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## Research Article

### RELATIONSHIP BETWEEN DENTAL CARIES AND BODY MASS INDEX AMONG SCHOOL CHILDREN AGED 12 YEARS: ACROSS-SECTIONAL STUDY

Pallavi Kumari., Suma B.S and GarimaMangal

Department of Public Health Dentistry, Buddha Institute of Dental Sciences & Hospital, Patna

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#### ABSTRACT

**Introduction:** Globally, non-communicable diseases are increasingly recognized as a major cause of morbidity and mortality. Among them, overweight and obesity are imperative. The present changing dietary pattern among children is contributing to childhood overweight and on other hand stands as a risk factor in the development of dental caries among school children.

**Objective:** To assess the nutritional status among the study population and to find out if there is any association between nutritional status and dental caries.

**Methods:** A total of 200 school children who had completed chronological age of 12 years from selected middle school in Patna city constituted the study population.

A pre-structured questionnaire was prepared to collect data regarding demographic details, oral hygiene practices, dentition status, treatment needs, and body mass index.

Data obtained were statistically analyzed using Chi-square, analysis of variance (ANOVA).

**Results:** There exists a significant association among children with normal BMI and mean DMFT among government and private school children. But no significant relation exists among other groups. No significant relationship among the gender with BMI.

**Conclusion:** Thbmese complex and multifactorial relations like overweight and dental caries may involve many unknown factors which warrant exploration on larger population.

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#### INTRODUCTION

The children of today are the future of tomorrow. In a state like Bihar 91.8% (6-17years) children are attending schools. The very size of the population suggested that the health care of the school children can contribute to overall health status of the country<sup>1</sup>. The World Health Organization (1946) defines health as "a state of complete physical, mental and social wellbeing and not merely an absence of disease or infirmity and also an ability to lead a socially and economically productive life". Health is multidimensional in nature and can be assessed by health indicators as death rate, infant mortality rate and expectation of life<sup>3</sup>. Dental caries is common non-communicable disease in the world<sup>9</sup>. As a result of untreated situation or lack of treatment or prevention has resulted in diseases like heart problems, stroke, diabetes, pneumonia and other respiratory diseases. According to World Health Organization global records (2011) on DMFT for 12 year old school children is 1.67 and percent of countries having DMFT score of 3 or less (WHO Goal) is 78% (148 out of 189 countries This was based on the data available in 2011 from the WHO Oral Health Database, Country/Area Profile Program

(CAPP). Today the world faces two kinds of malnutrition, one associated with hunger or nutritional deficiency and the other with dietary excess. Hence the present study was undertaken to assess the association of dental caries and obesity and the effect of nutrition and treatment needs among 12-year-old school children in Patna city.

##### Aim

To determine if there is any association between BMI and dental caries in school children aged 12 years.

##### Objectives

To assess the nutritional status among the study population, to find out if there is any association between nutritional status and dental caries and the role of diet with respect to BMI-for age and dental caries.

#### MATERIALS AND METHODS

A total of 200 school children aged 12 year selected from middle schools in Patna city, through simple random sampling. Structured questionnaire with closed ended questions was prepared to collect data regarding: Demographic details, Oral

