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Evaluation of the Association between Body Mass Index (BMI) and Dental Caries among Children

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Abstract: *The purpose of this study was to examine the relationship between age specific Body Mass Index (BMI) and dental caries among children. Seventy eight children of age group 3-6 years were examined and measured for height, weight and dental caries experience. Dental caries severity in primary dentition was calculated by using deft index. BMI was calculated by using metric formula. Co-variates included age and gender. Overall, 53% of normal weight, 81% of underweight and 70% of overweight had deft score > 0. Underweight children had significantly higher mean deft value than the normal weight children. The number of healthy teeth decreased with increasing age and dental caries experience were found to be equal amongst girls and boys. Theoretically, overweight should be associated with dental caries, but this association was not found. Rather, nutritional deficiency was found to be correlated to increased dental caries severity.*
Keywords - *BMI, dental caries, overweight, underweight*

I. Introduction

Today, the world faces two kinds of malnutrition, one associated with nutritional deficiencies and the other with dietary excess. Urbanization and economic development result in rapid changes in diets and lifestyle. Market globalization has a significant impact on overweight leading to chronic diseases such as obese, diabetes, cardiovascular diseases, cancer, osteoporosis and oral diseases. Diet and nutrition affects oral health in many ways, for example, their influence on craniofacial development, oral cancer and oral infectious diseases. Dental diseases related to diet include dental caries, developmental defects of enamel or dental erosion [1]. Assessment of BMI (Body Mass Index) has the advantage of simplicity and is useful for assessing both over and under nutrition. BMI is a number calculated by child' s height and weight. It is relative indicator of body fatness for children and teens. For children and teens, BMI is age and sex specific and is often referred to as BMI for age.
The purpose of this study was to determine the relationship between age specific-Body Mass Index and dental caries among children of 3-6 years age group.

II. Method

A sample size of 78 children of age group 3-6 years were randomly selected and measured for height, weight and dental caries experience after obtaining informed parental consent. Weight and height were measured for each child dressed in light clothes and no shoes. All children were measured in the same manner for both height and weight. Oral examination was carried out. Dental caries was expressed in deft index. BMI for this study was calculated by using metric formula [Weight in kg/ {height in meters} [2].

After BMI is calculated, the BMI number is plotted on the respective BMI for age growth charts to obtain the percentile ranking. Percentiles are the most commonly used indicators to assess the size and growth patterns of individual children. Percentiles give the relative position of the child' s BMI number among children of the same age and sex. BMI for age weight status categories and the corresponding percentiles is shown by [Table 1].

The total number of decayed, extracted or filled primary teeth was determined for each child. Dental caries severity was represented by mean deft. Pearson' s correlation coefficient was used to find out whether any significant correlation exists between age specific BMI and dental caries experience. Fisher' s exact test and Unpaired ' t' test were used to compare the values of overweight or underweight and the reference i.e., normal weight.

III. Results

Among 78 children of age group 3-6 years, 19% (15 children) were normal weight, 68% (53 children) of them were underweight, 3% of them (2 children) were at risk of overweight and 10% (8 children) were of overweight category [Fig 1]. Overall, 53% of normal weight, 81% of underweight and 70% of overweight had deft score more than 0. BMI was found to be negatively correlated, correlation coefficient being -0.095; as the BMI number for a child decreases, dental caries severity increases. Comparison of number of children with dental caries experience in underweight and normal weight children showed significant differences [p=0.042, p<

0.05] [Table 2] however, the differences between overweight and normal weight were not statistically significant [p=0.678, p>0.05] [Table 3].

Underweight children had higher mean deft value than the normal children and the differences were statistically significant [p=0.046, p< 0.05]. Overweight children also showed slightly higher mean deft than the normal weight children. However, the differences were not statistically significant [p=0.457, p> 0.05] [Table 4] [Fig 2].

The mean deft values amongst the age and gender wise groups were also compared [Table 5]. The correlation between age and dental caries were found to be positively correlated. Mean deft increases with increasing age. Mean deft amongst boys and girls were equal (3.48).

IV. Tables and Figures

Table 1: BMI for age weight status categories and the corresponding percentiles

Weight status categories	Corresponding percentiles
Underweight	Less than 5th percentile
Healthy weight	5th percentile to less than 85th percentile
At risk of overweight	85th to less than the 95th percentile
Overweight	Equal to or greater than 95th percentile

Table 2: Comparison of number of children with dental caries experience in underweight and normal weight children.

