

Salivary Streptococcus mutans and dental caries in relation to nutritional status among 6 years old children

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Abstract

Background: Nutritional status is the mirror image of health and one of its most accurate indicators. Normal salivary gland functions are essential for maintenance of oral health. Salivary flow rate and composition which could be influenced by nutritional status. The aim of this study was to investigate the effect of nutritional status on Streptococcus mutans and their relations to dental caries.

Materials and methods: Stimulated saliva was collected from 28 children with an age 6 years old. Those randomly selected children were divided into well-nourished and chronic malnourished children according to their age, weight and height indicators. Dental caries examination of primary teeth was assayed following the criteria of WHO. Microbiological assessment of Streptococcus mutans was done after measuring the salivary flow rate.

Results: No significant differences were found between well-nourished and chronic malnourished children in caries experience. Chronic malnourished children had a significant lower salivary flow rate and higher mean counts of salivary Streptococcus mutans than that of well-nourished children. Significant correlations were found between nutritional status with flow rate and Streptococcus mutans.

Conclusion: Early identification of malnourished children will lower the prevalence of dental caries and enhance their quality of life.

Keywords: Streptococcus mutans, dental caries, nutritional status.

Introduction

Nutritional and dietary Habits have a profound impact on the pattern and severity of oral complications of salivary gland hypo function⁽¹⁾. The role of saliva in the soft tissue protection and tooth remineralization is well known^(2,3). A reduced salivary flow rate can affect oral sugar clearance and diluting of saliva. In addition, each of the defense mechanisms depends on an adequate supply of proteins⁽⁴⁾. These antimicrobial factors were found to be regulated by salivary flow rate⁽⁵⁾. The

glycoproteins that result in aggregation of bacteria arise from the salivary glands. Immunoglobulin and cellular immunity also require protein for their production⁽⁴⁾. Under nutrition may exacerbate the development of dental caries not only by salivary gland atrophy, but it contributes to the development of hypoplasia and delays eruption and shedding of teeth⁽⁶⁾. Menaker and Navia⁽⁷⁾ demonstrated that the offspring of rates on a protein-deficient diet exhibited a lower salivary flow rate, altered protein content, and a greater susceptibility to caries. Although some Iraqi studies

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were carried out to assess oral health status in relation to nutritional status^(8,9), there is no information were recorded regarding salivary analysis and bacteriological evaluation. For this reason, it was decided to conduct this study to investigate the effect of nutritional status on salivary Streptococcus mutans count, salivary flow rate and dental caries.

Materials and methods

A random sample of 28 children aged 6 years old was examined. The children were distributed into two subgroups according to their age, height and weight. The first group was the well-nourished children regarding to the three indicators; which were normal. While the second group was chronic (had a low height for age) malnourished children⁽¹⁰⁾. Examination of primary teeth dental caries was carried out following the criteria of WHO⁽¹¹⁾. A piece of Arabic gum was chewed for 2 min. The collected saliva was expectorated. After a collection of mixed saliva for another 5 min in sterile disposable capped vial to be analyzed within 2 hours, salivary flow rate was calculated per minute. Then 0.1 ml of saliva was transferred to 0.9 ml of sterile phosphate buffer saline (pH 7.0) for microbiological analysis. After inoculation and incubation an aerobically for 48 hours the identification of Streptococcus mutans was carried out by colonial morphology⁽¹²⁾, Gram's staining and mannitol and sorbitol fermentation tests⁽¹³⁾. The data obtained was statistically analyzed using Person's correlation coefficient and Student's t-test, at a level of significance 0.05.

Results

Table 1 shows the distribution of the 6 years old children according to the nutritional status by gender. Mean values of dmft and dmfs for primary teeth in relation to nutritional status are presented in Table 2. Although chronic malnourished children had a higher mean values for both dmft and dmfs but statistically there were no significant differences between them ($P > 0.05$). Table 3 reveals the secretion rate of stimulated saliva and salivary concentrations of Streptococcus mutans in relation to nutritional status. Significant differences were found between the two groups regarding the salivary flow rate and Streptococcus mutans. A positive significant correlation was found between nutritional status and Streptococcus mutans. While negative significant correlations were found between flow rate with nutritional status and Streptococcus mutans. On the other hand, no significant correlations were found between dmft/dmfs indices with Streptococcus mutans and nutritional status ($P > 0.05$).

