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ORIGINAL RESEARCH

Intricate Evaluation of Association between Dental Caries and Obesity among the Children in Al-Kharj City (Saudi Arabia)

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ABSTRACT

Introduction: Dental caries and obesity are two of the most prevalent health conditions affecting children. Relative decrease in corporeal movements, escalating inactive lifestyles, and changes in dietary factors are strongly linked with the increasing incidence of overweight and obesity. Furthermore, obesity increases the risk of chronic disease and dental caries that significantly affects the quality of life of young children. The present study intends to explore the relationship between dental caries and obesity in children in Al-Kharj city, Kingdom of Saudi Arabia.

Materials and methods: The present descriptive study was designed as a cross-sectional study in which a total of 386 children in the age range of 6 to 12 years from elementary schools of Al-Kharj city and pediatric dental clinics in Prince Sattam Dental College were included.

Results: Mean decayed filled teeth (DFT) score was found to be considerably higher among obese children. Also, incidence of dental caries in deciduous dentition was found to be notably higher among obese children.

Conclusion: Obesity has a considerable outcome on prevalence of dental caries among primary schoolchildren in Al-Kharj city, Kingdom of Saudi Arabia. The importance of obesity is limited not only to systemic disorders but also in relation to carious lesions. Hence, educating primary schoolchildren about caries and its related factors is very important.

Clinical significance: High intake of free sugar is a well-established risk factor for dental caries and also for obesity. Therefore, it is speculated that factors that decrease these risk factors have the potential to affect both conditions at the population level to control it competently.

Keywords: Caries, Filled tooth, Obesity.

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INTRODUCTION

Obesity is a "global epidemic disease" as quoted by the World Health Organization (WHO).[1]The worldwide existing changes in the recent decade toward utilization of fast food and soft drinks have led to noteworthy dietary changes among the population. Overweight and obesity are described as unusual or undue fat deposition that may spoil the health.[1] Overweight is generally led by a higher daily total energy intake than total outflow. Overweight children carry higher risk for developing noninfectious diseases, such as diabetes and cardiovascular diseases later in age.[2] Body mass index (BMI) is a weight-for-height index usually used to classify normal weight, underweight, overweight, and obesity.[3] The BMI for children and teens according to the Centers for Disease Control and Prevention (CDC) includes underweight, normal weight/healthy weight, overweight, and obese.

Previous studies have revealed dissimilar relation for BMI and dental caries. Negative changes in eating and activity patterns, increased frequency of snacking, soft drink consumption, and increased intake of foods high in fats and fermentable carbohydrates are common in both obesity and caries in children.[4] Therefore, it can be hypothesized that overweight might also be an indicator for development of dental caries in children and adults. Dental caries and obesity are both multifactorial disorders that influence health and psychosocial maturity of children. The Saudi National Health Survey of 2014 showed that 28.7% of Saudis had BMIs of 30 kg/m^2, and the obesity rate increases with age, so the age from 55 to 64 showed that 48% of Saudis have obesity.[4] Even though there is lack of pertinent studies in Saudi Arabia reporting the high prevalence of obesity, the literature evaluating the association between BMI and caries among 6- to 12-year-old schoolchildren is seemingly scant. Therefore, the aim of the present study is to explore the prevalence and relation between dental caries and obesity among primary school-going children in Al-Kharj city, Saudi Arabia.

MATERIALS AND METHODS

The present study was designed as a cross-sectional study in which a total of 386 children in the age range of 6 to 12 years from elementary schools of Al-Kharj city and pediatric dental clinics in Prince Sattam Dental College of Al-Kharj city were included. Children belonging to age group of 6 to 12 years were selected while those suffering from systemic diseases (e.g., asthma, juvenile diabetes, epilepsy) and those on orthodontic treatment were excluded.

Ethical permission was obtained from the Institutional Ethical Committee, and examination of the children was carried out only after written consent from their parents or guardians. The oral examination was carried out using mirror, probe, and cotton roll, with optimal illumination under dry field with cotton balls and gauges. The dental condition was examined and recorded on a proforma. The caries experience was assessed using decayed, missing, filled teeth (DMFT) index with modified criteria for caries detection given by the WHO in 1986. Oral examination was done by seating the subjects on an ordinary chair with a back rest under available natural light with aseptic precautions at the school premises. Anthropometric measurements to assess BMI involve recording of height in meters and weight in kilograms (WHO criteria). Weight will be estimated close to 0.5 kg on a conventional scale. Height was calculated close to 0.5 cm using a standard measuring tape (the BMI for children and teens according to the CDC). Body mass index is fraction of individual's weight (kilograms) to square of height (meters) (Table 1).

Table 1: Body mass index for children and teens according to the CDC

Weight status category	*Percentile range*
Underweight	Less than the 5th percentile
Normal or healthy weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	Equal to or greater than the 95th perentile

For children and adolescents, BMI is gender and age specific and is often referred to as BMI-for-age. In children, elevated levels of body fat can result in weight-related disorders and related health issues. Body mass index for age depends on weight, height, age, and sex because weight and height change during growth and development, as do their relation to body fatness.

