So higher incidence of caries was found among fee-paying Indian school children because their sweet consumption was more than non fee-paying.

Numerous studies have shown that population groups consuming diets which are based wholly or largely on local agricultural products generally have a low rate of dental decay. Contact of these groups with the habits and diets associated with urban living have almost invariably led to pronounced increase in caries. A prominent feature of urbanization is to increase in consumption of manufactured and processed foods, particularly sugar.

The finding of the present study buttress the earlier report that increased consumption of fast food, biscuits,

snack and the parental economic status have direct relationship with the prevalence of dental caries among school children^{4,17,18}. Caries in developed countries has become most prevalent in low socio-economic group while in developing countries it starts as a problem mainly in those of high economic status.

The use of toothbrush and toothpaste was recorded for the subjects from fee-paying schools while the other group used more chewing stick. This finding supports the view that tooth brushing without appropriate instruction and regular supervision of the children will not prevent dental caries. Brushing the teeth may be done very fast and with a technique greatly reduced in quality. A chewing stick on the other hand, takes a longer period every morning.

The study conducted on effect of Cariogenic food exposure on prevalence of dental caries among fee and non fee-paying Nigerian school children showed that 5% of fee paying and 50.83% of non fee-paying use chewing stick for cleaning their teeth. In Nigeria 95% of fee-paying and 49.16% of non fee paying use tooth brush for cleaning their teeth whereas study conducted in India had shown that 97.2% of fee-paying and 65.0% of non fee-paying school children use tooth brush for cleaning their teeth¹⁶.

A well documented finding is that females take preventive oral health action more often and consume sugary products less often than males¹⁹. Studies conducted in Africa have shown that, the majority, and more women than men engage in daily tooth cleansing^{10,20-22}. In our study we also found the same results that females were more conscious about their oral health and consume less sugary products than male. Among Ghanaian children chewing sticks are commonly used, although the more educated use commercially produced tooth brushes²³.

In developing countries there is an urgent need for regular professional instruction in brushing to the mother at all health centers, at parent teacher association meeting and to school children right from nursery to secondary school level.

In the school curricula topics about nutrition and its effects on oral health should be incorporated. Such curricula should include instruction on health and social implication of dental caries, the type of foodstuffs that promote dental caries and those deterrent foodstuffs available in the community to be taken at each meal should be catalogued and explained thoroughly.

Reason for routine checkup should also be included. Perhaps one of the surest avenues to reduce dental caries in children is to make non-Cariogenic midday compulsory for all primary school children. On the part of the ministries of the health and education, concerted

efforts should be geared towards informing the public at large. Awareness should be created through mass media, by organizing various workshops; seminars about the causes and prevention of dental caries among school children.

Present study results agree with those of others authors²⁴ who found that the low frequency of sugar in take in between meals and the high frequency of tooth brushing were both correlated to caries reduction. The result concerning the oral hygiene habits also agree with some researchers^{25,26}.

CONCLUSION

It was found that fee paying subjects in India are having more dental caries prevalence as compared to non fee-paying because fee-paying subjects are consuming more sweets, more in between sugary meal, bakery products as they belong to high socio-economic status. Method for restricting the use of inbetween sugary snacks in addition to oral hygiene instructions are discussed as important means of reducing caries prevalence in school children in developing countries.

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Correspondence:

Dr. Manish Jain
Department of Public Health Dentistry
Peoples Dental Academy
Bhopal, Madhya Pradesh, India 462037
Phone: +91-7898523645
E-mail: manrescommunity@yahoo.com