The effect of nutritional status on dental caries in relation to salivary flow rate, pH, inorganic phosphorus, calcium, copper and lead among five years old kindergarten children

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ABSTRACT

Background: Malnutrition in human life may adversely affect various aspects of growth and increase the severity of oral problems at different stages of life. Teeth and salivary glands are particularly sensitive to malnutrition. That may reduce salivary protective components that may increase caries incidence. This study was conducted among malnourished kindergarten children aged 5 years in comparison to well-nourished group to determine the occurance and severity of dental caries in relation to salivary flow rate, pH, inorganic phosphorus, calcium, copper and lead.

Material and methods: This study was conducted among 84 malnourished and 89 well-nourished children aged 5 years. The assessment of nutritional status was done by using three nutritional indicators, namely Height-for-age, Weight-for-age and Weight-for-height. Diagnosis of severity of dental caries was recorded through the application of dmfs index. The stimulated saliva was collected to determine salivary flow rate, pH, inorganic phosphorus, calcium, copper and lead.

Results: The results reveled that the mean values of dmfs were found to be higher among malnourished respectively than well-nourished groups respectively, but with no significant difference (P> 0.05). A positive statistically significant correlation was observed between dmfs and ds and salivary lead for well-nourished group. No significant correlation was recorded between the salivary flow rate and the salivary pH and all the salivary elements in malnourished group. Nevertheless, a positive significant correlation was detected for the salivary flow rate and salivary pH and salivary inorganic phosphorus in well-nourished group.

Conclusion: Malnutrition affect on increase dental caries experience and reducing salivary flow rate, pH, inorganic phosphorus, calcium, copper and lead.

Keywords:Malnutrition, dental caries, stimulated salivary element. (J Bagh Coll Dentistry 2010;22(3):119-122).

INTRODUCTION

Dental caries remain one of major global public health problem[1,2]. It consider as multifactorial since it is influenced by dietary and host factors, in addition to the role of saliva as a defense system against dental caries which is well documented. Developmentally, teeth are generally morphogenetically static and malnutrition can be altered both morphologically and in composition only during their formative periods and are essentially unaffected once dental maturation is complete. Therefore, malnutrition consider as a risk factor for dental caries [3]. Saliva flow rate play a major role in determining the saliva composition [4]. The composition and specific physicochemical characteristics of saliva maintain physiological equilibrium between demineralization and remineralization of the enamel [5,6]. Moreover, a link between Protein Energy Malnutrition and salivary flow rates, buffering capacity and the protein composition content of saliva had been established [7]. This reduced function may increase caries risk and offers a mechanism that may partially explain an association of caries with Protein Energy Malnutrition [8,9].

MATERIAL AND METHODS

Three indicators of the subjects' nutritional status were used to assess the nutritional status of each person through using Height-for-age, Weight-for-age and Weight-for-height. Based on each nutritional status indicator , the cut off point used Z-Score below -2 SD and between median to +1 to classify malnutrition and well-nourished conditions respectively. Examinations and oral health assessments were performed according to the basic method proposed by WHO (1997) [10]. Clinical examinations were conducted using plane mouth mirror and dental explorer.The assessments and recording of caries experiences were done through the application of Decayed, Missing and Filled Surface Index for primary teeth [11].

The collection of the stimulated salivary samples from the individuals was formed under

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standardized conditions [12,13]. Salivary pH was measured using a digital pH meter. The spectrophotometer was used to determine Inorganic phosphorous. While Atomic Absorption Spectrophotometer was used to determine calcium, copper and lead.

RESULTS

Data of the present study showed absence of missing surface for primary dentition. The mean dmfs, decay fraction (ds) and filling surface (fs) was found to be higher among malnourished than well-nourished however, the differences were not significant (P> 0.05). Concerning females, the same picture was found. While reverse picture was recorded for males with no significant difference (P> 0.05). In both malnourished and well-nourished groups , no significant difference were reported between males and females for ds,fs,dmfs (P>0.05) as shown in Table 1.

