

Oral Health Status in Relation to Anthropometric Measurements in a Group of Iraqi Children

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ABSTRACT

Background: Anthropometric measurements are important signs of children's growth and nutrition. Several diseases like dental caries were linked to children's nutrition and weight status.

Aim: To compare the oral health findings (dental caries, dental plaque and gingival health) among children in accordance to gender specific measurements (stature-for-age, weight for age and body mass index for age) and body surface area.

Material and Methods: Cross-sectional study was carried out among randomly selected children aged 6-8 years old in Baghdad. Oral Examination was done by using of the dental caries indices (dmf and DMF), plaque index and gingival index. Weight and height were measured to evaluate gender specific body mass index for age, stature-for-age, and weight-for-age and body surface area in different formulas.

Results: The majority of children had normal weight and normal stature. Higher means of DMFS and DMFT were revealed in normal weight children than overweight with statistical significant differences. The study showed no statistical significant differences between normal stature and tall children in means of caries experience, plaque index and gingival index. Significant negative correlations were seen between body surface areas and dental plaque.

Conclusion: Normal weight children could have higher prevalence of dental caries and children with higher body surface area could have less dental plaque. However, further studies are needed to confirm the relationship between oral health status and anthropometric measurement.

Key words: Weight, Stature, Body surface area, Dental caries

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INTRODUCTION

Prevalence of dental caries in primary and permanent teeth of children in the world was still found to be high [1]. Studies have claimed that dental caries is associated with overweight, due to sugar consumption [2,3]. Other studies reported that dental caries negatively effects children's growth, practically in developing communities [4,5]. Dental pain and infections impact endocrine responses and disturbing the slow sleep wave leading to imbalances in growth hormones and altering the height and weight [6,7]. Regarding the relation between obesity and gingival health, studies reported higher prevalence of periodontal disease in obese and overweight children. Scientific explanations are still needed to justify these results [8,9].

In the anthropometric evaluation of children's nutritional status and growth, the variables weight, height, gender

and age are united to form anthropometric indices. These are currently expressed as percentiles or z-scores units [10]. Body surface area is one of the anthropometric measurement that have been correlated to many physiological processes, such as basal metabolic rate, oxygen consumption and vitamins level [11,12]. No previous study on the association between oral health status and Body surface area in children.

The aim of the study was the assessment of oral health conditions (dental caries, dental plaque and gingival health) in relation to gender specific anthropometric measurements: body mass index for age, stature-for-age, and weight-for-age and body surface area in different formulas. The null hypothesis of the study stated that there is no effect of anthropometric measurements to the oral health status.

METHODOLOGY

This work was a cross-sectional, observational study. Healthy children aged 6-8 years were selected from

randomly selected primary schools in Baghdad city and patients attended College of Dentistry\ University of Baghdad. Informed consent was obtained from parents or guardians. Examination of the dental caries was according to the requirements of decayed, missed, filled (dmf and DMF) indices for primary and permanent teeth respectively (WHO in 1987) [13]. Dental plaque was recorded by plaque index (PII) according to the criteria reported by Silness et al. [14]. For the assessment of gingival health condition, the gingival index (GI) was used according to Löe et al. [15]. Weight and height were measured for each child and the anthropometric measurements were classified according to Centres for Disease Control and Prevention (CDC) Growth Charts (gender specific: BMI-for-age, weight-for-age and stature-for-age). In addition to that, body surface area was calculated according to the commonly available formulas: Du Bois, Mosteller, Haycock, Gehan and George, Boyd, Fujimoto, Takahira and Schlich [16].

Sample size calculation

Sample size was estimated by using a program written by Franz-Faul, Universitatit Kiel (G power 3.1.9.7) with power of study equal to 80% and alpha error of probability equal to 0.05. Analysis Of Variance (ANOVA) was used in a pilot study of 10 subjects to measure the height status and DMFS for them. The means and standard deviation (SD) were (3.3 ± 0.26), (2.8 ± 0.23) and (3.2 ± 0.24) for short, normal and tall groups respectively. The calculated effect size of F was 0.216 (weak effect size). With 3 groups and under all these conditions the sample size was 210 subjects, adding 10% as an error rate thus sample size was 231 so 240 subjects is more than that calculated by G power and enough for this study [17-20].

