

Association between Dental Caries and Body Mass Index in 8-12-year-Old School Children

Research Article

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Abstract

Objective: The objective of this study was to identify the prevalence of dental caries among children aged 8-12-years and to correlate it with the body mass index.

Methods: A cross sectional study was conducted in Riyadh, Saudi Arabia. A total of 562 school children between the age of 8-12 years were selected from 3 schools. One examiner conducted the clinical examination using World Health Organization (WHO) criteria to diagnose dental caries. The body mass index (BMI) was also recorded.

Results: A high prevalence dental caries was observed among Overweight and obese children compared to normal weight children.

Conclusion: The results showed an association between Body mass index and dental caries in children. A higher prevalence of dental caries was experienced among Overweight and Obese children.

Keywords: Dental Caries; Obesity; Children; Epidemiology; Deft; DMFT; Overweight; Body Mass Index.

Introduction

Dental caries is one of the most prevalent chronic diseases of people worldwide. Individuals are susceptible to this disease throughout their lifetime [1]. Dental caries forms through a complex interaction over time between acid-producing bacteria and fermentable carbohydrate, and many host factors including teeth and saliva. The disease develops in both the crowns and roots of teeth, and it can arise in early childhood as an aggressive tooth decay that affects the primary teeth of infants and toddlers [2]. Risk for caries includes physical, biological, environmental, behavioral, and lifestyle-related factors such as high numbers of cariogenic bacteria, inadequate salivary flow, insufficient fluoride exposure, poor oral hygiene, inappropriate methods of feeding infants, and poverty [3].

Overweight and obesity in children are a major public health concern all over the world, and their health consequences can adversely affect a child's physical and psychological wellbeing [4-

6]. Both obesity and poor oral health are associated with lifestyle choices. Children and adolescents who are overweight are often exposed to unhealthy diet that focuses heavily on sugar as well as sweet foods and drinks. Such a diet promotes both the overweight condition and the development of tooth decay. Overweight children also experience depression and low self-esteem, further promoting and perpetuating negative behaviors. It is established that overweight and obesity are multifactorial diseases with a complex etiology and are associated with dietary habits [7]. A sugar-rich diet, including beverages, is associated with various health problems such as obesity, dental caries and poor diet quality [5, 8].

Studies and systematic reviews examining the relationship between weight status of children and adolescents and caries have yielded inconclusive and conflicting results [5, 9-17]. A study by Bailleul-Forestier et al., [18] in an adolescent population under treatment for obesity, found a significant association between BMI and DMFT among the obese group. Few other studies found no significant association between weight and caries [15,

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17, 19]. Overweight and obesity is often correlated with the quality of nutrition [16, 20]. A high prevalence of obesity and dental caries in children has been reported during the past decade [13] [15-17, 21-24]. The present study was undertaken to explore the relationship between body mass index and dental caries prevalence among school children aged 8 to 12 years from an urban area in Riyadh, Saudi Arabia.

Materials and Methods

The study sample composed of a total 562 children aged 8-12 years derived from three schools in central Riyadh city area. The reference population base for the study was selected based on the total enrollment of boys in central Riyadh schools aged 8 to 12 years. A consent form was given to children through the school administration to be signed by either one of the parents or by the legal guardian. The medical history was obtained from the consent form. Only children who got an approval by signing a consent form from the parent/legal guardian were enrolled in this study. The study was approved by the CDCR, King Saud University. Children with any systemic medical conditions were excluded.

The body weight was recorded to the nearest 100-gram using a standard beam balance scale with the subject barefoot and wearing light dresses. The balance was calibrated at the beginning of each working day and at frequent intervals throughout the day. Body height was recorded to the nearest 0.5 cm according to the following protocol. No shoes, heels together and head touching the ruler with line of sight aligned horizontally. To avoid subjective errors, all the measurements were done by the same person and by one observer (AA). BMI-for-age percentiles, representing eating habits in children and teenagers, were used. BMI-for-age [(weight in kilograms)/(height in meters)²] percentiles are dependent on gender and age-specific weight for height curves for those aged 2-20 years. According to these curves, “underweight” is defined as BMI-for-age < 5th percentile, “normal” is defined as 5th percentile < BMI-for age < 85th percentile, “at risk of overweight” is defined as 85th percentile < BMI-for-age < 95th percentile, and “overweight” is defined as BMI-for-age > 95th percentile [15].