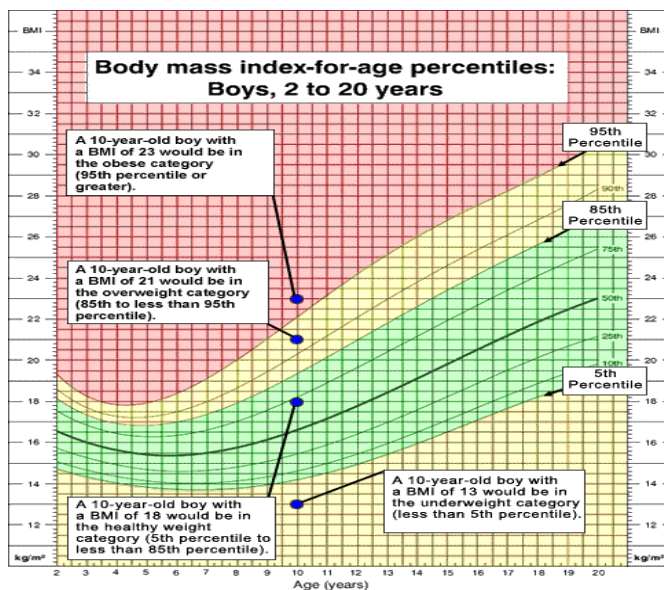
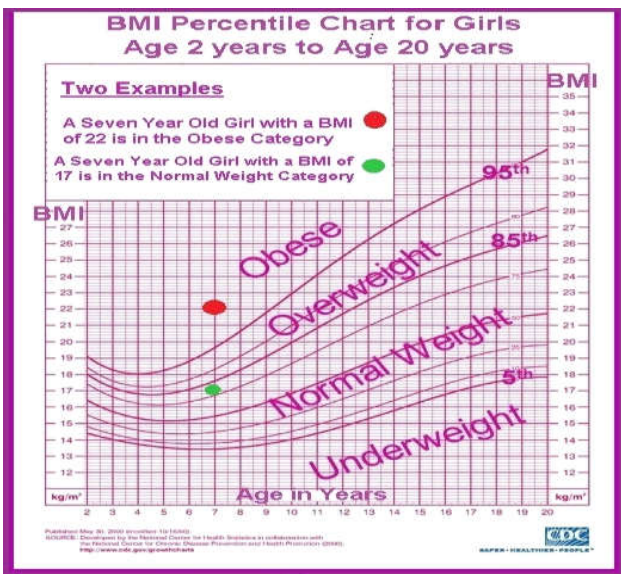
\*Corresponding author: Pallavi Kumari

Department of Public Health Dentistry, Buddha Institute of Dental Sciences & Hospital, Patna

hygiene practices, Sugar consumption, and Nutritional status. Dental caries was recorded according to WHO oral health assessment form, 1997. Training of the examiner was done before conducting the main survey. Informed consent from schools was taken. Ethical clearance was taken from Institutions ethical committee. Nutritional status was assessed using Body Mass Index (BMI).

**Nutritional status by body mass index**

BMI for age percentiles will be calculated by weight in kilogram divided by height in meter square. classification of nutritional status was achieved using the standard of WHO (1995) and also new growth charts from the Centres for Disease Control and Prevention (CDC) include an age- and sex-specific BMI reference for children aged 2 - 20 year .The following classification will be used (Centre for Disease Control and Prevention, 2006).<sup>16</sup>

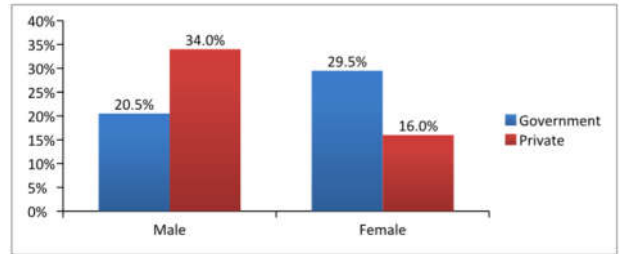


**Statistical Analysis**

Data obtained were statistically analysed using Chi-square test, analysis of variance (ANOVA).

**RESULTS**

A total of 200 school children 100(50%) government and 100(50%) private school children participated in the study, of which 109(54.5%) were males and 91(45.5%)were females. (Table 1) Table1: Distribution of study population according to. gender in private and Government schools.

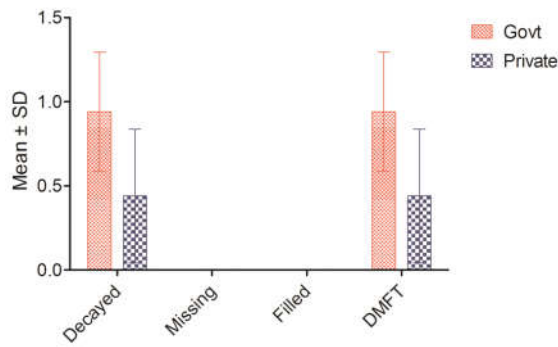


Majority of children 149 (74.5%) were not using any other oral hygiene aids like floss, interdental brush or mouth rinse or any other aids. Whereas 47( 23.5 %) of the subjects used mouth wash for cleaning their oral cavity, followed by 1.5 % and 0.5 % using dental floss and interdental brushes respectively. The use of oral hygiene aids were more commonly seen among private school children compared to government school children.

