

Correlation Between Malnutrition and Dental Caries in Children

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Introduction

Dental caries is a multifactorial infectious disease. Factors affecting the onset of dental caries include oral hygiene, diet composition and frequency, socioeconomic status, salivary immunoglobulins, bacterial load, and fluoride intake¹. It is identified as the single most common chronic childhood disease². Although dental caries prevalence and severity in children has dramatically decreased over the last three decades, significant levels of disease persist and are concentrated among socioeconomically disadvantaged groups³, especially in the developing countries^{4, 5}.

Malnutrition is a serious global issue⁶ and is considered a health problem in developing countries⁷. The World Bank estimates that India is ranked 2nd in the world of the number of children suffering from malnutrition, and the prevalence of underweight children in India is among the highest in the world². A report by WHO states that socioeconomic inequality in childhood malnutrition existed throughout the developing world⁸.

Although it has been well documented in animals that early malnutrition affects tooth development and eruption and results in increased dental caries later in life, it has not been directly demonstrated in humans¹. A strong correlation was observed between the degree of linear enamel hypoplasia and caries experience in the deciduous teeth of undernourished Guatemalan children⁹. Notably, malnutrition (wasting or stunting)

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Abstract

Introduction: Dental caries and malnutrition is a public health problem, concentrated more among socioeconomically disadvantaged groups. This study aimed to evaluate the correlation between malnutrition and dental caries among 6, 10 and 12 years children in Mangalore. **Materials and Methods:** Data about oral health status and body mass index of children of age groups 6, 10 and 12 were collected using a cross-sectional design. Anthropometric measurements and oral examinations were carried out. Statistical test was performed to look for categorical associations between BMI categories and dental caries prevalence and to see if any correlation exists between BMI Score and dental caries severity. **Results:** The Pearson correlation test result suggested children with less BMI score tend to have more caries affected teeth than children with normal BMI. **Conclusions:** Physicians and dentists treating young children should consider malnutrition as a risk marker for childhood caries. Inclusion of BMI calculation in the standard dental evaluation of any pediatric patient can provide a screen for prevention, timely diagnosis, and treatment of the children suffering from dental caries and malnutrition.

Key words: Dental caries, Malnutrition, Body mass index, Socio-economic status

is associated with enhanced susceptibility to caries because of impaired saliva secretion and composition¹⁰.

The prevalence of dental caries is high in children from lower socioeconomic groups and are often poorly nourished and suffer delayed growth and development compared with their healthy peers¹¹. In these populations, prenatal and perinatal malnutrition are often the causes of enamel hypoplasia, reduced salivary secretion and low buffering capacity¹².

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As lower socioeconomic status is a risk factor common to both dental caries and childhood malnourishment, and very few studies have been conducted till date, which probe into the association, a study was conducted to find out the correlation between malnutrition and dental caries among 6, 10 and 12 years low socioeconomic status children in Mangalore.

Materials and Methods

A cross-sectional study was carried out among children attending free dental examination in Mangalore city, India. The study was limited to children who were 6, 10 and 12 years old, and whose parents gave consent to participate in the study. The age groups were chosen so that the results of the study could be correlated in terms of primary tooth caries, mixed dentition caries and permanent tooth caries.

Anthropometric measures were carried out by trained nurses. Height (recorded to the nearest centimeter) and body weight (to the nearest 0.1 kg) was measured on validated scales when the child wore light clothing but no shoes. Body mass index (BMI: weight/height in kg/m²) was calculated and compared with the gender- and age-adjusted cut-off points. Children were classified into 4 categories using age- and gender-specific criteria: underweight – less than 5th percentile; normal weight – 5th percentile to less than 85th percentile; at risk of overweight – 85th to less than 95th percentile; and overweight – equal to or greater than 95th percentile.

Oral health examinations were conducted with a mouth mirror and a No. 23 explorer under good operating light. The World Health Organization basic methods for oral health surveys were used for dental caries scoring¹³. Only the decayed and filled teeth were recorded (dft/DFT: sum of decayed and filled teeth). Because of difficulty of correctly distinguishing among teeth extracted for caries and other reasons, such as exfoliation and trauma, missing teeth count was not included in the analysis.

Statistical test was performed with SPSS version 11.5. Chi-square (χ^2) test was done to predict categorical associations between BMI categories and dental caries prevalence. Correlation test was performed to see for relation between BMI Score and dental caries severity.

Results

A total of 248 children participated in the study, among them 28.6% were of 6 years, 33.1% were of 10 years and 38.3% were of 12 years of age. In total, 42.3% of the children were underweight, and 57.7% of them were found to be normal weight. (Table 1) Among children of 6, 10 and 12 years of age, the percentage

of underweight children were 42.3%, 46.3% and 38.9% respectively. (Table 2) The percentage of underweight children was found to be higher in males than in females (48.9% versus 38.6%); however the difference was not found to be significant.