All selected children were examined for dental caries by a dental intern utilizing the WHO criteria for diagnosis of dental caries [4]. Repeatability (Test-retest) was done for intra-reliability. The examination was carried out using a cycle and cow horn two-headed dental explorer (Aesculap AG, Tuttlingen, Germany), a plane mouth mirror (Aesculap AG) and cotton rolls to remove

any plaque or debris where necessary and recorded on special charts. All examinations were performed on a portable dental chair. Teeth were considered as decayed when in addition to showing clinical signs such as a color change, wedging and catching of an explorer tip during the examination of occlusal surface encountered some degree of resistance. Marthaler method was used for the proximal surfaces (Alvarez-Arenal et al., 1998). According to this method, a surface is diagnosed as decayed if the explorer is retained. Dressed and restored teeth that had recurrent caries were recorded as decayed. Teeth filled with temporary materials were considered as filled, and not as decayed. White spots were not considered as decayed in this study. Missing teeth were not marked correspondingly, since no definite statement could be made without a proper anamnesis whether the tooth really existed, or if an early extraction had taken place. To assess the caries frequency the DFT index for the permanent dentition and the dft index for primary dentition were used, since it gives a good insight into the state of decayed teeth in the patient [4].

Data was statistically analyzed using SPSS software Version 24 (IBM SPSS Statistics, Armonk, NY, USA). Test was used to analyze the mean decayed and filled permanent/primary teeth (DFT/dft) and the difference between groups, chi square test for evaluation of association between BMI-for-age and gender, and multiple linear regressions for evaluation of association between BMI-for-age and DFT/dft indices. P ≤ 0.05 was considered statistically significant.

Results

The total study population consists of 147 obese children (OB), 179 overweight children (OW) and 236 normal weight (NW) children between the ages of 8-12 years. The mean age of the study population was 9.36±1.21 for NW, 9.2±1.97 for OW and 9.69±1.9 for OB. The mean body mass index of obese children was 32.65 ± 2.34 and 27.38 ± 1.90 among the overweight children compared to 20.9 ± 2.45 for the normal weight children (Fig. 1). The caries index (dft, DMFT) is shown in Table 1 and Fig 2. The mean caries index was found to be significantly higher for the obese children compared to the normal weight and overweight children.

Tukey-Kramer multiple comparisons test revealed that the overall caries prevalence was significantly higher among obese/overweight children compared to normal and overweight children (P≤0.01). Though the rate of caries was higher among obese children compared to overweight group, it was not statistically significant (Fig 2).

Table 1. Distribution of the study group, Age, BMI and Caries Index.

	BMI (Mean ± SD)	AGE (Mean ±SD)	dft (Mean ± SD)	DMFT (Mean ± SD)	TOTAL (Mean ± SD)
Normal Weight (n=236)	21.11± 2.53	9.04±2.20	4.06±2.52	1.87±1.92	5.93±3.07
Overweight (n=179)	27.17±3.71	9.15±1.95	3.96±2.87	2.99±2.10	6.95±3.11
Obesity (n=147)	31.92±5.86	9.71±1.90	4.64±2.83	2.96±1.84	7.60±3.34

Figure 1. The BMI (Mean \pm SD) distribution of the study population groups (NW-Normal weight, OW-Over weight, OB-Obese group).