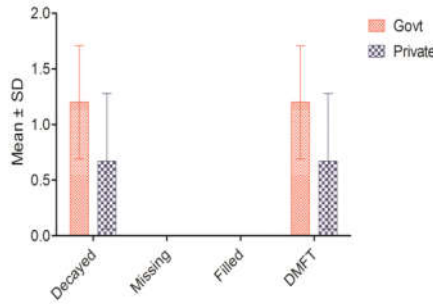
**Table 2** Distribution of study population according to the use of Oral hygiene aids

	Total	Oral hygiene aids			
		Flossing	Inter dental brushing	Oral mouth rinse	None
Government	100	0 (0%)	0 (0%)	25 (12.5%)	75 (37.5%)
Private	100	3 (1.5%)	1 (0.5%)	22 (11%)	74 (37.0%)
Total	200	3 (1.5%)	1 (0.5%)	47 (23.5%)	149 (74.5%)

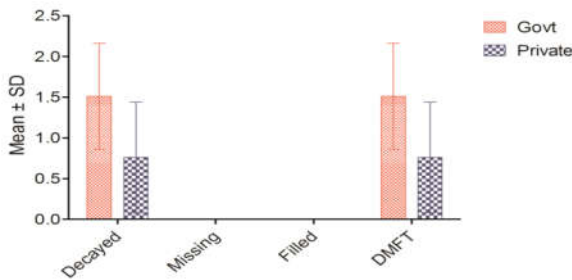
- MEAN DMFT for government school children was 0.84 plus minus 1.562 which was higher than private school children having mean DMFT of 0.24plus minus 1.102.
- Statistically significant high mean decay (0.84) among government school children in comparison to 0.24 among private school children), similar result were observed for the overall DMFT (P=0.002).
- Within male, Student from Government school had significantly high mean decay (1.05) in comparison to private school children (0.28) and similar results were observed for DMFT (P=0.014).
- Within female, Student from Government school had significantly high mean decay (0.69) in comparison to private school children (0.16) and similar result were observed for DMFT (P=0.014).
- Overall comparison between Male and female we observed non-significant difference for decay (p=0.748) as well as for DMFT (p=0.748).
- Within government school children and private school children we observed non-significant difference between Male and Female children for decay (Government p=0.267, Private p=0.605) as well as for DMFT (Government p=0.267, Private p=0.605). (Table 2) Table 2: The Distribution Of Study Population According To The Mean DMFT



A Over All Mean DMFT



B Mean DMFT for Males



C Mean DMFT for Females

The students affected by severe thinness and thinness were 5.5% and 11 % respectively. And overweight and obese were 12% and 4 % respectively.

Among males in government schools, nutritional status manifesting as severe thinness (7.3%) and thinness (2.4%) were relatively less when compared to private schools with severe thinness (4.4%) and thinness (14.7%). In contrary with obese variables, the values were high in private schools with (8.8%) when compared to (0.0%) in government schools.

Among females in government schools, nutritional deficiencies manifesting as severe thinness (8.5%) was relatively high when compared to private schools with severe thinness (0.0%). Whereas nutritional status was normal in 135 (67.5 %) children. It was higher (34%) in government school when compared to private school (33.5%) (Table3)

Association between the nutritional status of the subject and mean DMFT. The overall mean DMFT for nutritional status like severe thinness and thinness were 1.27and 0.14 and for overweight and obese variables, it was 0.42 and 0.50 respectively. The results were statistically significant with p=0.015 for normal weight category. Among males in government schools, the mean DMFT scores for nutritional status like severe thinness and thinness were 3.0and 0.00. And for overweight and obese variables, it was 0.33and 0.00 respectively. In private schools the mean DMFT scores for nutritional deficiencies like severe thinness and thinness were 0.67 and 0.00 and for overweight and obese variables, it was 0.00 and 0.67 respectively. The results were statistically not significant. Among females in government schools, the mean DMFT scores for nutritional status like severe thinness and thinness were 0.60 and 0.43 and for overweight and obese variables, it was 1.0 and 0.00 respectively. In private schools the mean DMFT scores for nutritional status like severe thinness and thinness were 0 and 0.00 and for overweight and obese variables, it was 0.00 and 0 respectively.

