Relationship between Body Mass Index, Caries Experience and Dietary Preferences in Children

Akhilesh Sharma*/ Amitha M Hegde**

Dental caries and childhood obesity epidemics are multifactorial complex disease and children's dietary pattern is a common underlying etiologic factor in their causation. ***Materials:*** *Five hundred children belonging to the age group of 8-12 years of both sexes were studied. In all of them BMI, dietary preferences to sweet and fatty food snacks and caries experience was determined. The results were subjected to statistical analysis using prevalence test, ANOVA test and chi-square test.* ***Results:*** *We found that children with obesity and overweight had increased prevalence of dental caries in both primary and permanent dentition compared to normal weight children, which was statistically significant. In addition obese and overweight children had frequent preference to sweet and fatty food snacks compared to children with normal weight.*
Keywords*: Body mass index, Caries, Obesity, Sweet and fatty food preferences.*
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INTRODUCTION

Obesity is the most common nutritional disorder in children, and the prevalence of the disease has increased dramatically over the past 3 decades. Currently, 25% of children are overweight or obese.[1] If these trends continue, this generation of children will become the heaviest adult population ever.[2] While this global epidemic is well described in the adult population, not much data is available regarding the prevalence of overweight/ obesity in children or adolescents amongst developing countries. In India the problem of obesity has been scantily explored even in the affluent population groups.[3]

Obesity is associated with numerous adverse health effects in children. Immediate psychosocial effects include social discrimination in childhood and self esteem problems in adolescents.[1,4] Physical health problems of obesity include poorer pulmonary function, advanced growth, hyperlipidaemia, glucose intolerance, hepatic steatosis and cholelithiasis, and a wide range of less common pathologic conditions.[4,6] Perhaps even more importantly, obesity in the school years is an important independent risk factor for adult obesity.[7]

Dental caries is one of the most prevalent infectious diseases to afflict mankind. The proportion of world's population affected by dental caries increased dramatically once refined carbohydrates became available to developed and developing nations.[8]

Children's dietary habits are a significant contributor to childhood obesity and dental caries epidemics. Many children consume too much fat, saturated fats, sodium and insufficient amounts of fruits, vegetables and calcium. A key dietary factor associated with increased risk of caries; particularly in children is the duration of exposure time that fermentable carbohydrates are in direct contact with dental plaque. Fruit drink and other beverages also represent high sugar sources, which may contribute to cariogenic potential. Soft drink consumption has been associated with increased caloric intake, increased body weight, pediatric obesity and dental caries.[9]

The objective of our study was to find the relationship between BMI, dental caries experience and dietary preferences to sweet and fatty foods among school going children.

METHOD

A total number of 500 children belonging to the age group of 8-12 years of both sexes who reported to the department of Pedodontics and Preventive Children Dentistry, A.B. Shetty Memorial Institute of Dental Sciences, Mangalore were a part of this study. Body mass index was determined, caries experience was recorded and dietary preferences to sweet and fatty foods were recorded in the questionnaire given to them.

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A single trained and calibrated examiner performed a comprehensive clinical examination with the assistance of one recorder. The caries experience (DMFS/dfs index) was recorded using visible light; mouth mirror and CPI probe.[10] All the teeth were examined for coronal surface caries and restorations. The number of decayed, missing and filled surfaces (dmfs/DMFS) in the coronal portion of each tooth was determined. Body weight was measured using a balanced beam scale and height was measured using stadiometer. Children were measured wearing light clothing and without shoes. Body mass index (BMI) was calculated using the formula weight in kilograms (Kg) divided by height in meter square (m2). The BMI percentile for age and sex were plotted on the growth chart developed by CDC 2000 standards.[11]

A food frequency questionnaire (35 items) was prepared and was given to the parents of the children to know their child's dietary habits[12] and their sweet and fatty food preferences. Older children completed the questionnaire by themselves while the parents of the younger children were asked to fill the questionnaire.

The results were subjected to statistical analysis using prevalence test and ANOVA test. Analysis was done using SPSS software version 11.

RESULTS

BMI percentile of 500 children examined comprised of 255 boys and 245 girls.

Two-hundred-ninety-two (58.4%) (150 boys and 142 girls) children were in the 5th–85th percentile range suggesting of having normal weight for age and sex. Forty-three (8.6%) (19 boys and 24 girls) were below 5 percentile and were underweight. One-hundred-eleven (22.2%) (58 boys and 53 girls) were between 85th–95th percentile and were over weight who are at risk of being obese in future. Fifty-four (10.8%) (28 boys and 26 girls) children were above 95th percentile and were obese. (Graph 1)

There is an increase in mean caries experience in both primary and permanent dentition as body weight increases from under weight to obese, with the exception of higher increase in caries experience in permanent dentition among under weight children compared to children with normal body weight, over weight and obese.

