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Original Article

Association Between Dental Caries and Body Mass Index Among Hamedan Elementary School Children in 2009

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Abstract:

Objective: Excessive weight in children is a major public health concern. The intake of refined carbohydrates, especially sugars and the prevalence of dental caries are well documented in the literature. The purpose of this study was to investigate the relationship between dental caries and BMI in elementary school children.

Materials and Methods: The sampling technique used in the present study was a cluster random sampling. A total of 1000 pupils (500 girls, 500 boys) aged 6-11 years from 20 private and state elementary schools (10 boys, 10 girls). The weight status was measured in children by assessment of body mass index (BMI) (=body weight/body height^2 kg/m^2) corresponding to gender and age-ranked percentages. To assess the caries frequency the decayed filled teeth (DFT) index for permanent dentition and the dft index for primary dentition were used since they give good perception about the situation of tooth caries in young patients.

Results: The highest mean total dft/DFT was seen in normal weight and lowest average in at risk of overweight children. There was not a statistically significant relationship found between high weight and caries frequency in the first (p=0.08) and permanent dentitions (p=0.06).

Conclusion: The results of this preliminary study do not support an association between dental caries and obesity.

Key Words: Body Mass Index; Dental Caries; School Children

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INTRODUCTION

The prevalence of obesity in children has increased worldwide; especially among those with a low socio-economic background [1]. Obesity among children is a problem in both developed and less developed countries around the world [2]. Excessive weight in children is a major public health concern. Excess of weight is a problem rising these days and the complications of this situation when the child reaches adulthood is growing [3]. Assessment of body mass index (BMI) according to age and sex evaluates the child's weight situation [3] . Children's eating style has changed so much leading to the outbreak of increase in weight [4]. Increase of obesity worldwide is due to using non-alcoholic beverages and fast food and decrease in exercise. A study in the USA documented that children are amongst the fastest growing group of the overweight and obese

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population [5].Childhood obesity may lead to serious disease, a decrease in life expectancy and numerous other problems. A high body weight is associated with a greater risk for type 2 diabetes and might be at risk factor for cardiovascular disease, asthma, arthritis, and general poor health [6,7]. Obesity in children may also result in emotional unhealthiness [8]. Obese adolescents are more likely to become obese adults, and obese adults have an increased risk of morbidity and mortality in adulthood [9].Iran has experienced a rapid ˝nutrition transition˝ characterized by decrease in physical activity and increase in energy intake [10] leading to rapid overweight since the 1990s [10,11]. There are many reports of refined carbohydrate consumption and the prevalence of tooth decay [12]; however, studies assessing the relationship between obesity and tooth decay in children have been limited [13].The objective of this study was to investigate the relationship between dental caries and BMI among elementary school children.

MATERIALS AND METHODS

This cross-sectional study was conducted from May to July 2009 in Hamedan, western Iran. The sampling technique used in the present study was a cluster random sampling, a total of 1000 pupils (500 girls, 500 boys) aged 6-11 years from 20 private and state elementary schools (10 boys, 10 girls) were screened. Each school was considered as clusters that were selected by random selection in view of the total sample size. The sample size was estimated according to prior studies (calculated as p=0.05, confidence coefficient 99% and error coefficient 3% of the number of the sample size 900). Parents were encouraged to give their written consent. The dental and physical examinations of the children were only conducted with the written consent of the parents. Body weight was recorded by using digital electronic scale with Italian trade mark LAICA 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 using with china trademark SECA that fixed at 2 meter height, according to the following protocol: no shoes, heels together and head touching the ruler with line of slight aligned horizontally.To avoid subjective errors, all the measurements were performed by the same person and by one observer.Weight status in children is measured by assessment of body mass index (BMI) (=body weight/body height^2 kg/m^2) corresponding to gender and age-ranked percentages. 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 5-20 years. According to these curves under weight is defined as under the 5th percentile curve, normal as between 5th and 85th percentile, at risk for overweight as higher than 85th and lower than the 95th percentile and overweight as higher or equal to the 95th percentile [14].

