

Original Research

Correlation of Body Mass Index and Dental Caries among Pre-School Children of Patna: A Cross Sectional Study

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ABSTRACT:

Objective: The purpose of this study was to determine the relationship between age-specific body mass index (BMI) and dental caries among pre-school children of district of Patna, Bihar, India. **Methods & Materials:** The design of our study was analytical cross-sectional was conducted on 350 healthy preschool children with the age range of 3-6 years studying in preschool classes of district of Vaishali, Bihar. The measurements of height and weight were evaluated and calculating the z-scores using WHO Anthro-software to elucidate the subject's status on the age and sex-specific growth chart. The data was analyzed using Statistical Package for Social Sciences (SPSS) version 16. The statistical tests used were t-test and correlation analysis. **Results:** The Prevalence of dental caries was 68.57% with a mean dental caries score of 2.82 ± 2.03 . Among the study participants 38.57% were underweight, 47.71% had height deficiency and 44.57% had BMI deficiency (BAZ score). There was significant positive correlation found between children's WAZ (Weight for age) [$r=0.102$, $p=0.040$], BAZ (BMI for age) [$r= 0.761$, $p= 0.032$] and dental caries. **Conclusions:** This study showed that fewer percentage of the participants had deficient height, weight and BMI. As there is increase in the weight and BMI, there was a significant increase in the number of caries and dental restoration among the children's.

Key words: Pre-School Children, Dental Caries, BMI, Height and Weight.

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INTRODUCTION

Dental caries has been found to be most chronic childhood disease in oral cavity. It is a multimicrobial, multifactorial disease and several factors contribute towards it including oral hygiene maintenance, application of fluorides and amount of fermentable carbohydrates in food^{1,2}. Anthropometric measurements provide information on body growth and its composition. By acquiring such anthropometric measurements we can acquire data about one's body growth and thus individuals can be classified as underweight, overweight, wasting or stunting and

accordingly relationship can be drawn between these measurements and adverse health outcomes³. At present, there is little information available regarding relationship between dental caries and underweight/ overweight categories⁴⁻⁸ positive association has been shown in a few cross-sectional studies between dental caries and obesity⁴⁻⁸. Whereas other studies have reported weak or no association between body mass index and dental caries among pre-school children. Many studies have investigated the relation between BMI and dental caries, however, WHO Anthro-software as a standard method of anthropometric and

nutritional survey of children growth was not used. The current study aimed to assess children with dental caries to determine whether the dental caries was associated with age-specific BMI, weight and height deficiency in a sample population of 3 to 6-year-old preschool children at Patna district of Bihar state.

METHODS

The current analytical cross sectional study was conducted to assess the association between dental caries experience with age-specific BMI in a sample population of 3 to 6 year-old preschool children in Patna district of Bihar state over a period of 3 months. Prior to study, permission was obtained from the Principals of the various schools to conduct the study. Before any clinical examinations, consent was obtained from the parents to include their children in the study. 350 pre-schools children in the age group of 3-6years who cooperated for oral examination were included in the study. Those who had any type of systemic diseases or were on any medications was excluded from the study. 15 students were examined per day. We were able to collect data of 350 preschool children aged 3-6 yrs in the duration of 3 months. A structured and validated proforma for records was used to collect and record the data. The proforma included the details of demographic characteristics (name, age, date of birth and gender), weight (kgs), height (cms) and dental chart to record data. Weight and height of the children were recorded with the help of pre-calibrated weighing machine corrected for zero error and with least measurement up to 0.1 kg and height recorded with Self-retracting tape measure and scale with least measurement of 0.1 cm. Measurements for height and weight were made to the nearest 0.1 cm and 0.1 kg, respectively. The weight and height of each child were measured according to World Health Organization (WHO) guidelines, and the values were recorded. The values of

height and weight of each child was transferred to WHO Anthro software version 3.2.2 (www.who.int/child_growth/software/en/index.html). Height and weight were assessed by using the z scores of height-for-age (HAZ), weight-for-age (WAZ), and BAZ. This software enables the calculation of growth reference data for children and adolescents by generating Z-scores and percentile curves and cut-offs based on the standard deviations (SD) from the median. Every Child who had received two z-scores under the normal value (<-2) was considered as abnormal. Oral examinations were conducted in school premises. All subjects were examined in the supine position under adequate light. Sterilized instruments including intraoral no. 5 mouth mirror & no. 23 explorer were used for examination. Dental caries experience was assessed using Nyvad's criteria⁹. The relationship between dental caries experience and BMI was then investigated.