All examinations was carried by a single examiner who was calibrated to match a benchmark (guide) and also calibrated to minimize intraexaminer variability. All the obtained data were compiled systematically in Microsoft Excel Spreadsheet and subjected to statistical analysis (Statistical Package for the Social Sciences (SPSS) version 17).

RESULTS

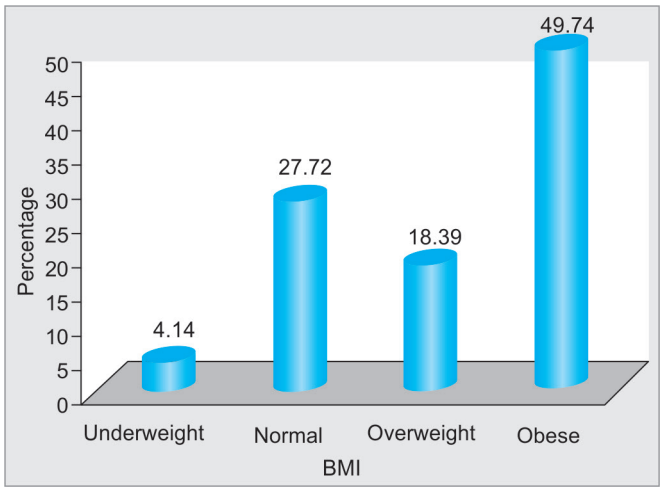
Comparison of mean decayed and filled teeth (DFT) scores of different BMI groups was done using one-way analysis of variance (ANOVA) followed by suitable *post hoc* test if necessary. Correlation between BMI and dental caries was done using Spearman's rank order correlation coefficient test. Table 2 shows the age characteristics of study population. Age groups of the participants were between 6 and 12 years, with a mean age of 9.98 ± 1.67 (Table 2). On exploring the distribution of study participants according to BMI, among 386 children (49.74%) were obese followed by 27.72% of children being normal; 18.39% of children were at risk of obesity, i.e., overweight. Only 4.14% of children were underweight (Table 3 and Graph 1). Table 3 shows mean BMI of study

Table 2: Age characteristics of study subjects

Total number	*Minimum age*	*Maximum*	*Mean*	*Std. Deviation*
386	6 years	12 years	9.98	1.67

Table 3: Distribution of study subjects according to BMI

BMI	*Number*	*Percentage*
Underweight	16	4.14
Normal	107	27.72
Overweight	71	18.39
Obese	192	49.74
Total	386	100



Graph 1: Distribution of study subjects according to BMI

subjects categorized into different nutritional segments according to the CDC guidelines based on percentile. An ANOVA revealed a statistically highly significant difference among different categories with a p-value <0.001 (Table 4). The mean decayed tooth according to BMI status was least among subjects with normal BMI values and highest among subjects belonging to obese category. An ANOVA revealed a statistically significant difference with different BMI category and mean decayed tooth (Table 5). Furthermore, multiple comparisons for decayed tooth and BMI status have been figured out (Table 6 and Graph 2). Statistically significant difference was found between normal BMI subjects and obese BMI subjects. Using Spearman's correlation, an existence of correlation was revealed between decayed tooth and BMI categories among the study participants. There was a positive correlation with an *r* value of 0.209, meaning as BMI increases, caries levels also increased, which was statistically significant with a p-value <0.001 (Table 7). Also while evaluating mean filled tooth according to BMI status, the least was reported among subjects with underweight BMI values and highest was among subjects belonging to obese category. An ANOVA revealed a statistically significant difference with different BMI category and mean filled tooth (Tables 8 and 9).

DISCUSSION

The importance of refined carbohydrates as the cause of dental caries is well recognized in literature.[5] In recent times, conventional food items are being steadily substituted by ready-to-eat items, such as highly polished cereals and bakery foodstuffs. Childhood dental caries persists as a significant global health problem.[6] Obesity in childhood and dental caries are multifactorial disorders led by multifarious intricate connections amid these factors.[7] It is reasonably logical to hypothesize that "obesity augments the risk of caries" and vice versa. In the present study, the mean DFT score was found to be significantly higher among obese children. Caries in deciduous dentition was also found to be considerably higher among obese children. These observations are similar to previous studies conducted by Bailleul-Forestier et al[8] and Alm et al[1] whereas results were in contrast to the studies by Chen C et al and D'Mello et al.[9,11]

The probable explanation was that dental caries and obesity are both multifaceted diseases, and numerous genetic and environmental factors have a considerable influence on them. Another plausible reason was that intake of sugar is a risk factor for dental caries and obesity. Published literature has recorded that dental caries in the deciduous dentition is coupled with early childhood phase and deprived nutrition. Nutritional parameters (vitamins A and D, phosphorus, and calcium) have an impact on the macroscopic and microscopic structure, chemical composition, and pattern of tooth eruption. Ultimately, these factors establish the vulnerability of a