To assess the caries frequency the decayed-filled teeth (DFT) index for permanent dentition and the decayed-filled teeth (dft) index for primary dentition were used because they define the condition of caries in children [15]. The dental examination was performed by the same operator, was noninvasive (non magnifying mirror, dental probes, cotton roll with day light). No x-rays were used. Decayed deciduous teeth and permanent teeth in need of treatment were marked as cavities. Dressed and restored teeth that had recurrent caries were recorded as caries. A surface is diagnosed as decayed if the explorer is retained. Teeth with fissure sealants were separately recorded as having received prophylactic treatment [sound teeth]. If restoration materials were present, the teeth were marked as sufficiently or insufficiently treated (filled). Teeth filled with temporary materials were consi-

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dered as filled and not as decayed and no radiographs were taken. White spots were not considered as decayed in this study. Missing teeth were not pointed out because without an appropriate dental history no definite statement is possible about the actual existence of the tooth or occurrence of an early removal. Data was statistically analyzed using SPSS software (version 16). T-test was used to analyzed 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 also to compare outcomes of different weight groups, and one way analysis of variance ANOVA for evaluation of association between BMI-for-aged and DFT/dft indices. $P \leq 0.05$ was considered statistically significant.

ANOVA analysis was implemented without considering the design effect of cluster sampling.

RESULTS

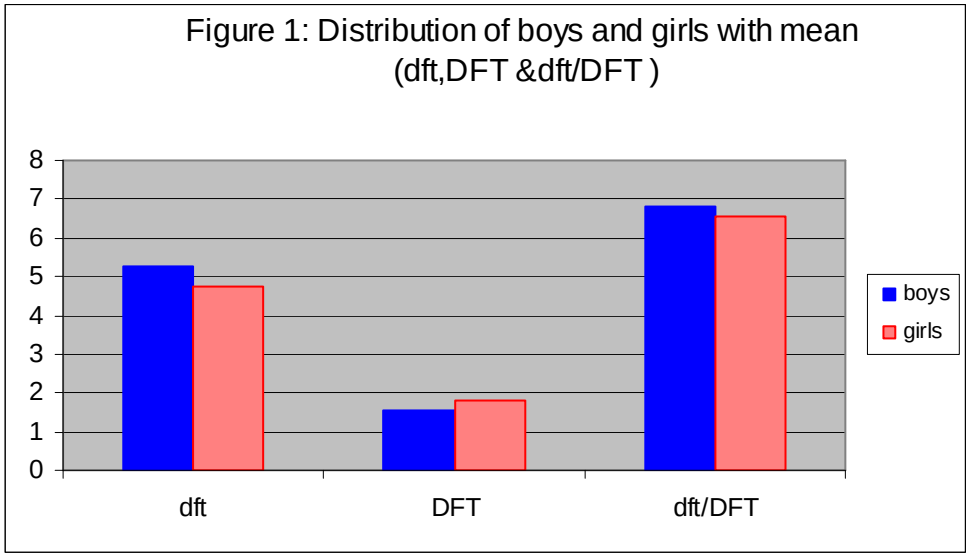
The examination of elementary school children included 1000 pupils.

The gender distribution was even with 50% boys and 50% girls (age range; 6 to 11 years).

The dental examination showed that only 51 of the children (24 girls and 27 boys) were caries-free without decayed or filled teeth.

Teeth with fissure sealants were present in 4.2% of the children. 9.1% of the children in the study (n=91; 44 boys and 47 girls) were underweight, 71.9% (n=719; 349 boys and 370 girls) of the children were normal weight, 11% (n=111; 59 boys and 55 girls) of the children were overweight and at risk of overweight was present in 7.9% (n=79; 51 boys and 28 girls) of the children. The boys showed a mean of 5.28 carious lesions (df-t values) in the first dentition and 1.55 in the permanent dentition (DF-T values). The girls showed a mean df-t value of 4.76 and a mean DF-T value of 1.82 and mean total dft/DFT value of 6.82 in boys and 6.58 in girls (Fig 1). The distribution of the children according to gender (boys, girls) and different weight classes (BMI) is given (Fig 2). Underweight children (n=91) showed a mean DFT value of 1.39 (mean df-t=5.34), children with normal weight (n=719) had a mean DF-T value of 1.74 (mean df–t=5.1). At risk of overweight children (n=79) had a mean DF-T value of 1.59 (mean df- t=4.25), and overweight children (n=111) had a mean DF-T value of 1.59 (mean df–t=4.79 (Fig 3).

