

# Relationship between obesity and dental caries in children - A preliminary study

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## Abstract:

Obesity in the young is a public health priority. The present study assessed the association between obesity and dental caries. A total of 2688 students were examined from three schools. The students from private school were more obese than government school. The study was done by means of an anthropometric study using height/weight indices according to WHO criteria and National Center for Health Statistics guidelines. BMI and DMFT indices were used . The prevalence of caries was 19.1%.No correlation between dental decay in obese and non-obese children was detected ( $p=0.99$ ). These findings support US population based literature and study done by Pinto et al .Nevertheless, the impact of interventions to address the epidemic in the dental setting has not been investigated. As a part of health care team, dentist and dental students should be exposed to the changing demographics and sequelae of overweight in children.

**Key words:** Obesity, dental caries, children

## Introduction:

Excessive weight in children is a cause of major concern. Obesity is a chronic disease, a global epidemic both in developed and third world countries<sup>1</sup>. Obesity and overweight are defined as being an excess of body fat related to lean mass, with multifactor conditions, involving psychological, biochemical, metabolic,

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anatomic and social alterations<sup>2</sup>. The definitions of overweight (BMI  $\geq$  25 kg/m<sup>2</sup>), obesity (BMI  $\geq$  30 kg/m<sup>2</sup>) and morbid obesity (BMI  $\geq$  40 kg/m<sup>2</sup>) are based on health risks for adult Caucasian populations<sup>1</sup>. Children at risk for being overweight during preschool years carry a greater risk of being overweight by age twelve years<sup>3</sup>.

The exact cause of pediatric obesity is not clear. Diet plays an important role in the obesity epidemic, as dietary habits in children have suffered major changes in the last thirty years<sup>4</sup>. Spending too much time watching television or playing electronic games together with substituting industrialized food (rich in carbohydrates/fats and poor in fiber) for processed foodstuffs are the main causes of obesity and overweight<sup>5,6</sup>. Children are considered at risk of being overweight if they are between the 85<sup>th</sup> and 95<sup>th</sup> percentile of age and gender –related BMI and are considered overweight if they are at or beyond the 95<sup>th</sup> percentile of age and gender related BMI according to Centers for Disease Control and Prevention (CDC) guidelines<sup>7</sup>.

Current researches in dental medicine trends towards exploring the link between oral health and systemic health, an effective way of underscoring the public health impact of oral care. Previous studies have heightened the awareness of dentists about the connection between obesity and oral health in the young<sup>8,9</sup>.

In summary, given the strong evidence supporting the association of dental caries with irregular dietary patterns and quality<sup>10</sup> and the fact that abnormal dietary intake has been linked to the development of obesity at a young age<sup>4</sup>, a link between dental caries and weight is biologically plausible.

Hence, the aim of this preliminary study was to evaluate the association between obesity and dental caries. Null hypothesis: There is no relationship between dental caries and obesity in children. Alternate hypothesis: A significant relationship exists between the dental caries and obesity in children.

### **Materials And Method:**

The study was done by Department of Pedodontics and Preventive Children Dentistry, Institute of Dental sciences Bareilly. Two thousand, six hundred and eighty eight students between the age group of 6-17 years were selected from a private and two government schools in the city of Bareilly, Uttar Pradesh after their parents had signed an informed consent form.

The prevalence of dental caries was obtained using World Health Organization (WHO) standard criteria for dental caries diagnosis<sup>11</sup>. The clinical examination was performed in natural light, sitting in chairs in school rooms. Caps, masks, gloves and gauze were used in accordance with the infection control guidelines. The data was collected by one previously trained researcher (kappa=0.92). Children presenting treatment needs were referred to Department of Pedodontics and preventive children dentistry, Institute of Dental sciences, Bareilly, Uttar Pradesh. Teeth missing for orthodontic reasons, extraction or trauma were not included in the DMFT scores. Caries in primary teeth was not recorded. Radiographs were not taken.

Regarding anthropometric assessment, a 150 KG digital scale, a 100 g scale and a 200 cm tape were used according to WHO criteria<sup>12</sup> and National Centre for Health Statistics guidelines. Assessment and classification of BMI were performed following established guidelines by National Center for Health Statistics (NCHS, 1976) for age and gender. For each student, the percentage of ideal body weight for height at the 50th percentile was calculated and the nutritional status was also compared. The four weight categories were defined: (1) underweight - < 90% of ideal for weight/height, (2) normal-weight - 90% to 110% of ideal for weight/height, (3) overweight - 110% to 120% of ideal weight for height, and (4) obesity - >120% of ideal for weight/height<sup>13</sup>. All examinations were performed by a set of examiners who were trained in the assessment of the DMFT and were blinded to anthropometric measurement. SPSS (Statistical Package for the Social Sciences) version 11.0 was used for statistical analysis. Absolute and percentage frequencies were obtained

for data analysis (descriptive statistical techniques). The existence of significant association amongst the variables was verified by means of bivariate analysis (Pearson chi-square and Mann-Whitney tests),  $\alpha=0.05$  being considered for rejecting the null hypothesis.

### Results:

A total of 2 688 children were examined, 1 420 of whom were enrolled in private establishments and 1268 in government schools.

