Original Article

Association between Anthropometric Measurements and Dental Caries in Children

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ABSTRACT

Aim: The purpose of this study was to investigate the association between anthropometric measurements and dental caries in 6–12 years old children. **Materials and Methods:** A total 100 children were randomly selected from the outpatient department. Caries score was recorded by a qualified using DMFT and deft indices. Anthropometric measurements included body weight, height, neck circumference, triceps circumference, waist circumference, hip circumference, and body mass index (BMI) were calculated using formula kg/m^2. **Results:** The prevalence of children with DMFT ≥1 was 59% and deft ≥1 was 60% in this study. The caries scores were not significantly different with anthropometric measurements categories except for deft significantly associated with BMI and DMFT significantly associated with high weight. **Conclusion:** This study showed that high weight, BMI, and dental caries have common risk determinants and require a comprehensive multidisciplinary approach by dentists and oral health-care professionals.

Key words: Anthropometric measures, body mass index, dental caries

INTRODUCTION

An assessment of nutritional status by different anthropometric data gives information on growth and body development.[1]

Anthropometry refers to the "measurement of the size, weight, and proportions of the human or other primate body."[2]

Obtaining these information is important for evaluating the different types of body development such as underweight, stunting, wasting or overweight correlated with increased risk for adverse health effects.[1]

Body mass index (BMI), weight for age, and actual weight which is derived by divided the 50th percentile weight for age, and actual height divided by 50th percentile height for age are some of the anthropometric estimation methods which can be used as a substitute of a child's nutritional status.[3]

Different contributing factors for the assessment of the relationship between BMI and dental decay are biological, genetic, socioeconomic, cultural, dietary, and environmental and lifestyle.[4] Many studies have been reported that there is positive correlation between caries experience and children's systemic health.[5] Moreover, untreated dental caries is a ignored cognitive factor of low BMI.[6] It is also believed that the growth rate and systemic health can be improved by treating dental caries.[7]

According to the studies, nutritional deficiencies may damage not solely the formation of tooth structures but it also harm the development of the salivary glands. The evidence also suggests that saliva has an effect on dental decay.[8] Several studies have shown that, in countries where proper oral hygiene is followed, despite increases in sugar consumption caries prevalence has decreased, thus marking the importance of oral hygiene in caries etiology.[9]

Therefore, we conducted this study to evaluate the association between the various anthropometric measures and dental caries in children.

MATERIALS AND METHODS

The study was conducted at the Department of Pediatric and Preventive Dentistry, Institute of Dental Sciences, Bareilly. Hundred children aged 6–12 years were randomly selected. Demographic measures such as age and sex were recorded for each child before examination. Written informed consent was taken from parents or guardians of all participating children before participating in this study. The present study was approved from the institutional ethical committee.

Recorded anthropometric data were weight, height, mid upper arm circumference (MUAC), neck circumference (NC), hip circumference (HC), and waist circumference (WC). Measures of weight (kg) and height (m) were evaluated using a standard physician's scale and a Stadiometer (WS 021, Anand Medical

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Exports, India), respectively. WC was recorded at the least circumference area present between the iliac crest and the rib cage. MUAC measurements were taken in centimeters with non-elastic measuring tape to the nearest 0.1 mm on the upper left arm (midway between the acromion process and the olecranon process). HC was measured as the maximum measurement around the buttocks and below the iliac crest. BMI was calculated using the formula kg/m^2.

All children underwent an intra-oral examination and dental decay according to the World Health Organization (WHO) recommendations.[10] The dental examination was done by using a non-invasive method using armamentarium such as mouth mirror, dental probe, and cotton rolls. Caries were checked visually with optimal reflected light in the oral cavity, not any means of radiographs were used. Decayed lesions were recorded when a carious cavity was apparent on visual inspection. The prevalence of caries was procured by calculating the number of decayed (D), missing teeth (M), filled teeth (F), teeth (T), the DMFT index for the permanent dentition, and the deft index: Decayed (d), exfoliated (e), filled teeth, and (F) for the primary dentition were used to detect dental caries.