**Distribution of study population according to the nutritional status of the subject**

The study subjects had some form of nutritional discrepancies ranging between severe thinness to obese subjects.

**Table 3** Distribution of study population according to the nutritional status

Nutritional Status	Total (N=200)		Government school (N=100)		Private school (N=100)		Chi square test (Govt. v/s Private)	
	No.	(%)	No.	(%)	No.	(%)	χ <sup>2</sup> , df	P value
Sever thinness	11	5.5%	8	4.0%	3	1.5.0%	6.583, 4	0.1596
Thinness	22	11.0%	8	4.0%	14	7.0%		
Normal	135	67.5%	68	34.0%	67	33.5.0%		
Overweight	24	12.0%	14	7.0%	10	5.0%		
Obese	8	4.0%	2	1.0%	6	3.0%		
Male								
Nutritional Status	N=109		N=41		N=68		8.960, 4	0.0621
Sever thinness	6	5.5%	3	7.3%	3	4.4%		
Thinness	11	10.1%	1	2.4%	10	14.7%		
Normal	73	67.0%	31	75.6%	42	61.8%		
Overweight	13	11.9%	6	14.6%	7	10.3%		
Obese	6	5.5%	0	0.0%	6	8.8%		
Female								
Nutritional Status	N=91		N=59		N=32		4.827, 4	0.3055
Sever thinness	5	5.5%	5	8.5%	0	0.0%		
Thinness	11	12.1%	7	11.9%	4	12.5%		
Normal	62	68.1%	37	62.7%	25	78.1%		
Overweight	11	12.1%	8	13.6%	3	9.4%		
Obese	2	2.2%	2	3.4%	0	0.0%		

**Table 4** Association between the nutritional status of the subject and mean DMFT

Nutritional Status	Total			Government school			Private school			T test (Govt. v/s Private)	
	n	Mean	SD	n	Mean	SD	n	Mean	SD	T value	P value
Sever thinness	11	1.27	2.33	8	1.50	2.67	3	0.67	1.16	0.5088	0.6231
Thinness	22	0.14	0.47	8	0.38	0.74	14	0.00	0.00		NA
Normal	135	0.57	1.44	68	0.87	1.56	67	0.27	1.24	2.465	0.015
Overweight	24	0.42	0.93	14	0.71	1.14	10	0.00	0.00		NA
Obese	8	0.50	1.41	2	0.00	0.00	6	0.67	1.63		NA
ANOVA	F=1.318, P= 0.2648			F= 0.6986, P= 0.5948			F= 0.6235, P= 0.6469				
Male											
Sever thinness	6	1.83	3.13	3	3.00	4.36	3	0.67	1.16	0.8963	0.4208
Thinness	11	0.00	0.00	1	0.00	0.00	10	0.00	0.00		NA
Normal	73	0.62	1.65	31	1.03	1.84	42	0.31	1.44	1.886	0.0634
Overweight	13	0.15	0.38	6	0.33	0.52	7	0.00	0.00		NA
Obese	6	0.67	1.63	0	0.00	0.00	6	0.67	1.63		NA
ANOVA	F=1.567, P= 0.1887			NA			F= 0.4235, P= 0.7911				
Female											
Sever thinness	5	0.60	0.55	5	0.60	0.55	0	0	0		NA
Thinness	11	0.27	0.65	7	0.43	0.79	4	0.00	0.00		NA
Normal	62	0.52	1.16	37	0.73	1.31	25	0.20	0.82	1.803	0.0765
Overweight	11	0.73	1.27	8	1.00	1.41	3	0.00	0.00		NA
Obese	2	0.00	0.00	2	0.00	0.00	0	0	0		NA
ANOVA	F= 0.3546, P= 0.8401			F= 0.3866, P= 0.8173			F= 0.1982, P= 0.8213				

