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Study Of Association Between Dental Caries And Nutritional Status Among Children Attending OPD Of A Tertiary Care Center - A Retrospective Study

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Abstract:
Aim*: The purpose is to study the association between nutritional status and dental carries in children attending outpatient department of a tertiary care centre.*
Materials and methods*: A total of 342 children aged up to 16 years attending the department of District Early Intervention and Care (DEIC) of a Government Medical College and Hospital were selected for this study. The nutritional status was evaluated using BMI for age and converted into Z score by plotting into age and gender specific WHO growth charts. Dental caries status was recorded according to WHO criteria. The obtained data were subjected to statistical analysis.*
Results: *The prevalence of underweight was 49.2% and prevalence of dental caries was 61.7%. Significant association between Caries and undernutrition was noted in ages between 2 to 10 years.*
Conclusion: *Undernutrition is a risk factor for dental caries. It is important to identify and determine all the factors leading to undernutrition in children especially aged 2 to 10 and execute action plans for timely diagnosis and intervention.*
Keywords: *BMI-for-age, Dental caries, Malnutrition, Z score*

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I. Introduction:

Childhood malnutrition is an important socioeconomic issue that ultimately results in substantial losses and burden during adolescence and adulthood by increasing the child's susceptibility to various infections and delaying recovery. Malnutrition is a multifactorial disease that is proved to have multiple effects on the oral tissues and subsequent oral disease development.[1] Similar to malnutrition, dental caries has multifactorial aetiology with diet as a common risk factor. Both are major public health problems and have significant impact on quality of life. With the so-called modernisation in recent dietary habits among children and young adults determining the risk variables that could modified to be the focus of efficient intervention is essential.[2] Our study aims to study the association between nutritional status and dental carries in children attending outpatient department of a tertiary care centre.

II. Methods And Materials:

This is a retrospective analytical report which summarises the data from the period of August 2022 to January 2022 in the children aged up to 16 years attending the department of District Early Intervention and Care (DEIC) of Government Kilpauk Medical College and Hospital, Chennai. This included 342 children and they are grouped as per age group into 4 groups.

Group I: Less than 2 years, Group II: 2.1 to 5 years, Group III: 5.1 to 10 years, Group IV: 10.1 to 16 years

Consent was obtained from parents of these children and this study was approved by the institutional ethical committee.

On the child's first visit to the centre following information were collected (i) Age (ii)Height (iii) Weight. All measurements followed standardised techniques using accurate equipment which are regularly calibrated. All measurements are done by single investigator to avoid inter observer bias and to maintain uniformity and accuracy in techniques.

BMI for age was calculated using following formula i.e., weight in kg divided by height in m^2.The number obtained was converted into Z score by plotting in age and gender specific WHO(Z Score) growth charts, BMI for age indicates a child's BMI for their age and sex relative to the reference population.[3] Based on these scores, the children were grouped into these categories; Z score >3 :obese, >2 :overweight, > 1 to <-1:Normal, <-2 : Wasted, <-3 : severe wasted.[4]

Oral examination was carried out using a non-invasive technique using sterile mouth mirror, straight probe, shepherd's hook explorer and cotton roll with the child sitting in upright position under good illumination and dental caries status recorded as per WHO criteria.

The data was entered in a proforma designed to record all the above information. Statistical analysis was performed using IBM SPSS 22. The data obtained was analysed using Chi-square test and level of statistical significance were set at $p<0.05$.

III. Results:

A total of 342 children were enrolled in the study among them 178 (52%) were boys and 148(48%) were girls (Table 1). They were divided into 4 groups based on age, less than 2 years, 2.1 to 5 years, 5.1 to 10 years, 10.1 to 16 years. Among them 12.9% were within 2 years, 23.4% between 2.1 to 5 years of age, 47.4% between 5.1 to 10 years, 16.3% between 10.1 to 16 years. (Table 2).

Table 1: Distribution according to gender

Gender	***Number of children***	***Percentage***
Male	178	52
Female	164	48
Total	342	100

Table 2: Distribution according to age

Age in years	***Number of children***	***Percentage***
Less than 2 years	44	12.9
2.1 to 5 years	80	23.4
5.1 to 10 years	162	47.4
10.1 to 16 years	56	16.3
Total	342	100.0

Regarding the nutritional status, 15.2% were severely wasted, 34% showed wasting, 40.6% were normal 7% was overweight, 3.2% were obese. In total 49.2% were undernourished, 40.6% were normal, 10.2% were over nourished. (Table 3).

Table 3: Distribution according to BMI for age

Z score - BMI for age	***Category***	***Number of children***	***Percentage***
<-3 SD	Severe wasted	52	15.2
<-2 SD	Wasted	116	34.0
>1 to <-1 SD	Normal	139	40.6
>2 SD	Overweight	24	7.0
>3 SD	Obese	11	3.2
Total		342	100.0

Table 4 shows age wise distribution of children according to BMI for age. In age group less than 2 years 45.5% were normal, 45.4% were undernourished (wasted and severe wasted) and 9.1% were overnourished (overweight and obese). In age group 2.1 to 5 years 50% were normal, 47.5% were undernourished and 2.5% were overnourished. In age 5.1 to 10 years age group only 35.8% were normal while 53.1% were undernourished with 11.1% being overnourished. In 10.1 to 16 years, 37.5% were normal, 42.8% were undernourished and 19.7% overnourished.