Statistical analysis

The results are presented in frequencies, and mean ± SD. Frequency distribution tables were produced, and the Chi-square test was used to assess associations of variables. Student unpaired *t*-test was used to compare continuous variables between two groups for compare more than two groups for continuous variables between the groups one-way ANOVA was used. Pearson Correlation test was performed to find correlation of DMFT and def to age, anthropometric measurements. $P < 0.05$ was considered statistically significant. All data analysis was carried out on the SPSS version 23.0 (Chicago, Inc., USA).

RESULTS

According to the gender mean (±SD) age, anthropometric measurements and dental indices of children are presented in Table 1. The mean age of the children was 9.35 ± 2.14 years. Mean DMFT index in these children, for boys and girls were 1.25 ± 1.40 and 1.57 ± 1.48, respectively, and mean deft index in these children, for boys and girls were 1.70 ± 1.81 and 1.84 ± 1.93, respectively. The prevalence of children with DMFT ≥1 was 59% and deft ≥1 was 60% [Tables 2 and 3].

When correlations between anthropometric measurements and dental indices were analyzed, age, height, weight, HC, NC, and WC were found to be negatively correlated with def index (r: 0.100, p: 0.323; r: −0.020, p: 0.846; r: −0.132, p: 0.191; r: −0.042, p:0.682; and r: −0.132, p: 0.192, respectively). Correlations between BMI and def were found to be positively correlated (r: 0.344, p: 0.000). When correlations between anthropometric measurements and DMFT index were analyzed, age, height, BMI, HC, NC, biceps circumference, and WC were found to be negatively correlated with DMFT index (r: 0.108, p: 0.238; r: −0.120, p: 0.235; r: −0.110, p: 0.287; r: −0.079, p:0.433; r: −0.107, p: 0.289; r: −0.216, p: 0.031; and r: −0.058, p: 0.567, respectively). Correlations between weight and DMFT were found to be positively correlated (r: 0.280, p: 0.005) [Table 4].

Table 1: Age, anthropometric measurements, and dental indices of the studied children according to gender

Variables	Male(*n*=56)	Female (*n*=44)	Total (*n*=100)	t-value	P-value
	Mean±SD	Mean±SD	Mean±SD		
Age (in years)	9.57±2.06	9.07±2.22	9.35±2.14	1.170	0.245#
Height (in cm)	133.54±17.27	131.52±14.56	132.7±16.08	0.623	0.539#
Weight (in KG)	38.84±9.63	37.27±10.02	38.15±9.79	0.793	0.430#
BMI (KG/m^2)	21.99±4.68	21.58±5.00	21.81±4.80	0.425	0.672#
HC (cm)	67.91±13.75	65.68±15.33	66.93±14.43	0.763	0.447#
NC (cm)	28.78±5.63	27.26±6.42	28.11±6.01	1.257	0.212#
TC (mm)	24.44±5.67	23.91±6.01	24.21±5.80	0.454	0.651#
WC (cm)	56.41±10.43	53.77±12.03	55.24±11.18	1.174	0.243#
DMFT	1.25±1.40	1.57±1.48	1.39±1.44	−1.097	0.276#
deft	1.70±1.81	1.84±1.93	1.76±1.85	−0.385	0.701#

#statistically not significant. BMI: Body mass index, WC: Waist circumference, HC: Hip circumference, DMFT: Refers to primary dentition, d=Decayed, m=Missing due to caries (not from trauma, orthodontic extraction, congenitally missing, etc.), f=Filled, t=Teeth, dmfs: Number of dmf tooth surfaces, DMFT refers to permanent teeth, DMFS: Number of DMF tooth surfaces