The results were statistically not significant

## DISCUSSION

Oral diseases are ranked among the most significant of human diseases, mainly because of their high frequency of occurrence. These diseases may never be eradicated because of complex interplay of social, behavioral, dietary and biological factors that are found to be associated with their initiation and progression

**Oral Hygiene Practices:** Majority of population used tooth brush and fluoridated tooth paste for cleaning their teeth. Similar finding were seen in other study Jurgensen N *et.al*<sup>28</sup>. Majority of the school children 129(64.5%) brushed their teeth once a day. These finding were slightly higher when compared with findings of Shailee *et.al* (64%)<sup>49</sup> Nurelhuda *et.al.*( 64%)<sup>29</sup> and less as compared with Petersen *et. al* (88%)<sup>18</sup> 70(35%) school children brushed twice which was surprisingly more in government schools (19.5%) compared to private school(15.5%).This observation is in agreement with other studies like National Oral Health Survey and Fluoride Mapping (2004).<sup>12</sup>

### Dietary Sugar Consumption

An overall 94% of the subjects consumed sugar at the frequency of 1-2 times per day. It was observed that children from both private and government school children consumed equal amount of sugar

### Dental Caries

In the present study it has been observed that the overall prevalence of dental caries (21%) mean DMFT 0.84±1.562 and 0.24±1.102 for government school and private school children respectively. Higher prevalence rate of dental caries was reported by Al-Haddad *et.al*<sup>34</sup>. Low prevalence of dental caries in 12 year old children attributed to the fact that the carious deciduous first and second molars are replaced by newly erupted premolars by the age of 12 years.

Present study conducted in Patna city where fluoride concentration (0.5 to 1ppm) in drinking water is also one of the factors for low DMFT. The higher prevalence of caries among females has been explained by the fact that teeth in females erupt earlier than in males and that females have easier access to food and frequent snacks in comparison to that of males, who mostly spend their time outdoors. The risk of dental caries is relatively high consuming solid & sticky sugar. This finding goes together with the previous studies conducted by Petersen *et. al*<sup>24</sup>, Jurgensen N *et.al*<sup>35</sup>, Rehman M M *et.al*<sup>34</sup>.

**Nutritional Status And Its Association:** Malnutrition both in the form of underweight and obesity is a haunting health problem affecting an increasing statistics of children worldwide.<sup>1</sup> Present study (67.5%) subjects were normal weight but high as compared with study conducted by Narang *et.al*<sup>13</sup>. Majority of children 135 (67.5%) in this study have normal BMI, where males constituted 73 (67%) and females constituted 62 (68.1%). In the present study, Mean DMFT among government school children is 0.87 and private school children 0.27 among those having normal BMI (is statistically significant (p=0.015). There exists no significant association between gender and BMI and among the government and private school children in this study. Macek *et al.* (2006) found an association between caries severity in the permanent dentition and high BMI but in the present study no such associations were found. Similar observation found in study conducted by Jurgensen N *et al.*<sup>28</sup>. This cross-sectional study demonstrated non-significant relationship between dental caries and BMI among the study subjects the caries was observed to be high in normal children. Similar observations were found in studies by Hooley *et al*<sup>47</sup>, throws a light on the fact that 48% of studies found no association between dental caries and BMI.

### Limitation

The limitation of the present study was that the socioeconomic status of the subjects could not be assessed because the children could not be relied upon for this information and the collection of information from the school was not feasible.

## CONCLUSION

The present study has presented some interesting observations which reflect the oral health status among 12 year old school children in Patna city. The observation of a relatively low DMFT among school children should be seen as positive and it is well below the standard formulated for the year 2010 by the WHO. This indicates lack of awareness and affordability to the dental care facilities available. The nutritional status of an individual plays a very important role in growth and development. For the prevention of dental caries, access to food items, drinks and snacks rich in sugars should be discouraged and healthy choices have to be supported.

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