Fig1. Comparison of the mean of dft and DFT in boys and girls



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The highest total mean (dft/DFT) was seen in normal weight and the lowest mean was reported in at risk of overweight children. There was no significant association between dental caries and obesity. On the other hand, the highest DFT was seen in normal weight and the lowest in the underweight group. 11.8% of underweight children were caries-free, while 66.7% of normal weight, 9.8% overweight and 11.8% of at risk of overweight children had oral cavity without any caries. There was no statistically significant relationship found between high weight and caries frequency in the first (p=0.08) and permanent dentition (p=0.06). The association between underweight and high caries experience in total values dft/DFT in boys could be observed, although this relationship was not observed in girls.

DISCUSSION

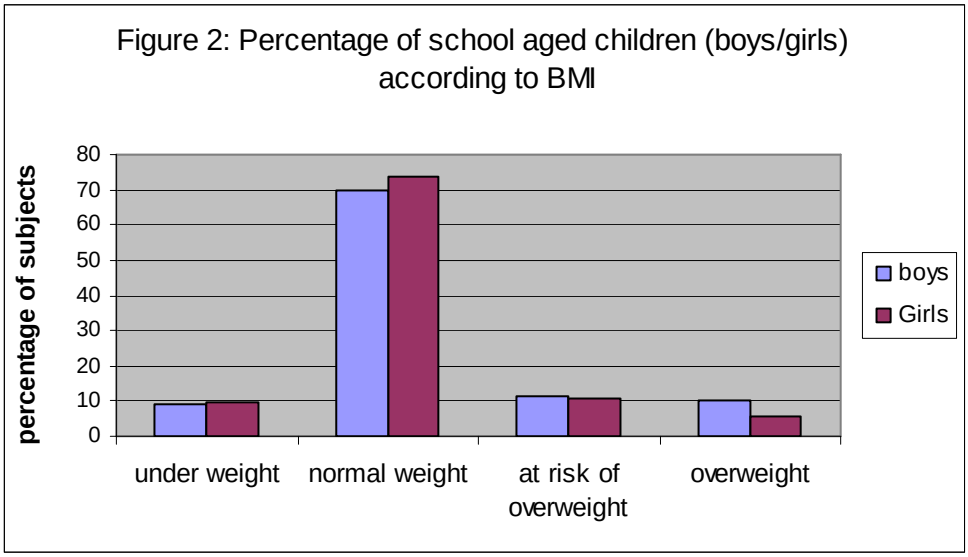
It is thought that the increase in children's overweight status has occurred because of an increase in caloric intake and also because of lack of physical activity among children and adolescents [16].

The amount of carbohydrates in children's diet has been increasing over the last 10 years as a consequence of recommendations to decrease dietary fat. Overweight in children has been associated with increased carbohydrate intake and may be related to prolong exposure to carbohydrates [17, 18]. Given the causative relation between refined carbohydrates and dental caries, it is appropriate to hypothesize that overweight might also be a marker for dental caries in children and teenagers [19]. The methodologies varied for determination of caries and overweight. Body weight of a population can be viewed as a continuum from underweight to obesity.

Deviation from normal weight results from an imbalance between caloric consumption and energy expenditure. Both underweight/malnutrition and overweight/obesity have significant adverse implications for health [20].

An accepted method to evaluate an individual's body weight relative to population norms is through calculation of body mass index (BMI) using the formula BMI=weight in kilograms/height in meters [21].