The average DMFS for obese children was 2.85 and for children with normal weight was 1.58 (p - 0.013) and overweight children 2.48 (p - 0.021) respectively. The under weight Children had higher mean DMFS of 3.11 compared to normal weight children 1.58, (p - 005) The inter group variation as evaluated by Tukeys test showed a significant difference between all the three groups. The mean value was highest in the under weight children than the other groups.

The mean dfs value for normal weight was 2.14 where as in obese children dfs value was 3.25 (p = 0.351), overweight children dfs value of 4.79 (p = 0.000) and under weight children had mean dfs value of 2 (p = 0.997) respectively.

Between the overweight and obese group there was no significant increase in the mean DMFS. Thus it can be concluded according to our study that children with over weight/obese or underweight/malnourished children have higher DMFS compared to children with normal weight.

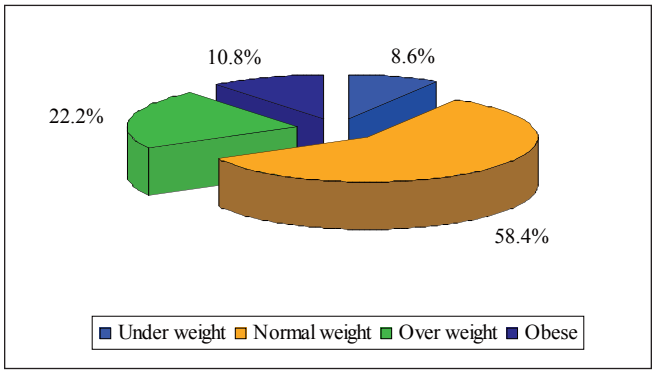
The over weight and obese children had higher mean caries experience score in primary dentition compared to mean caries experience score in the permanent dentition. This was found to be very highly significant

Dietary preferences to sweet /sugar containing foods like Candy, Biscuits, Cake/Pastries, Jam, Chocolates, Ice-creams, Soft-drinks, Fruit-Juices, Jaggery/honey, Solid sugar, Sweet puddings and fatty foods like Peanuts, Nuts, Coconut, French fries, Butter, Ghee, Cheese, Milkshakes, Egg/egg yolk, Mutton, Chicken, Pork, Fried fish, Banana chips, Pizza, Squash Soda/cool drinks, Popcorn fried foods among the children of differing body weight are shown in the graph 3.

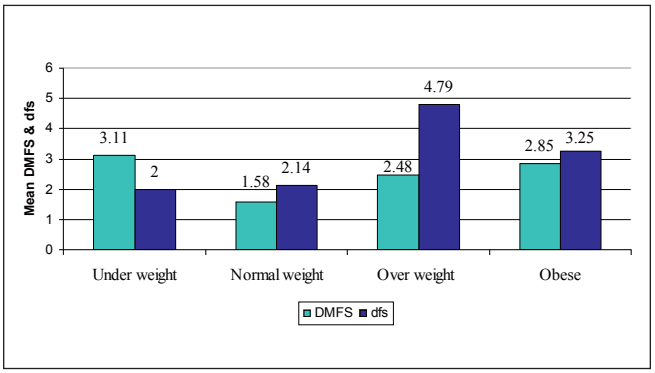
Overall, 25.2% of the overweight and 25.9% of obese children preferred sweet and fatty foods more frequently whereas 12.6% of overweight and 5.6% of obese children did not prefer sweet and fatty foods. Among the normal weight children 27.4% did not prefer sweet and fatty foods at all whereas only 7.9% of them preferred sweet and fatty foods more frequently. This was found to be statistically significant using chi square analysis. (p = 0.001)

DISCUSSION

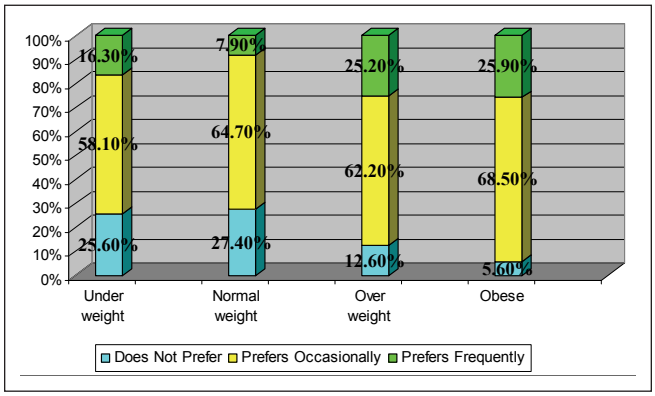
Obesity is a global nutritional concern. The increasing prevalence of overweight, obesity and its consequences