Discussion

The result revealed that although the chronic malnourished children developed increased caries, which is in accordance with other humans^(8,14) and animals⁽⁷⁾ studies, but there is no significant differences in caries experience between well-nourished and chronic malnourished children. This finding which is in agreement with other studies^(8,9) may be attributed to the effect of long term malnutrition on teeth eruption^(15,16). Alvarez and Navia⁽¹⁵⁾ noted that the prevalence of dental caries as a function of time occurs approximately 15 months later in undernourished children compared with well-nourished children. This may explain the positive

correlation between nutritional status and dental caries.

It is well known that many of the protein molecules secreted by the salivary glands are of extreme importance in protecting the integrity of the teeth and soft tissues. All of these can be diminished in volume or alteration in structure during malnutrition period^(17,18). The quality of total protein secreted per minute was reduced by 20% in protein energy malnutrition⁽¹⁹⁾, and this may explain the positive relation between nutritional status and Streptococcus mutans. Menaker and Navia⁽⁷⁾ found a decrease in salivary protein content and increase in oral disease incidence in marginally undernourished rats. Beside that, it was reported that malnourished humans had a decreased lysozyme level^(20,21) lactoferrin⁽¹⁹⁾ as well as lower anti-Streptococcus mutans S-IgA levels^(19,20,21). Protein energy malnourished children, who have reduced secretion rate, lower Ca⁺⁺ and protein secretion in stimulated saliva, also have impaired immunological and agglutinating defense factors in unstimulated saliva⁽¹⁹⁾. All these reasons may explain that the malnourished children had a significantly higher Streptococcus mutans mean counts than that of well-nourished group.

Malnourished group had a significantly lower salivary flow rate, this result is in agreement with other animals⁽⁷⁾ and human studies^(14,19). The last two studies found that chronic malnutrition reduced the secretion rate of stimulated saliva, but not of unstimulated. This finding may explain the significant correlation between nutritional status and salivary flow rate. The no significant correlation was found between Streptococcus mutans and caries experience is in agreement with Tenovuo et al study⁽²²⁾. They noted that the amount of Streptococcus

mutans correlated significantly with the number of initial caries but not with DMFT/DMFS and DS. The significant correlation between mean counts of Streptococcus mutans with flow rate may be due to the more acidic pH as a result of reduced flow rate which favors the growth of acidogenic and/or acid uric micro flora and enhances the cariogenic potential of dental caries⁽²³⁾.

Management of these children is very important. A significant emphasis should be placed on preventive oral care. It may include daily oral hygiene, frequent professional oral evaluations and care, stimulation of the salivary glands as well as nutritional consenting.

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Table 1: Distribution of the Children According to Nutritional Status by Gender

Gender	Well-nourished		Chronic malnourished	
	No.	%	No.	%
Males	8	57.14	8	57.14
Females	6	42.85	6	42.85
Both	14	100	14	100

Table 2: Caries Experience (dmft/dmfs) According to Nutritional Status by Gender

Dental caries	Gender	No.	Well-nourished		No.	Chronic malnourished		t-test
			Mean ± SD			Mean ± SD		
dmft	Males	8	8.8	3.2	8	7.8	1.6	N.S
	Females	6	3.2	2.1	6	5.9	3.1	
	Both	14	6.3	4.0	14	6.6	2.8	
dmfs	Males	8	12.3	5.0	8	19.6	5.5	N.S
	Females	6	5.0	4.1	6	7.3	5.3	
	Both	14	9.1	5.8	14	11.7	8.0	

Table 3: Salivary flow rate and salivary concentration of Streptococcus mutans According to Nutritional Status by Gender

Variables	Gender	No.	Well-nourished		No.	Chronic malnourished		t-test
			Mean ± SD			Mean ± SD		
Flow rate#	Males	8	0.98	0.5	8	0.61	0.4	2.09*
	Females	6	0.97	0.5	6	0.69	0.4	
	Both	14	0.98	0.4	14	0.66	0.4	
S. mutans ##	Males	8	5.52	3.72	8	10.18	5.45	2.15*
	Females	6	3.43	3.41	6	8.37	7.52	
	Both	14	4.63	3.62	14	9.02	6.69	

* P < 0.05, d.f = 20

ml/min

The values expressed at the level of 10⁵ cfu/ml saliva

Table 4: Correlation Coefficient among the Variables

Variables	dmft	dmfs	Flow rate	S. mutans
Nutritional Status	r = + 0.03 P = 0.86	r = + 0.18 P = 0.34	r = - 0.38 P = 0.04	r = + 0.39 P = 0.04
S. mutans	r = + 0.19 P = 0.33	r = + 0.33 P = 0.08	r = - 0.84 P = 0.001	