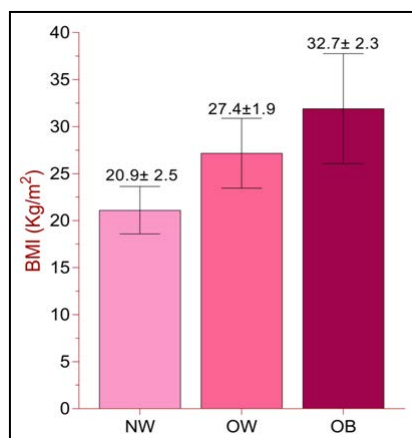
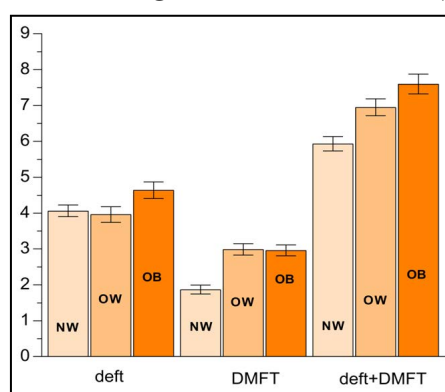


Figure 2. Caries Index (deft/DMFT) in normal weight, overweight and obese groups of children (NW-Normal weight, OW-Overweight, OB – Obese children).



Discussion

The prevalence of overweight and obesity in children is rapidly increasing in many countries around the world [25, 26]. The World Health Organization (WHO) has compared this marked change in body weight to a “global epidemic disease”. According to the American Academy of Pediatrics, Committee of Nutrition [27] overweight and obesity are now the most common medical conditions of childhood. The potential health problems associated with overweight/obesity in children are numerous [28]. The etiology of childhood obesity is multifactorial and includes social and cultural factors. Saudi Arabia ranks among countries with the high rate of obesity in children [29]. Global changes over the past decade have led to serious behavioral changes in populations, such as the increased consumption of soft drinks and fast food, which, together with more sedentary lifestyles [30, 31], has contributed to the increasing number of overweight people worldwide [32]. Studies have also shown a relationship between the consumption of sugar-sweetened drinks and childhood obesity [33, 34]. Obese children tend to become obese adults [28, 35]. Studies point to the fact that parental BMI has a positive association with childhood obesity [28, 36] and that familial behavior can predict the risk of obesity.

Body adiposity status is determined by calculating body mass index (BMI= weight/height²). The cut off points for overweight and obesity are body mass index of 25 kg/m² and 30 kg/m², respectively. In childhood, body mass index changes substantially

with age, therefore the international classification system for childhood obesity (isoBMI) is recommended by the International Obesity Task Force [37]. Overweight and obesity have a higher approximal caries prevalence than normal-weight adolescents. Both dental caries and obesity are multifactorial diseases and have common “promoting factors” that increase the likelihood of both diseases [8]. Both obesity and dental caries are related to dietary habits and to lower economic status [25, 38, 39]. Obesity develops when energy intake exceeds expenditure for a considerable time. Several characteristics are contributing to the widespread childhood obesity problem.

In the present study we found a correlation between dental caries prevalence and obesity. This is an agreement with other studies which identified an association between dental caries and obesity in childhood/adolescence and have suggested that obese children run an increased risk of caries development [11, 13, 14, 18]. However, other studies have not provided evidence to suggest that overweight children run an increased risk of dental caries [15-17] [19, 40, 41].

Obesity and caries share common risk factors. The role of a poor diet, for example, a diet high in calories and sugar, is significant in the development of the two conditions. Children with a high BMI and those with a high prevalence of dental caries share similar lifestyle habits. Both overweight and dental caries are related to consumption of sugary foods and beverages, as well as the excess of carbohydrates [42]. The amount of time spent watching TV is positively correlated with obesity [30] as it did with the increased

consumption of soda [43]. However, in this study all children were from an urban area. The study agrees with previous studies reported from Saudi Arabia [44-46].

Conclusion

Dental caries and obesity share some common, modifiable influences such as diet and lifestyle including changes in physical activity and food characters. Hence obesity can be considered a predictor of dental caries and obese individuals need frequent dental examination and educational care. The present study is cross-sectional in nature. Longitudinal studies are indicated to obtain more knowledge about causative factors and the possible relationships between dental caries and overweight/obesity in children. Knowledge of these relationships could lead to preventive health measures designed to reduce the prevalence of both obesity and dental caries.

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