Caries	Underweight	Normal weight	Total
deft score > 0	43	8	51
deft score = 0	10	7	17
Total	53	15	68

Fisher' s exact test, p= 0.042, p <0.05, Significant

Table 3: Comparison of number of children with dental caries experience in overweight and normal weight children

Caries	Overweight	Normal weight	Total
deft score > 0	7	8	15
deft score = 0	3	7	10
Total	10	15	25

Fisher' s exact test, p= 0.678, p >0.05, Not Significant

Table 4: Comparison of mean deft values of overweight, underweight and normal weight children

	Overweight	Normal weight	Underweight
Mean deft value	2.62	2.06	3.96
Standard deviation	2.72	2.76	3.29
Number of children	10	15	53
Standard error of mean	1.295	0.71	0.453
Minimum	0	0	0
Mean	2	1	4
Maximum	9	8	12

Unpaired ' t' test

Table 5: Comparison of mean deft according to age and gender

	Age group				Gender wise	
	3yrs	4yrs	5yrs	6yrs	Boys	Girls
Mean deft	2.04	4	4.26	4.18	3.48	3.48

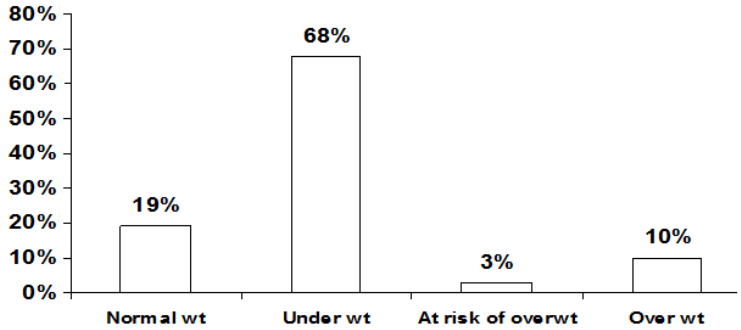

Figure 1: Distribution of children according to different weight status categories

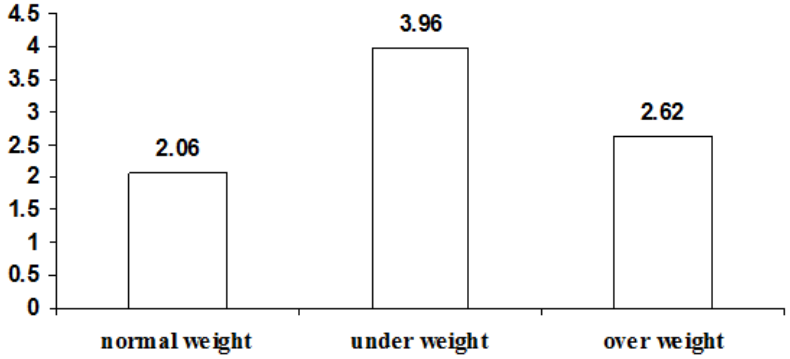

Figure 2: Mean deft values in overweight, normal weight and underweight categories

V. Discussion & Conclusion

Few studies till date have been done to establish if a relationship between dental caries and BMI exists. Studies conducted so far showed varying results. The current analysis showed that underweight is significantly associated with increased dental caries severity in primary dentition. Similar results were found by Li et al who concluded that nutritional deficiency have an important impact on tooth development and susceptibility to dental diseases [2]. Epidemiological studies have also suggested associations between caries, enamel hypoplasia and undernutrition [3]. Enamel hypoplasia has been associated with caries development as it provides a mechanical nidus for bacteria and food [3,4]. Study carried out by F. L. Cameron et al in Aug 2006 conducted at Glasgow also showed severe dental decay was associated with underweight [5]. An investigation by Johansson et al, linked malnutrition, salivary gland malfunction and caries incidence. Johansson et al (1994) observed that Indian children with moderate to severe Protein Energy Malnutrition had a reduced salivary secretion rate, reduced buffering capacity, lower calcium and lower protein secretion in stimulated saliva and reduced agglutinating defense factors in unstimulated saliva. This reduced function may increase caries risk and offers a mechanism that may partially explain an association of caries with undernutrition [6].

Theoretically, overweight should be associated with dental caries, since overweight and dental caries are in principle caused by the same factors [7]. However, it was surprising to find that in the present study overweight was not significantly associated with increased prevalence of dental caries in primary dentition. Also, Macek, Mitola et al reported that overweight children were associated with lower geometric mean deft; hence denoting that the relationship between overweight and dental caries in children is far complex than can be explained by carbohydrate consumption alone [8]. Although, dental professionals are reminded that they still have an important role in influencing eating habits and food choices of children.

To conclude, in the present study, underweight children exhibit more decayed, missing and filled teeth than do their normal weight peers. Nutritional status does play an important role in influencing child' s dental health. In future preventive programmes, the importance of nutrition should not only be emphasized with respect to general health diseases but also with regards to oral and dental health.

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