Table 4: Distribution of BMI for age z- score according to age group

Category	***< 2 years***	***2.1 to 5 years***	***5.1 to 10 years***	***10.1 to 16 years***
Severe wasted	8(18.2%)	16(20%)	22(13.6%)	6(10.7%)
Wasted	12(27.2%)	22(27.5%)	64(39.5%)	18(32.1%)
Normal	20(45.5%)	40(50%)	58(35.8%)	21(37.5%)
Overweight	4(9.1%)	2(2.5%)	12(7.4%)	6(10.7%)
Obese	0	0	6(3.7%)	5(9%)
Total	44(100%)	80(100%)	162(100%)	56(100%)

In our study 61.7% of children had Dental caries, presenting as 8.5%, 13.4% 31%, 8.8% in study age groups respectively, percentage of caries was found to be higher in group 5.1 to 10 years, followed by 2.1 to 5 years age group. (Table 5).

Table 5: Distribution of Dental caries according to age

Age in years	*Number of children*	*Percentage*
Less than 2 years	29	8.5
2.1 to 5 years	46	13.4
5.1 to 10 years	106	31
10.1 to 16 years	30	8.8
Total	211	61.7

Table 6 shows the distribution of dental caries according to the nutritional status. 81 % of children who are undernourished had dental caries while 35.3% of normally nourished and 74.3% of overnourished children had caries.

Table 6: Distribution of dental carries according to Nutritional status (BMI for age)

Dental Caries	*Undernourished (Severe wasted + wasted)*	*Normal*	*Overnourished (Overweight + Obese)*	*Total*
Present	136(81%)	49(35.3%)	26(74.3%)	211(61.7%)
Absent	32(19%)	90(64.7%)	9(25.7%)	131(38.3%)
Total	168	139	35	342

Table 7: Association of Nutritional status and dental carries

Nutrition	*Significance of Dental carries prevalence Age-wise*									
	<2 years		*2.1 to 5 yrs*		*5.1 to 10 yrs*		*10.1 to 16 yrs*		*Total*	
	X^2	*p value*	X^2	*p value*	X^2	*p value*	X^2	*p value*	X^2	*p value*
Under Nourished	0.27	p=.60	32.82	**p<.001***	25.41	**p<.001***	1.34	p=.24	50.21	**p<.0001***
Over Nourished	0.16	p=.68	0.25	p=.61	1.36	p=.24	2.01	p=.15	2.61	p=.10

Chi-square analysis of association between Caries and undernutrition was done which showed significant association [$X^2(1, N=342) = 50.21$ p<.001]. No significant association were observed between caries and undernutrition in groups 0-2 and 10 -16 years. But there was significant association noted in age groups 2.1-5 and 5.1-10 years (p<001).

In our study there was no signification association noted between caries and over-nourishment (overweight + obese) in all age groups.

IV. Discussion:

Dental caries is a multifactorial disease condition having several identified diverse risk factors. Mostly researched are environmental factors including cariogenic carbohydrate rich diet, cariogenic microbes, poor dental hygiene, but alone cannot explanation why some patients are more susceptible or resistant being in the same environment.[5] However the relationship between caries and nutritional status are not well understood in spite of various studies.

Malnutrition is an important health problem faced in the world today affecting children's growth, development, health, and overall wellbeing.[6] It affects bodies homeostasis, lowers resistance to microbial biofilm and reduces the ability for tissue healing leading to dental caries. Also, researches show malnutrition cause dental caries through enamel hypoplasia, decreased salivary gland activity and altered saliva composition.[7,8]

In the analysis done in our study out of 342 children whose BMI for age Z score and prevalence of dental caries showed that 49.2% were undernourished, 40.6% were normal and 10.2% were overnourished. Among children under 5 years of age 46.8% were undernourished, 48.7% were normal and 4.5% were overnourished. In India as per national family health survey IV 2014-15, 35.7% are undernourished, 41% of children under 3 years were undernourished.[9] Key indicator survey of Tamil Nadu showed only 26.6% undernourishment in children less than 5 years.[10] The increased prevalence of undernourished children in this study may be attributed to predominantly lower socioeconomic status of the patients attending the OPD. Among children between 5-10 years of age 53% were undernourished in this study, whereas 66.7% were undernourished in whole of India, and 52.4% in Tamil Nadu.[11]

Overall prevalence of dental caries in our study was 61.7%. A systematic review done in India on the prevalence of dental caries in age up to 18 years was found to 57%.[12] The prevalence of caries in our study was found to be more (31%) in children between 5 – 10 years, 81% of the undernourished had caries.

Our study shows overall significant association between caries and undernutrition. In our study there was significant association between undernutrition and caries in children in age of 2- 10 years, suggesting malnutrition as an important cofactor in development of dental caries in children in the above age group. The associated age shows development of caries is predominant when the children have a complete set of deciduous teeth, and in mixed dentition stage. This shows the changes in dietary habits of the kids play a major role in nutritional defection and caries development.

In our study there was no significant association between caries and overnutrition. Though obesity and caries can be attributed to high carbohydrate diet, the aetiology for dental caries is far more complex and multifactorial.

The key finding is underweight children, especially in age of 2-10 yrs are more susceptible to caries than normal children. Many studies show varied observations regarding the association between caries and nourishment.[13,14] Still literature is sparse and there is a need for elaborate longitudinal study to exact the association between dental caries and nutrition.

The major limitation of our study is it being a cross-sectional study rather than a longitudinal design and is also limited to children attending the OPD. Other relevant factors such as diet, socioeconomic conditions were not accounted for owing to restraints of time and expenses. We have addressed the issue of undernutrition and its relationship with dental caries with appropriate sample strength with accurate anthropometric measurements using calibrated instruments and standardised assessment protocols.

V. Conclusion:

The study found that low BMI for age is associated with dental caries and hence nutritional status and oral health are interrelated. This emphasises that it is highly important to identify and determine all the factors leading undernutrition in children especially aged 2 to 10 years and to promote health planning to execute actions addressing them.

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