The mean value of salivary flow rate was found to be highly significantly lower among malnourished than well-nourished (P<0.01). Concerning each gender, same result was found with statistically highly significant difference (p < 0.01). However, the mean pH value was found to be highly significantly lower among malnourished than well-nourished (P < 0.01). The same result was found concerning each gender (P < 0.01). The results showed that there is no significant difference between males and females among malnourished (P>0.05). While among well-nourished group males had highly significant higher than females (P<0.01). Data of the present study showed that all inorganic salivary elements that studied in the present study were lower among malnourished than well-nourished group with significant difference concerning phosphorus (P<0.05), and highly significant concerning calcium, copper and lead (P<0.01). Among males, data of the present study showed that copper in the present study was higher among malnourished than well-nourished groups with significant difference (P<0.05), and highly significant concerning phosphorus, calcium, and lead (P<0.01). Among females, the results reported that salivary calcium and copper were lower among malnourished than well-nourished groups with highly significant (P<0.01). While concerning phosphorus and lead showed no significant difference (P> 0.05) as shown in Table 2.

Concerning malnourished, the relation between salivary flow rate and pH and dmfs, ds and fs were not significant. The same results found for males and females. Concerning well-nourished, the relation between salivary flow rate and dmfs, ds and fs were not significant in negative direction. Similar finding were reported among males. While among females the relations were significant with negative direction concerning dmfs and ds only. Results showed negative relation between pH and dmfs and ds. The same relations were found in addition to fs among females. While among males the relations were not significant as shown in Table 3.

Concerning malnourished children, the relation for the total sample between dmfs and ds and salivary phosphorus, calcium, copper and lead were not significant. The same pictures were found for both males and females. Concerning well-nourished, no relation for the total sample between dmfs and ds and phosphorus, calcium and copper. While the relation concerning lead was significant in positive direction. Data analysis in each gender showed that among males no relations were recorded between dmfs and ds and salivary elements. While among females, the relation were in negative direction concerning phosphorus as shown in Table 4.

Table 1: Dental caries experience (dmfs) and components (ds,ms and fs) among malnourished and well-nourished children aged 5 years by gender.

		Malnourished			Well-nourished			Statistical differences	
	Gender	No.	Mean	±SD	No.	Mean	±SD	Z -value	P-value
dmfs	Males	42	5.450	5.760	44	5.560	7.220	-0.619	0.536
	Females	42	6.410	7.690	45	5.540	7.310	-0.719	0.472
	Total	84	5.930	6.770	89	5.550	7.219	-0.969	0.333
ds	Males	42	5.240	5.320	44	5.290	7.040	-0.819	0.413
	Females	42	6.080	7.080	45	5.400	6.990	-0.662	0.508
	Total	84	5.660	6.240	89	5.350	6.980	-1.059	0.290
fs	Males	42	0.210	0.980	44	0.270	0.900	-1.048	0.295
	Females	42	0.330	1.100	45	0.140	0.470	-0.096	0.923
	Total	84	0.270	1.030	89	0.210	0.710	-0.789	0.430

Note: No missing surfaces (ms)

Table 2: Concentration of flow rate, pH and inorganic salivary elements among malnourished and well-nourished children aged 5 years by gender.