**Table 1. Distribution of children as per their age and type of school.**

AGE(years)	PRIVATE SCHOOL	GOVERNMENT SCHOOL	TOTAL
6- 8	254	135	389
8-10	259	275	534
10-12	302	305	607
12-14	375	290	665
15-16	230	263	493
Total	1420	1268	2688

**Table 2. Evaluating nutritional status as per their type of school.**

VARIBLES	PRIVATE N %	GOVERNMENT N %	TOTAL GROUP N %	P value
Nutritional status				
Obese	107 (7.5%)	20 (1.57%)	127 (4.7%)	P< 0.0001*
Non obese	1313(92.6%)	1248(98.4%)	2561(95.27%)	
Total	1420	1268	2688	

(\* ) significant association at 5.0% level using Pearson chi square test

The Table -2 shows a high prevalence of children's obesity in private school 7.5% as compared to government school 1.57% ( $p<0.0001$ ). The larger prevalence of obesity in high socioeconomic level children could be explained by them adopting low-intensity physical activities together with consuming high-energy value food<sup>14-16</sup>.

**Table – 3 The prevalence of dental caries according to type of school.**

Variable	Type of school		Total group N %
	Private N %	Public N %	
Dental caries prevalence	392(27.6%%)	122(9.6%)	514(19.1)
Total	1420	1268	2688

Dental caries prevalence was 19.1% (n=514). The overall prevalence of dental caries shown in Table – 3 was low (19.1%) when compared to other studies<sup>17, 18, 19</sup>; however, it was similar to that in a previous report from Macau<sup>20</sup>.

**Table –4 Prevalence of DMFT score and components concerning nutritional status in private schools**

Variables	Statistics	Nutritional status		P values
		Obese	nonobese	
decayed	Mean	1.015	0.931	P= 0.869 *
	SD	2.216	1.991	
missing	Mean	0.021	0.051	P= 0.488
	SD	0.128	0.349	
filled	Mean	0.067	0.089	P= 0.845
	SD	0.247	0.435	
DMFT	Mean	1.163	1.072	P=0.836
	SD	2.451	2.238	

(\*) – significant association at 5.0% level (1) using Mann-Whitney test

**Table –5 Prevalence of DMFT score and components concerning nutritional status in government schools**

Variables	Statistics	Nutritional status		P values
		Obese	nonobese	
decayed	Mean	0.177	0.385	P= 0.007*
	SD	0.734	1.262	
missing	Mean	0.0068	0.015	P= 0.751
	SD	0.079	0.187	
filled	Mean	0.118	0.108	P= 0.729
	SD	0.568	0.561	
DMFT	Mean	0.298	0.490	P=0.098
	SD	0.980	1.511	

(\*) – significant association at 5.0% level (1) using Mann-Whitney test

When Tables 4 and 5 were analyzed, there was no statistical difference in DMFT score between obese and non-obese children, a similar result to previous reports from China<sup>21</sup> and the USA<sup>22</sup> but different to one from France<sup>23</sup> and the USA<sup>24</sup>.

### Discussion:

Dental caries is a multi factorial infectious disease<sup>25</sup>. Factors affecting the onset of carious lesions include oral hygiene, diet composition and frequency, socioeconomic status, salivary immunoglobulin's, bacterial load and fluoride intake<sup>26</sup>. This makes the study of dental caries a challenging task. Obesity is characterized by the energy and metabolism imbalance and is responsible for multiple complications<sup>27,28</sup>. Exploration of the link between weight and oral health in children has been controversial.

In this preliminary study the prevalence of dental caries was observed more in obese children in both private and government schools. These findings correlate with those of Larsson et al<sup>29,30</sup> who showed that adolescents with higher DMFT values tended to be obese. Chen et al.<sup>21</sup> investigated whether three-year-old obese children were prone to develop dental caries and found that there were

no significant differences in the dft scores between groups with different nutritional status. However the age groups of the children studied in the latter study were different from those reported in this paper. Ludwig et al.<sup>31</sup> in a longitudinal study found that the increasing prevalence of obesity in children is linked to the consumption of sugar-sweetened drinks.

The concept of dental caries which was initially based on a model proposed in 1962 (host, diet and microorganisms)<sup>32</sup> has changed. The modern concept of dental caries includes social and behavioral factors regarding a particular individual<sup>33</sup>. In turn, obesity has been associated with diet, genetic, behavioral and psychological factors<sup>2,34</sup> associated diseases and maintains pediatric patients' oral health. Health professionals should thus focus on the parents of children at risk of becoming overweight/obese and/or underweight by

providing them with strategies concerned with bad eating behavior, such as fussy eating and overeating<sup>35,36</sup>.

Limitations inherent to this study include not narrowing down the age span and gender discrepancy of the subjects. Since severe obesity is a rare disorder, it is difficult to collect information from large groups and groups with more confined age limits. In order to obtain more reliable and relevant results, multicentre studies need to be undertaken.

Another limitation of this study was its design, which may have underestimated caries experience because of the lack of intraoral radiographs.

### Conclusions:

Although the obese children studying both in private and government schools had more dental caries in comparison to non obese children there was no significant association between obesity and increase incidence of dental caries. Notwithstanding the fact that the results of this preliminary study do not support an association between dental caries and obesity, future longitudinal research should integrate validated dietary assessments, socioeconomic status, oral hygiene compliance and other factors that may act as confounders or effect modifiers. Study of dental caries at an individual level must account for these variables. As obesity results in many health complications, association with oral health parameters seems plausible, albeit not supported by the current evidence. Even if a link between oral health and weight in children is not clear, our obligation as health care providers is to seek creative methods by which we can effect change in our pediatric patients.

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