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## PREVALENCE OF DENTAL CARIES IN OVERWEIGHT SCHOOL GOING CHILDREN OF 12-15 YEARS IN AND AROUND JAIPUR CITY, RAJASTHAN, INDIA

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### ABSTRACT

**INTRODUCTION.** Dental caries and obesity are both multifactorial disease with a complex etiology and both are associated with dietary habits. Prevalence of dental caries and an association between body mass index (BMI) and dental caries among school children. **METHODS.** The present was done on 1500 school going children to assess the prevalence of dental caries in 12-15 year old overweight children. Weight and height were measured in light clothing and without shoes using an electronic weighing scale. Subjects' heights were measured using a stadiometre. Subjects were examined on an upright chair in adequate natural daylight and dental caries was measured by using DMF index. Chi-square test was used to analyze and compare qualitative data whereas unpaired 't' test was used to analyze and compare quantitative data. **RESULT.** Amongst 1500 children, 156 were found to be overweight, 443 were normal weight. When mean BMI between overweight and normal weight were compared a highly significant difference was observed. When DMFT of overweight and normal weight were compared no significant difference was observed. **CONCLUSION.** dental caries was observed more in females as compared to males and no significant difference was observed between dental caries and weight gain

**Key words:** dental caries, overweight, diet, multi factorial, prevalence

### INTRODUCTION

“Dental caries is an irreversible microbial disease of the calcified tissues of the teeth, characterized by demineralization of the inorganic portion and destruction of the organic substances of the tooth, which often leads to cavitation (1). It has been known as the major cause of dental pain and tooth loss in populations all over the world (2) throughout the history of mankind and is still a major public health problem worldwide (3). Risk factors associated with dental caries includes physical, biological, environmental, behavioral, and lifestyle-related factors such as high numbers of cariogenic bacteria, inadequate salivary flow, insufficient fluoride exposure, poor oral hygiene, inappropriate methods of feeding infants, and poverty (2).

Overweight /Obesity can be defined as having an excess of body fat related to lean mass. High sugar intake, e.g. sugar containing snacks and Junk food, is reported to be more common among overweight and obese children than those with normal weight. Thus, the claimed eating pattern among overweight or obese children may be a risk factor in common for overweight and caries (4). Overweight children also experience depression and low self esteem, stress

can add to this problem, serving as a risk factor for a periodontal disease as well as early fat and highly caloric foods (5-7).

Dental caries and obesity are both multifactorial disease with a complex etiology and both are associated with dietary habits. A number of studies have linked consumption of sweetened beverages with increased energy intake, obesity and dental decay (8). There are reports of associations between obesity and dental caries although the data are mixed and provide conflicting evidence. A systemic review reported that only one of seven cross-sectional studies with children showed an association between obesity and dental caries (8). Several other studies have also reported conflicting results (9-13). Various studies (14-18) reported an association between BMI (Body Mass Index) and DMFT (Decayed, Missed, Filled Teeth) while other studies (19-20) found no significant association between weight and caries.

Keeping in view the above factors the present study was undertaken to find prevalence of dental caries and an association between body mass index (BMI) and dental caries among school children of 12-15 years in and around Jaipur city, Rajasthan in Northwest India.

## MATERIAL AND METHODS

A study on the prevalence of dental caries in 12-15 year old overweight children in and around Jaipur city was undertaken by the Department of Pedodontics and Preventive Dentistry, Jaipur Dental College, Jaipur.

### Source of Data

Random sampling method was used to select children to be included in the study. The study population consisted of 1500 school going children in the age group of 12-15 years from different schools in and around Jaipur city which includes both male and female children.

### Methods of collection of data

Information and lists of government and private schools in Jaipur was obtained from the Block Education Officer. Schools were randomly selected from this list. Informed consent was taken from the Principals of schools and parents of the children.

### Inclusion criteria

- 12-15 years of age
- The children were divided into two groups overweight (OW) and normal weight group (NW) according to BMI standardization. If any recording of BMI > 30, the children of that category will also be included in the overweight group.