		Malnourished			Well-nourished			Statistical differences	
	Gender	No.	Mean	±SD	No.	Mean	±SD	Z -value	P-value
Flow rate	Males	42	0.284▲▲	0.088	44	0.808▲▲	0.148	-7.987**	0.000
	Females	42	0.186	0.094	45	0.734	0.100	-8.042**	0.000
	Total	84	0.235	0.103	89	0.771	0.131	-11.360**	0.000
PH	Males	42	6.641	0.778	44	7.261▲▲	0.199	-3.190**	0.001
	Females	42	6.725	0.647	45	7.208	0.365	-4.088**	0.000
	Total	84	6.683	0.712	89	7.234	0.294	-5.776**	0.000
Phosphorus (ppm)	Males	42	105.881▲▲	15.480	44	123.686▲▲	26.466	-3.297**	0.001
	Females	42	82.893	12.849	45	90.147	18.290	-1.216	0.224
	Total	84	94.387	18.265	89	106.728	28.176	-2.193*	0.028
Calcium (ppm)	Males	42	17.488	4.561	44	30.682	4.994	-7.552**	0.000
	Females	42	15.548	3.690	45	30.300	7.452	-7.935**	0.000
	Total	84	16.518	4.237	89	30.489	6.324	-10.889**	0.000
Copper (ppm)	Males	42	0.111	0.048	44	0.138	0.052	-2.548**	0.011
	Females	42	0.092	0.027	45	0.132	0.072	-2.707**	0.007
	Total	84	0.102	0.040	89	0.135	0.063	-3.830**	0.000
Lead (µg/dl)	Males	42	4.081	0.969	44	5.473▲▲	1.117	-4.785**	0.000
	Females	42	4.129	1.148	45	4.600	1.352	-1.585	0.113
	Total	84	4.105	1.056	89	5.032	1.310	-4.601**	0.000

(*P<0.05, **P<0.01 between malnourished and well-nourished) (▲▲ P<0.01 between males and females)

Table 3: Correlation coefficient (r) between salivary flow rate (ml/min) & pH and components of dental caries among malnourished and well-nourished children aged 5 years by gender.

		Salivary flow rate				pH			
		Malnourished		Well-nourished		Malnourished		Well-nourished	
	Gender	r	P	r	P	r	P	r	P
dmfs	Males	-0.088	0.580	0.033	0.832	-0.175	0.269	-0.016	0.916
	Females	0.171	0.279	-0.503**	0.000	-0.091	0.568	-0.503**	0.000
	Total	0.042	0.701	-0.192	0.071	-0.133	0.229	-0.276**	0.009
ds	Males	-0.090	0.570	0.040	0.795	-0.183	0.247	-0.010	0.948
	Females	0.174	0.269	-0.503**	0.000	-0.096	0.543	-0.503**	0.000
	Total	0.042	0.705	-0.195	0.067	-0.136	0.218	-0.279**	0.008
fs	Males	-0.116	0.465	0.106	0.494	0.049	0.760	0.103	0.506
	Females	0.222	0.158	-0.408**	0.005	-0.071	0.653	-0.408**	0.005
	Total	0.043	0.696	-0.096	0.373	-0.029	0.795	-0.153	0.153

**** P<0.01 Note: No missing surfaces (ms)**

Table 4: Correlation coefficient (r) between dmfs and ds and inorganic salivary elements among malnourished and well-nourished children aged 5 years by gender.

		dmfs				Ds			
		Malnourished		Well-nourished		Malnourished		Well-nourished	
	Gender	r	P	r	P	r	P	R	P
Phosphorus (ppm)	Males	0.078	0.621	-0.195	0.204	0.082	0.606	-0.199	0.195
	Females	-0.269	0.085	-0.397**	0.007	-0.268	0.086	-0.397**	0.007
	Total	-0.054	0.623	-0.126	0.237	-0.057	0.607	-0.141	0.188
Calcium (ppm)	Males	-0.059	0.712	0.268	0.079	-0.055	0.727	0.252	0.099
	Females	-0.051	0.748	-0.062	0.686	-0.047	0.766	-0.060	0.695
	Total	-0.040	0.719	0.105	0.328	-0.034	0.759	0.099	0.357
Copper (ppm)	Males	0.184	0.242	0.138	0.371	0.191	0.226	0.107	0.488
	Females	-0.259	0.098	0.090	0.556	-0.253	0.105	0.094	0.538
	Total	-0.028	0.803	0.117	0.274	-0.019	0.860	0.102	0.344
Lead (µg/dl)	Males	-0.036	0.823	0.280	0.065	-0.033	0.834	0.279	0.067
	Females	0.013	0.936	0.162	0.289	0.008	0.959	0.162	0.288
	Total	-0.011	0.922	0.228*	0.032	-0.010	0.928	0.220*	0.038

*** P<0.05 ** P<0.01**

DISCUSSION

Human saliva is a unique secretion that maintain optimal oral health [14]. Saliva represents the first line of defence against dental caries after tooth eruption [15,16]. This results also found in present study as data showed an inverse relation between salivary flow rate and pH and some grade of dental caries. This finding in agreement with previous study [17]. Results showed no relation between salivary calcium and dental caries, this finding coincide with other study, [18] while other found strong negative association [17]. At high level of lead exposure, the acinar cell of the parotid gland may damage and result in alteration of salivary secreation protein and calcium [19]. Among aged 5 years, present study showed relation between lead in saliva and dental caries. This finding agree with Almaas study [20].