Fig 2. Distribution of BMI in boys &girls



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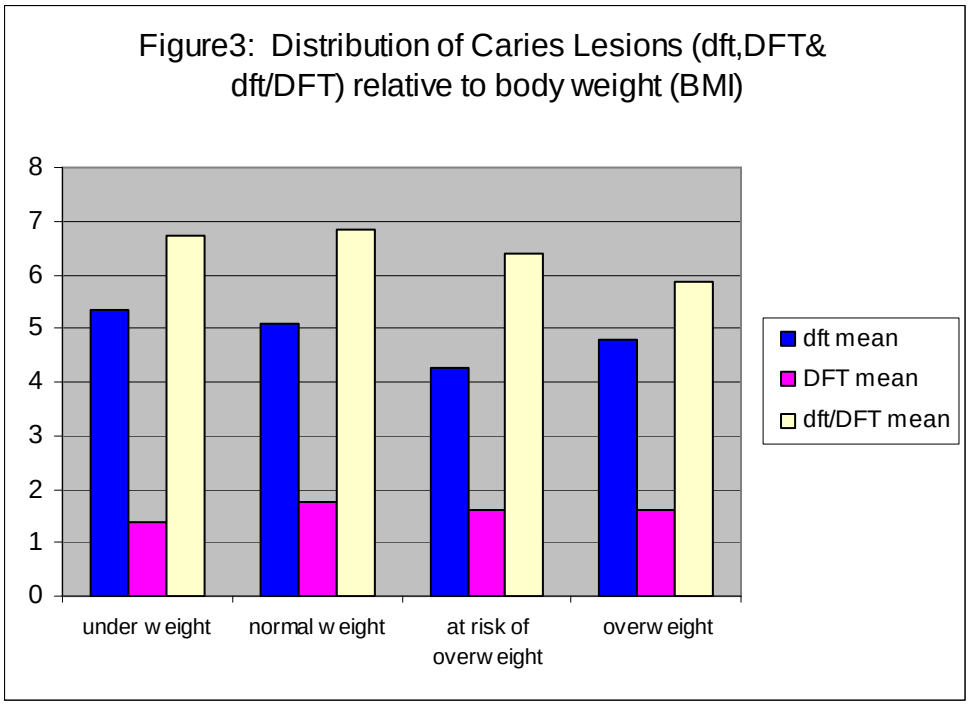
thors choose different kinds of indices، without radiograph or with radiograph for interdental decay; Wilierhausen and Sadeghi, df-t/DF-T Sheller (dmf-t); Forestier (DMF-T) and Pinto, decayed surfaces (as/Ds) index. Results of the present study showed the high prevalence of 11.1% overweight and 7.9% obesity in the 6 to 11-year-old children in Hamedan. There is a growing epidemic of overweight in Iran among children and teenagers [22]. A study showed that the prevalence of overweight was 20.8% in 3 to 9-year-old children according to BMI [23]. The mean Total DFT/dft indices in obese children were less than children in other groups.

Several reports including ours describe an inverse relationship between dental caries and weight [24, 25]. Chen et al [26] also investigated BMI index and dft score in three-year-old children. They concluded that there were no significant differences in the dft score of carious children among different BMI groups and there is no relationship between carious deciduous teeth and weight status. Macek and Mitola [23] found that overweight children aged 6-7 years had a significantly lower dental caries severity than children of normal BMI-for-age.Pinto et al concluded that there is no statistically significant association between BMI-for-age and dental caries prevalence for children aged 6-11 years. Sheller et al [27] found that in severe early childhood caries, the BMI percentile was not correlated with dmft or the number of pulp-involved teeth, even after adjusting for confounding factors in 2 to 5-year-old children.The results of this study are in disagreement with same studies. Willerhausen investigated BMI index and DF-T/df- t values in 6 to 11-year-old children. They demonstrated a significant association between caries frequency and weight in 1290 German elementary school children (13). Tuomi reported that obesity at young age and caries experience in children aged 5-13 years were useful in predicting the risk of dental caries, especially in permanent second molars [28].

Fig 3. Comparison of mean of caries lesions (dft and DFT) according to body weight



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Larsson et al found that caries-prone adolescents were more obese and had higher blood pressure than caries-free adolescents [29]. Burt and Pai reported that children of low birth weight subsequently developed more caries in primary dentition than children with normal to high birth weight. They concluded that this may be related to social deprivation factors during the development of the primary dentition [30]. Another study from willerschausem following 2071 primary school pupils, aged 6 to 10 years showed the significant correlation between BMI and caries frequency persisted even after adjustment to the children's age [13].In a Swedish study, children with DMFT indices over 9 had significant higher BMI values than caries-free children [28]. Another Swedish study of 15-year-old children revealed a significant positive correlation between DMFS indices and relative BMIs in the obese group [31].

Dental caries is a multifactorial infectious disease [32]. Factors affecting the onset of carious lesions include oral hygiene, diet composition and frequency, socioeconomic status, salivary immunoglobulins, bacterial loud and fluoride intake [33]. Dental hygiene, intake of fluoride and dietary habits (snacking) were not evaluated in the pediatric population we studied [34]. Presumably the low prevalence of obese children found in this sample could have biased the results towards a negative correlation [35].Albeit the findings of the present study are meant to be used in future preventive programs [31, 36].

CONCLUSION

Not with standing the fact that the results of this preliminary study do not support an association between dental caries and obesity. Both obesity and caries have common determinants and require a comprehensive, integrated management approach by multidisciplinary teams. The pediatric dentist should thus be involved in the management of obese children.

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