Table 4: Mean BMI value among study participants

	n	*Mean*	*Std. Deviation*	*F*	*p-value*	*Significance*
Underweight	16	13.5308	0.44402	220.113	<0.001	HS
Normal	107	17.5464	2.29118			
Overweight	71	21.4492	3.34547			
Obese	192	30.3971	6.05758			

HS: Highly significant

Table 5: Comparison of mean decayed tooth according BMI status among study subjects

BMI status	*n*	*Mean*	*Std. Deviation*	*F-value*	*p-value*	*Significance*
Underweight	8	3.06	1.48	5.227	0.002	S
Normal	60	2.90	2.34			
Overweight	39	3.692	2.39			
Obese	102	4.00	2.57			

S: Significant

Table 6: Multiple comparisons for decayed tooth and BMI category

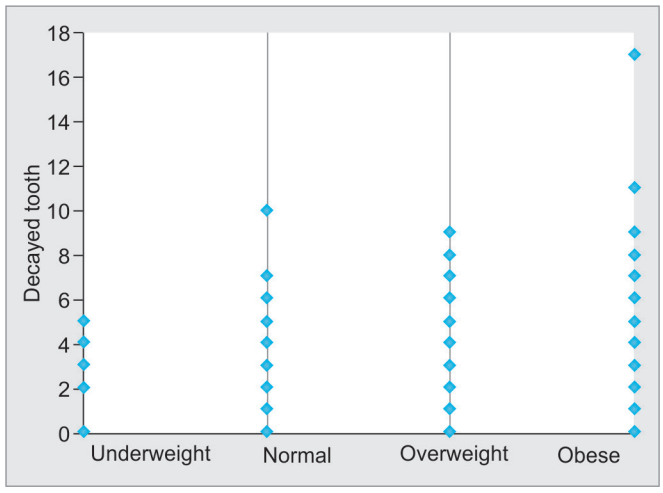
BMI	Compared with	Mean difference	Std. Error	Sig.
Underweight	Normal	0.15596	0.65577	0.995
	Overweight	−0.19102	0.67705	0.992
	Obese	−0.94271	0.63660	0.450
Normal	Overweight	−0.34698	0.37449	0.791
	Obese	−1.09867*	0.29515	0.001
Overweight	Obese	−0.75169	0.33982	0.122

*Significant

Table 7: Correlation between BMI and decayed tooth

BMI vs decayed tooth	Spearman's rho correlation t	p-value	Significance
	0.209	<0.001	HS

HS: Highly significant



Graph 2: Scattered diagram showing BMI category and decayed tooth among study participants. There was a linear increase in the decayed tooth from underweight to obese

Table 8: Comparison of mean filled tooth according to BMI status among study subjects

BMI status	n	Mean	Std. Deviation	F-value	p-value	Significance
Underweight	8	0.25	0.68	3.323	0.020	S
Normal	60	0.34	0.95			
Overweight	71	0.39	0.70			
Obese	192	0.68	1.18			

S: Significant

Table 9: Multiple comparisons for filled tooth and BMI category

BMI	Compared with	Mean difference	Std. Error	Sig.
Underweight	Normal	–0.09579	0.27626	0.986
	Overweight	–0.14437	0.28522	0.958
	Obese	–0.43229	0.26819	0.373
Normal	Overweight	–0.04857	0.15776	0.990
	Obese	–0.33650*	0.12434	0.036
Overweight	Obese	–0.28793	0.14316	0.186

*Significant

tooth to develop caries. In order to interpret these conflicting results, a variety of factors have to be discussed. The prime concern refers to technique for the diagnosis of both disorders. The most common technique used in most studies for diagnosis of dental caries is the direct visual oral examination. Nonetheless, this diagnostic technique can regularly result in reduced levels of detection of disease. Secondly, in most of the studies including our study, obesity was measured by BMI. There is lack of studies evaluating obesity using other diagnostic techniques, such as skin fold thickness, waist to hip ratio, waist circumference, or X-ray densitometry; all of them are more precise techniques for defining obesity levels. Over the last few decades, large increase in overweight and obese children, adolescents, and adults has been noticed. Variations in lifestyle, low socioeconomic status, low income, and cardiovascular diseases may increase obesity risk factors and caries development. Both dental caries and obesity are multifactorial diseases impacted by dietary habit. There is need to further elucidate the triangular liaison of sugar, dental caries, and obesity.

Recent evidences suggest that the nutritional shift is hastened and the product of this tendency is a speedy increase in obesity and other chronic disorders.[10] Change in lifestyle and improvement in socioeconomic status have extensively added to the growing health concern in developing nations.[11] Particularly, lifestyle and food stuffs have an impact on obesity.[12,13] Therefore, the pattern of eating among overweight children may be a prevalent risk factor for dental caries. Inadequate education about oral health and reduced physical preparation to elementary schoolchildren can also be associated with prevalence of obesity and dental caries.

CONCLUSION

Obesity may have a significant effect on caries prevalence of elementary schoolchildren of Al-Kharj city, Saudi Arabia. The importance of obesity is limited not only to general diseases but also with regard to carious lesions. Hence, educating primary schoolchildren is very important.

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