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Iraqi cephalometric norms using McNamara's analysis

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ABSTRACT

Background: This study aimed to establish the cephalometric norms for Iraqis using McNamara's analysis and to verify the existence of sexual dimorphism.

Materials and Methods: 75 dental students, (33 males and 42 females) having normal occlusion, were chosen for this study. Each student was subjected to clinical examination and digital true lateral cephalometric X-ray. The radiographs were analyzed using AutoCAD program 2006 to measure the distances and angles. Descriptive statistics was obtained for the measured variables for both genders and independent- samples t-test was performed to evaluate the genders difference.

Results and Conclusions: The maxilla is protrusive in males in comparison with females, the effective midface and mandibular lengths, lower facial height are significantly higher in males, and the Frankfort mandibular plane angle is significantly higher in females. The females show retrusive mandibles with slight retrusive upper incisors in comparison with males, while both genders show the same lower incisor position.

Key words: McNamara's analysis, cephalometric norms. (J Bagh Coll Dentistry 2010;22(3):123-127).

INTRODUCTION

Since the introduction of cephalometrics by Broadbent [(1)] in 1931, a number of different analyses have been devised such as that of Downs [(2-4)], Steiner [(5-7)], Harvold [(8)] and Ricketts [(9-11)].

McNamara [(12)] suggested that a need has arisen for a method of cephalometric analysis that is sensitive not only to the position of the teeth within a given bone but also to the relationship of the jaw elements and cranial base structures one to another because he felt that clinical orthodontics has seen the advent of numerous orthognathic surgery procedures which allow three-dimensional repositioning of almost every bony structure in the facial region and of functional appliance therapy which presents new possibilities in the treatment of skeletal discrepancies. So, in 1984, McNamara [(12)] introduced his analysis which was derived, in part, from the principles of the cephalometric analyses of Harvold [(8)] and of Ricketts [(9-11)], although other aspects, such as the construction of the Nasion perpendicular and the point A vertical, are presumed to be original. He thought that his method of analysis represents an effort to relate teeth to teeth, teeth to jaws, each jaw to the other, and the jaws to the cranial base.

In an effort to create a clinically useful analysis, McNamara [(12)] divided the craniofacial skeletal complex into five major sections: maxilla to cranial base, maxilla to mandible, mandible to cranial base, dentition, and airway.

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The purposes of this study were to establish the cephalometric norms for Iraqi adults using McNamara's analysis and to verify the existence of sexual dimorphism.

MATERIALS AND METHODS

Sample

The sample included under and postgraduate students in the College of Dentistry. The age ranged between 18-33 years. 75 subjects (33 males and 42 females) were selected having normal occlusion, full permanent dentition regardless the third molars, with no history of orthodontic/ oro-facial surgery, facial trauma or deformity.

The Instruments

1. Kidney dish.
2. Dental mirrors.
3. Sterilizer (Memmert, Germany).

The Equipments

1. X-Ray Unit (The Planmeca ProMax X-ray unit)
2. Analyzing Equipments
   - **a)** Pentium IV portable computer.
   - **b)** Analyzing software (AutoCAD 2006).

Method

Each student was examined clinically and subjected to the digital true lateral cephalometric X-ray. The individual was positioned within the cephalostat with the sagittal plane of the head vertical, the Frankfort plane horizontal, and the teeth were in centric occlusion. Every lateral cephalometric radiograph was analyzed by AutoCAD program to calculate the linear and angular measurements. Once the picture was imported to the AutoCAD program, it will appear in the master sheet on which the points