### Exclusion criteria

- Any habit to tobacco use
- Any systemic disease
- Child with any primary teeth present.

### Method of examination

- Oral examination was undertaken by a single examiner Recording was done by a trained person who assisted the examiner throughout the study.

### BMI recording

- Weight and height were measured in light clothing and without shoes using an electronic weighing scale. Subjects' heights were measured using a stadiometre.
- BMI categorized using internationally recognized classification system
- **IOTF criteria** (International Obesity Task Force)
- The degree of obesity is determined by the body mass index- body mass index (BMI) weight in kilograms by the square of the height in meters.

### Body weight/ (body height)<sup>2</sup> in kg/m<sup>2</sup>

- Under weight--BMI < 20
- Normal weight-- BMI 20-24.9
- Over weight--BMI 25-30
- Obese children--BMI >30

Children were categorized as overweight group and normal weight group according to the BMI. If any recording of BMI > 30, the children of that category will also be included in the overweight group.

### Oral Examination

Subjects were examined on an upright chair in adequate natural daylight and dental caries was measured by using DMF index.

### Statistical Analysis

Quantative data was summarized as mean and standard deviation while qualitative data was summarized as percentages. Chi-square test was used to analyze and compare qualitative data whereas unpaired 't' test was used to analyze and compare quantative data. Pearson correlation coefficient was used to find co-relation between two variables. Multivariate logistic regression analysis was done to find out predictor of caries and to derive regression equation. p value < 0.05 was taken as significant. Medcalc 14.0.0 version software was used for statistical calculation.

## RESULTS

The present study was to evaluate the association between dental caries and overweight children on a sample of 1500 school going children of 12 to 15 years of age in and around Jaipur city, Rajasthan. The examination included 1500 school children of 12-15 years of age. Amongst 1500 children, 156 were found to be overweight, 443 were normal weight.

Table 1 shows Distribution of study participants according to the weight, classified as underweight, normal weight and overweight as calculated by BMI (**IOTF CRITERIA**)

Table I. Distribution of study participants according to weight category

Category		BMI (kg/m <sup>2</sup> )	
NW	:	20-24.9	
OW	:	25-30 and above	
UW	:	BMI < 20	
<b>NW</b>	<b>OW</b>	<b>UW</b>	<b>Total</b>
<b>443</b>	<b>156</b>	<b>901</b>	<b>1500</b>

Table 2 shows Distribution of sample population (excluding underweight participants that were 901) according to gender and weight category. Out of 435

normal weight children who were included in our study, 254 were males and 181 females. The number of overweight males is 80 and 74 were females.

Table II. Distribution of sample population according to Gender and weight category

Sex	NW		OW		Total	
	No.	%	No.	%	No.	%
Male	254	58.39	80	51.95	334	56.71
Female	181	41.61	74	48.05	255	43.29
Total	435	100.00	154	100.00	589	100.00

Chi-square = 1.670 with 1 degree of freedom; p = 0.196

Table 3 shows Distribution of sample population according to caries status and weight. The prevalence of caries in overweight children was 52.60 % (n=154) and in the normal weight children was 47.82 %

(n=435). This indicates a higher prevalence of caries in overweight children in comparison to normal weight. However no statistically significant difference was observed between he both.

Table III. Distribution of sample population according to caries status and weight category

Category	Absent		Present		Total	
	No.	%	No.	%	No.	%
NW	227	52.18	208	47.82	435	100.00
OW	73	47.40	81	52.60	154	100.00
Total	300	50.93	289	49.07	589	100.00

Chi-square = 0.858 with 1 degree of freedom; P = 0.354

Table 4 shows comparison of mean BMI between overweight and normal weight. The mean BMI of

overweight group is 26.45 and normal weight group is 21.24. The findings are highly significant statistically

Table IV. Comparison of mean BMI in overweight and normal weight group

BMI		N	Mean	Std. Deviation	'P' Value*
	NW	435	21.24	1.19	
OW	154	26.45	1.55	0.000	

\*Unpaired 'T' Test

Table 5 shows comparison of mean DMFT between overweight and normal weight.