Approximately 70.2% of the children had dental caries in 1 or more teeth (Table 3), and was highest in 6 years age group (83.1%) followed by 10 (67.1%) and 12 years of age (63.2%). The differences were found to be significant. (Table 4)

Mean DFT at 6 years was 3.17 ± 2.94 , at 10 years, it was 2 ± 2.61 . Mean DFT for permanent dentition was 0.66 ± 1.16 at 10 years and 1.16 ± 1.66 at 12 years of age. (Table 5)

The overall dental caries prevalence was found to be almost equal in normal weight children and underweight children (71.3% and 68.6% respectively). (Table 6)

A Pearson correlation test was performed between Body Mass Index score and dft score of deciduous dentition. A negative correlation (-0.016) was obtained. Similarly the Pearson correlation test was performed for DFT score of permanent dentition of age groups 10 and 12. A negative correlation was observed in both age groups (-0.108 and -0.033 respectively). The result suggested children with less BMI score tend to have more approximal caries affected teeth than children with normal BMI. But the association was weak.

Table 1: Distribution of study population-BMI category wise

BMI category	Frequency	Percent
Underweight	105	42.3
Normal	143	57.7
Total	248	100

Table 2: Distribution of BMI Category-Age wise

Age	BMI category		Total
	Underweight	Normal	
6 years	30	41	71
	42.3%	57.7%	100%
10 years	38	44	82
	46.3%	53.7%	100%
12 years	37	58	95
	38.9%	61.1%	100%
Total	105	143	248
	42.3%	57.7%	100%

Table 3: Dental caries prevalence

Dental caries prevalence	Frequency	Percent
No decay present	74	29.8
Decay present	174	70.2
Total	248	100

Table 4: Dental caries prevalence - Age wise

Age	Dental caries prevalence		Total
	No decay present	Decay present	
6	12	59	71
	16.9%	83.1%	100%
10	27	55	82
	32.9%	67.1%	100%
12	35	60	95
	36.8%	63.2%	100%
Total	74	174	248
	29.8%	70.2%	100%

(P = 0.014 Significant)

Table 5: Mean dft/DFT at different ages

Age group	Mean dft/DFT	Std. Deviation
dft at 6 yrs	3.17	2.942
dft at 10 yrs	2	2.615
dft at 12 yrs	0.79	1.494
DFT at 6 yrs	0.39	0.933
DFT at 10 yrs	0.66	1.168
DFT at 12 yrs	1.16	1.665

Table 6: Dental caries prevalence - BMI category wise

BMI category	Dental caries prevalence		Total
	No decay present	Decay present	
Underweight	33	72	105
	31.4%	68.6%	100%
Normal	41	102	143
	28.7%	71.3%	100%
Total	74	174	248
	29.8%	70.2%	100%

Discussion

Both malnutrition and dental caries are complex conditions and many biological, genetic, environmental, socioeconomic and behavioral factors are known to be involved⁷. Given the strong evidence supporting the association of dental caries with irregular dietary patterns and quality¹⁴ and the fact that abnormal dietary intake has been linked to the development of malnutrition at a young age⁷, a link between dental caries and weight is biologically credible.

In our study, 56.5% of the children had normal BMI, which is less than as reported in a US study (75%)¹⁵. About 42.3% were underweight, which is much higher than that obtained in the US study (4%)¹⁵. The percentage of underweight children among 6 and 10 years of age were almost equal (42.3%, 46.3%); whereas, it was lower for children of 12 years of age (38.9%). The reason for lower prevalence of underweight children among 12 years age could be their partial dependence on mothers for their diet.

In the present study, dental caries was a prevalent disease affecting 70.2% of the study population. For age group 6 years, the prevalence of dental caries was low in underweight children (76.7% versus 87.8%). The possible explanation could be a delayed tooth eruption among malnourished children which may have resulted in delayed caries development¹⁶.

Exploration of the link between weight and oral health in children has always been controversial¹. The result of our study suggested no association existed between dental caries prevalence and body mass index ($p > 0.05$), however the Pearson correlation test showed a negative correlation between body mass index score and number of dental caries in both the deciduous and permanent dentition, which meant children with less BMI score tend to have more approximal caries affected teeth than children with normal BMI. But the association was weak. The reasons for the increased severity of dental caries among children with less BMI score could be low literacy rates, especially among mothers, inaccess to dental care, lack of balance diet, easy access to snacks, junk food—highly cariogenic and low calorie, and above all lack of awareness about proper oral hygiene.

In contrast to our study, a study in elementary school children in Germany found a positive correlation between weight and caries experience in primary and mixed dentitions¹⁷. Several reports described as inverse relationship between dental caries and weight^{1, 18}. In a study of children, Chen W et al reported no association between BMI-for-age and dental caries among 3-year-old Chinese children¹⁹. In addition, a recent systematic review only identified one study as having a sufficient level of evidence to substantiate a positive correlation between dental caries and weight in a pediatric cohort²⁰.

Conclusion

Physicians and dentists treating young children should consider that malnutrition is a risk marker for childhood caries. For dentists, children presenting with dental caries should be considered at risk for nutritional deficiencies that may affect long-term health and well-being. Hence, BMI calculation should be included in the standard dental evaluation of any paediatric patient, as

it can provide a screen for potential dental complications of the growing child. The goal for both physicians and dentists should be the prevention, timely diagnosis, and treatment of the children suffering from dental caries and malnutrition.

Limitations

Since convenience sampling was done, sampling bias could have occurred as no attempt was made to randomly select patients for the study. Although we did not perform a formal socioeconomic assessment of our sample, the well-characterized geographic localization of our subjects and known characteristics of the area, in the view of authors, provided homogeneity to the group.

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