Table 2: Percentage distribution of DMFT

DMFT	Number	Percentage
0	41	41
1	12	12
2	28	28
3	8	8
4	8	8
5	3	3
Total	100.0	100

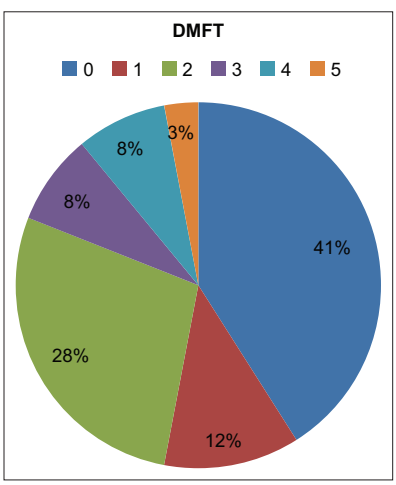
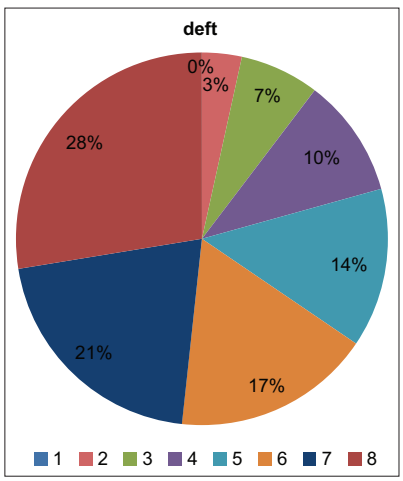


Table 3: Percentage distribution of deft

DEF	Number	Percentage
0	40	40
1	9	9
2	19	19
3	14	14
4	8	8
5	7	7
6	2	2
8	1	1
Total	100.00	100



DISCUSSION

Dental caries is a arduous task to the dentist due to its multi factorial etiology. Our study reported that in total sample of children age, weight, height, HC, NC, and WC had not significant association with dental caries. Significant association of def with BMI in both males and females was found, which was same as previous studies where increased BMI and dental caries were correlated.[11-14]

Controversies have been always seen in the evaluation of the association between weight and dental caries in children. A recent study in children with primary and mixed dentitions found strong association,[15] while many studies have found no relationship.[16-18] And this lack of relation between weight and caries in children was in accordance with the previous studies.[16,19] Many teeth would have recently erupted and for caries to progress, sufficient amount of time is needed. When prevalence of caries is low, such relationship could not be established. Height is the main parameter for calculating the BMI, but has not related it to dental caries. The formula of BMI is dependent on both height and weight. Hence, to check the link between BMI and dental caries it is also important to check the relationship of height and dental caries to have proper information.

Table 4: Correlation of DFMT and deft to age, anthropometric measurements

Variables	DMFT		deft	
	Pearson correlation (r-value)	*P*-value	Pearson correlation (r-value)	*P*-value
Age	0.108	0.283	−0.489**	0.000
Height (in cm)	−0.120	0.235	−0.100	0.323
Weight	0.280**	0.005	−0.020	0.846
BMI	0.110	0.278	0.344**	0.000
Hip	0.079	0.433	−0.132	0.191
Neck	0.107	0.289	−0.042	0.682
Biceps	0.216*	0.031	0.097	0.335
Waist	0.058	0.567	−0.132	0.192

*statistically significant ,** statistically highly significant

WC showed a significant association when overall sample was considered but failed to show a significant association in stratified analysis. This could be because of the gender variations in WC in the overall sample. The fact that females have higher WC than males could possibly factor such association to be significant. The effect might have nullified when the stratification was done as per gender and age groups. The WHO expert consultation committee[20] recommended that in populations with a predisposition to central obesity, WC should also be used to refine action levels on the basis of BMI. Chen *et al.*[19] discussed about the triangular etiological factors of dental caries, obesity, and frequency of sugar ingestion and their association. Time or duration of oral clearance and sugar intake should also be taken into consideration. If substantial numbers of teeth are newly erupted, then even in the obese children, such association will not be demonstrated. This could be one of the reasons that many studies reported a lack of association in 12–14 years. The WHO also recommended to evaluate caries in adolescents.[20] The caries index, which was used in this study, does not take into consideration of caries risk assessment. Since it is most widely accepted index and recommended by the WHO, we had considered the same for our study. Limitations of this study are lack of any information on dietary habits and socio-economic status. Future preventive programs for children should conducted and focus on common risk factor approaches such as reducing frequency in sugars intake to avoid overweight/obesity and decay. Fluoride applications can also be easily incorporated in these programs.

CONCLUSION

Obesity and dental caries have common risk determinants and require a comprehensive multidisciplinary approach by dentists and oral health-care professionals.

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