Table V. Comparison of DMFT w.r.t. weight category

	N	Mean	Std. Deviation	'p' Value*
OW	154	1.34	1.68	0.165
NW	435	1.13	1.62	

'Unpaired 't' test

The mean DMFT in overweight children is 1.34 and 1.13 in normal weight group. DMFT is slightly higher in overweight children. The values are statistically not significant p=0.165.

Table VI. Comparison of DMFT w.r.t. Gender

	N	Mean	Std. Deviation	'p' Value*
Male	334	0.99	1.54	0.001
Female	255	1.44	1.72	

'Unpaired 't' test

Table 6 shows comparison of mean DMFT between males and females. DMFT scores were higher in females with mean DMFT 1.44 and in males it is 0.99. This difference is highly significant statistically.

Table 7 shows the Logistic Regression for Caries Status and other variables, in the study only male gender showed significant association with the dental caries.

Table VII. Logistic Regression for Caries Status

Variables in the Equation	B	S.E.	Wald	df	Sig.	Exp(B)
Age	.139	.069	4.055	1	.044	1.149
Male	.571	.170	11.304	1	.001	1.769
OW	-.171	.191	.802	1	.371	.843
Constant	-1.986	.914	4.721	1	.030	.137

$$\text{Log (present/absent)} = -1.986 + 0.139*x \text{ Age} + 0.571*x \text{ Male} - 0.171*x \text{ OW}$$

## DISCUSSION

Obesity has become a global health problem existing throughout post-industrial and developing regions. According to the American Academy of Pediatrics, Committee on Nutrition (2003), being overweight is now the most common medical condition of childhood, with the prevalence having doubled over the past 20 years. The overweight condition in childhood and adolescence increases the risk for adult obesity and its consequent health risks during adulthood (21). Dentists must be aware of how nutrition impacts on general and oral health and how dental treatment can impact on the patient's nutritional status (22).

Diets high in sugar (for example, added sugar) have been associated with various health problems, such as dental caries, dyslipidemias, obesity, bone loss and fractures and poor diet quality. In addition, sweetened drinks (fruitades, fruit drinks, soft drinks, etc) constitute the primary source of added sugar on children's daily diet. Furthermore, soft drinks pose a risk of dental caries because of their high sugar content and enamel erosion due to their acidity. When sugar intake exceeds 15 to 20 kilograms per person per year, such intake is directly associated with increasing caries prevalence (21).

Childhood obesity has become a global health problem and is associated with precursors of adult illness including cardiovascular disease and type 2 diabetes. In the United States 17% of children and adolescent are currently obese (8). Study done in Delhi showed prevalence of 6.2% and (23). A study done in Jaipur on Prevalence of obesity in school going children showed overall prevalence of obesity and overweight to be 5.69% and 14.83% respectively. In girls, the prevalence of obesity and overweight was 6.58% and 16.23% respectively while in boys, it was 5.11% and 13.92% respectively (24).

The increasing rate of obesity for young people is of particular concern because research has suggested that childhood obesity predicts adult obesity. Obesity is a multifactorial disorder, influenced by environmental and genetic risk factors where a sustained imbalance between energy intake and energy expenditure facilitates storage of excess energy as fat. Diet is a primary determinant of obesity. Diet specifically through the frequent consumption of monosaccharide (glucose, fructose) and disaccharide (sucrose) sugars is the predominant cause of dental caries.

In recent year, concern has been raised over the consumption of sugar-sweetened beverages in contributing towards diseases such as obesity and caries<sup>8</sup>. The association of poor oral health with obesity is likely to be associated with the quality of the diet. Consumption of high caloric food together with

less activity and exercise contributed to the increasing number of overweight children worldwide.