STATISTICAL ANALYSIS

The data was entered in Microsoft Excel sheet and the data analysis was done using statistical software SPSS version 16. Descriptive statistics, Mann Whitney U test and Spearson correlation coefficient was used for analysis. P value was set up at 0.05 which was statistically significant.

RESULTS

Out of the 350 study subjects who participated in this study, majority of the participants (65.4%) were 4 years old with a mean age was $3.74 \pm SD 0.47$ years. Majority, 65.7% were males while 34.3% were females. In our study 44.57% of participants had BMI deficiency (Table 1). It was also observed that a higher incidence of overweight was among boys (61.3%) than in girls (38.4%). Dental caries prevalence was 68.57% with a mean dental caries score of 2.24 ± 2.57 (Table 2).

	No. of participant	Percentage
Age		
3	70	20
4	228	65.14
5	30	8.57
6	22	6.28
Gender		
Males	230	65.71
Females	120	34.3
Weight for age		
< - 2 WAZ group	114	32.57
\geq -2 WAZ group	236	67.43
Height for age		
< - 2 HAZ group	163	46.57
\geq -2 HAZ group	187	53.43
BMI for age		
< - 2 BAZ group	166	47.42
\geq -2 BAZ group	184	52.58

Table 1 : Distribution of study participants.

		<- 2 z score [Mean (±SD)]	≥-2 z score [Mean (±SD)]	Z	p
Dental caries experiences	WAZ	2.19 (±2.23)	2.39 (±2.73)	-0.205	0.016*
	HAZ	2.08 (±2.17)	2.38 (±2.88)	-1.488	0.480
	BAZ	1.74 (±1.788)	2.70 (±2.61)	-2.788	0.006*

Table 2: Mean dental caries in WAZ, HAZ and BAZ groups.

	r	p
WAZ* dental caries experience	0.102	0.040*
HAZ* dental caries experience	0.012	0.862
BAZ* dental caries experience	0.761	0.032*

Table 3: Correlation among HAZ, WAZ, BAZ and dental caries experience.

There was significant positive correlation found between dental caries experience and children's WAZ (Weight for age) [r=0.102, p=0.040] and BAZ (BMI for age) [r= 0.761, p= 0.032] (Table 3).

DISCUSSION

The present study was conducted to show a correlation between the dental caries and BMI among a group of pre-school children (3-6years) at Patna. Existence of a link between growth and oral health in children is controversial and it has been investigated by many researchers throughout the world. Deficient weight for age z score (underweight) was seen in 114 (32.57%) of the study participants, 46.57% (163 study participants) were deficient height for age z score and 166 of participants (47.42%) had a deficient BMI for age z score when their BMI, z scores were compared to WHO standard for the same age. A similar study in Germany was done on 1290 children of elementary schools showed 31.6% of the children were underweight, 46.8% had a normal weight, 11.9% were overweight, and 9.7% were obese. This is also in accordance to studies conducted in Bareilly, Shiraz & Bangalore¹⁰⁻¹² But was found to be lower than that reported in Brazil¹³. These differences among the reports might be related to diversity of study subjects.

The mean deft (Nyyvad's criteria) score of the study subjects was 2.24±2.57. It is higher than the results of Oral health survey in 2011 which was 1.23±2.051 for this age group in Bangalore district.²¹ However, it was lower than study conducted in Sweden (3.20±5.16), Kerman (4.70±3.4).^{9,13} However; it is still high from public health perspective.

A correlation between dental caries and growth in children has been proposed by some preliminary and population-based studies. Our findings showed a positive correlation between BMI score and dental caries in 3-6 years old children, which confirms some previous studies. Studies done in United States and Iran showed similar results^{14,15}.

Low BMI and high dental caries are still two public health problems which some studies showed might be associated. Growth and dental caries could be associated through some dietary pattern and also some metabolic mechanism. High

sugar diet intake could result in obesity and dental caries. On the other hand, metabolic factors form dental pain and infection could be a reason for poor growth. In this study about 40% of underweight children were in very high caries group who need special attention from both aspects. They might need intervention for oral rehabilitation which may tend to weight gain on them. Some clinical studies showed improvement in growth indicators after dental rehabilitation especially in undergrowth group^{9,16}. The dentists can play an important role in promoting good nutrition with the aim of establishing a healthy lifestyle for the children. This can be done by educating their parents and caregivers about importance of integrating healthy snacks and meal patterns in their diet which can help in reduction of dental caries in school children.

CONCLUSION

The present study showed a positive graded association between the BMI and caries levels in 3-6 years old pre-school children. A lesser percentage of the participants had deficient height, weight and BMI. As the weight and BMI increased there was a significant increase in the number of caries and fillings among the participants at Patna.

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