Graph No 1. Pie diagram showing the frequency distribution of population based on BMI percentile



Graph No 2. Bar diagram showing mean DMFS and dfs among the children with different body weight



Graph No 3. Bar diagram showing dietary preferences for sweet and fatty foods among the children with different body weight

prompted the World Health Organization to designate obesity as a global epidemic.[1] Over one-third of our study population had higher body weight than ideal standard weight for age and sex. No gender difference in prevalence of overweight and obesity was found. The children under study were from higher socioeconomic strata of society. Various studies from India also showed the increased prevalence of obesity.[14, 15, 16, 17, 18] The BMI which was recently proposed as the reference index for the diagnosis of childhood obesity at the international level was used in the present study. The use of centiles of BMI may offer useful information on changes of weight excess, simplifying the follow-up of the patient and the sensitivity to treatment.[19] It is found to be reliable, simple and easy to use indicator of degree of obesity in childhood.[20]

The overweight and obese children had higher mean dfs score compared to mean DMFS score. This finding could be due to presence of many primary teeth present in the oral cavity compared to permanent teeth, which is related to sample selection age group of 8–12 years. Our findings of an association between an increase of dental caries and high weight in children are in accordance to studies on elementary school children in Germany.[21] These results are in agreement with a Swedish study in which children with DMFT indices over 9 had significantly higher BMI values than caries free children.[22] In 1995, Larsson *et a l*[23] found that caries prone adolescents were more obese and had higher blood pressures than caries free adolescents. Forestier[24] and colleagues found a significant association between BMI and DMFT indices (p=0.01) in the severely obese group. These results are in agreement with another Swedish study of 15-year-old children[25] in which a significant positive correlation was found between DMFS indices and relative BMI's in the obese group.

Childhood obesity and dental caries are coincidental in many populations probably due to common confounding risk factors such as intake frequency, cariogenic diet and poor oral hygiene. A study on the association between childhood obesity and smooth surface caries in posterior teeth found that, the mean caries average for permanent molars significantly increased with increase in BMI, even after adjusting for age and gender.[26]

In our study the frequent preference for sweet and fatty foods showed a positive relationship to increase in body weight, which in turn had positive relation to caries experience in children. There is considerable evidence suggesting that sucrose and other free sugars contribute to the global epidemic of obesity. Reducing the intake of sugars may make a useful contribution along with other measures in reducing the risk of obesity and its clinical consequences.[27] Free sugars promote a positive energy balance. Short term experiments in humans confirm that total energy intake increases when energy density of the diet is increased, whether by free sugars or fat.[28, 29] Drinks rich in free sugars increase overall energy intake by limiting appetite control. There is thus less of a compensatory reduction of food intake after consumption of high sugar drinks than when additional foods of equivalent energy content are provided.[30] Children with a high consumption of soft drinks rich in free sugars are more likely to be overweight and gain excess weight.[31] Diets limited in free sugars have been shown to reduce total energy intake and induce weight loss, even when people are encouraged to replace sugars with starches and nonstarch polysaccharides.[32, 33] The frequent preference of these high caloric sweet and fatty foods and sweetened soda drinks among the overweight and obese children in between snacking was observed in our study.

Thus the present study confirms the findings of increase in caries experience with increase in body weight and puts light on the increase in frequency of dietary preference to sweet and fat snacks to play a role. Another finding in the present study was that the underweight children had the highest mean decay score in permanent dentition. Literature shows link between malnutrition and dental caries but no conclusive evidence exists. Thus lack of adequate nutrition could be cause for increase in the caries in permanent molars. Poor eating habits in early childhood, especially during tooth development can impair tooth mineralization and increase the risk of caries.[35, 36] However further studies are required to confirm these findings. Further studies with larger sample size and recording of detailed dietary habits should be included.

CONCLUSIONS

There is higher prevalence of dental caries in overweight and obese children in both primary and permanent dentition.

Children who were obese and overweight preferred sweet and fatty foods more frequently compared to children with normal weight.

We recommend that BMI calculation should be included in the routine examination of children. The importance of

Table 1. Mean DMFS/dfs in children with different body weight

Body weight	N	Mean DMFS	Mean dfs	P value
Under weight	43	3.1163	2.0000	.000 VHS
Normal weight	292	1.5890	2.1473	
Over weight	111	2.4865	4.7928	
Obese	54	2.8519	3.2593	

vhs = very highly significant

nutrition should not only be emphasized with respect to general diseases but also with regards to carious lesions.

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