In the present study it was observed that out of 154 overweight children 51.95% were males and 48.05 % were females. Out of 435 normal weight children 58.39% were males and 41.61% were females. But the values are not statistically significant. Contradictory to our study, *Marshall TA et al 2007 (6)* did a study and reported 74 % and 76 % normal weight females and males respectively. At risk of overweight females and males were 21% and 18 % respectively and overweight females were 5 % and males 7%. In a study by *Prashant S.T et al 2011 (25)* 56.6 % Females and 43.4 % Males were in Normal weight group and 68% Females and 32% Males in Overweight group. In another study by *Ali Bagherian et al 2013 (26)* 20 % and 21 % were Normal weight boys and girls respectively. At risk of overweight were 5.8% boys and 7.5% girls. 16.5% boys and 8.2 % girls were in overweight category.

The present study shows the prevalence of dental caries in the overweight children in our study to be 52.60 % and in the normal weight children to be 47.82%. This indicates a higher prevalence of caries in overweight children in comparison to normal weight. However, the differences were not statistically significant these results are contrary to the results observed by *Macek et al 2006 (19)* 38.8 % in overweight children and 37.8 % in normal weight children. In another study by *Morerira et al 2006 (5)* prevalence in obese children was 50.9 % and 52.7 % in normal group for children in state schools and in private schools 9% and 9.6 % in obese and normal weight category respectively. In a study done by *Alves et al 2013 (27)* the prevalence of dental caries in normal weight, overweight and obese was 55.86%, 54.20% and 53.89% respectively. Another study by *Bhoomika et al 2013 (28)* showed a positive correlation between the BMI and severe early childhood caries (S-ECC) indicating mean BMI of S-ECC is statistically more than the normal children, whereas there is no correlation between S-ECC and obesity.

Both overweight/obesity and caries are associated with poor diet quality rich in sugars and we assume that there is a link between these two factors; it is surprising to find no significant association between the two in our study. The reason could be complex interaction of many factors which are responsible for the condition and diet cannot be considered to be the only factor responsible for caries and obesity. Another reason could be the overweight children were mainly seen in affluent schools of Jaipur with high socio economic status and it was seen that these children are even more aware of their oral and overall hygiene than children with low socio economic status.

It was observed that the mean DMFT in overweight children is 1.34 and 1.13 in normal weight group.

Hence in our study the incidence of dental caries is slightly higher in overweight group. However the difference is not statistically significant. The findings of the present study are in accordance with the study by *Macek et al 2006 (19)* which analyzed National Health and Nutritional Examination Survey (NHANES) for survey years 1999-2002. According to the NHANES data regarding the permanent dentition, overweight children had only slightly higher dental caries prevalence values than did normal children and the differences were not statistically significant. In a study by *Fotedar Shailee et al 2013 (29)* showed an inverse relationship between caries and weight. However *Alves LS et al 2013 (27)* found no association between weight status and tooth decay.

However in contradiction to the present study, *Willershhausen et al 2007 (18)* reported a significant correlation between dental health and obesity in 2071 primary school pupils. *Larsson et al 1995 (30)* found that caries prone adolescents were more obese and had high blood pressure than caries-free adolescents. *Hayden et al 2013 (8)* did a systematic review and meta-analysis to investigate and quantify the relationship between obesity and dental caries in children and concluded a small overall association between obesity and level of caries in the permanent dentition when standardized definitions for the assessment of child obesity are used.

In comparison of DMFT with gender, it is seen 0.99 is the mean DMFT in males and 1.44 in females indicating a significantly higher DMFT in females. Similar to our study, *Fotedar Shailee et al 2013 (29)* reported females had a significantly higher mean DMFT value than males. *Al Shammery et al 1990 (31)* and *Basha Sakeenabi et al 2012 (23)* also gave similar findings. This may be due to the fact that teeth erupt earlier in females than males which lead to prolonged exposure of the teeth to the oral environment in females (29).

The overweight condition in childhood and adolescence increases the risk for adult obesity and its consequent health risks during adulthood. Dentists must be aware of impact of nutrition on general and oral health of the children. Preventive programs should be undertaken at school level so as to educate the school children and teachers about the dietary pattern and its effect on health of the child. Children should be made aware about the harmful effects of refined sugar. Sticky sugary products, junk food and carbonated drinks should be banned in school canteens.

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