Data management and analysis

The program SPSS (version 23) with level of significance less than 0.05 ($p < 0.05$) was used in order to analyze the estimated data. Mean, standard deviation (SD) and Independent sample t- test were used to compare

between two independent variables. In addition to that, Pearson correlation was used to assess the relation between oral health findings and body surface area with different formulas.

RESULTS

The total sample size was 240 child, including 161 boys and 79 girls. Table 1 revealed the comparison in oral health findings according to body mass index (BMI) for age. Only 14 children were reported with underweight status, so they were excluded from the comparison. Most of the children were with normal weight. Higher means of DMFS and DMFT were revealed in normal weight children than overweight with statistical significant differences. The mean of missing surfaces of primary teeth was also higher in normal weight children than overweight with statistical significant differences.

Table 2 showed the comparison of dental plaque and gingival health according to weight for age. Only 5 children were reported with underweight status and excluded from comparison. Most of the children were with normal weight. No statistical significant differences were reported between normal weight and overweight in means of gingival index and plaque index.

The study also revealed no statistical significant differences between normal stature and tall children in means of caries experience, plaque index and gingival index as illustrated in Table 3. In this part of the results, only 4 children were reported with short stature and excluded from comparison.

In addition to that, Table 4 showed the correlations between oral health finding and body surface area using different formulas. No statistical significant correlations were observed between body surface area in different formulas and caries experience. Significant negative correlations were seen between body surface areas and dental plaque while no statistical significant correlations were reported between body surface areas and gingival health.

Table 1: Comparison in oral health findings according to BMI for age.

Oral health variables	BMI status	N	Mean	SD	T value/P value
ds	Normal weight	131	14.19	10.567	1.290/0.19
	Overweight	95	12.452	9.147	
ms	Normal weight	131	2.099	3.82	2.162/0.03*
	Overweight	95	1.105	2.746	
fs	Normal weight	131	0.389	2.021	-0.415/0.67
	Overweight	95	0.494	1.681	
dmfs	Normal weight	131	16.725	11.266	1.907/0.058
	Overweight	95	14.052	9.067	
dmft	Normal weight	131	6.534	3.256	1.366/0.17
	Overweight	95	5.947	3.092	

DS	Normal weight	125	2.28	2.835	2.483/0.014*
	Overweight	89	1.404	2.06	
MS	Normal weight	125	0.12	0.996	1.135/0.25
	Overweight	89	0	0	
FS	Normal weight	125	0.112	0.511	-0.005/0.99
	Overweight	89	0.112	0.463	
DMFT	Normal weight	125	1.592	1.616	2.483/0.014*
	Overweight	89	1.067	1.38	
DMFS	Normal weight	125	2.47	2.98	2.574/0.011*
	Overweight	89	1.52	2.175	
Gingival index (GI)	Normal weight	131	1.069	0.51	-0.310/0.75
	Overweight	95	1.09	0.489	
Plaque index (PII)	Normal weight	131	1.421	0.59	1.154/ 0.25
	Overweight	95	1.328	0.619	
*Significant (p<0.05)					

Table 2: Comparison of oral health findings according to weight for age.

Oral health variables	Weight status	N	Mean	SD	T value/P value
Gingival index	Normal weight	176	1.08	0.505	0.070/0.94
	Overweight	59	1.075	0.481	
Plaque index	Normal weight	176	1.404	0.585	1.137/ 0.25
	Overweight	59	1.302	0.626	

Table 3: comparison of oral health findings according to height for age.

Oral health variables	Height status	N	Mean	SD	T value/P value
ds	normal	193	13.347	10.101	0.715/0.47
	tall	43	12.139	9.625	
ms	normal	193	1.709	3.561	0.345/ 0.73
	tall	43	1.511	2.566	
fs	normal	193	0.45	1.743	0.326/0.74
	tall	43	0.348	2.287	
dmfs	normal	193	15.518	10.547	0.811/0.41
	tall	43	14.093	9.829	
dmft	normal	193	6.248	3.1	1.193/0.23
	tall	43	5.604	3.619	
DS	normal	184	2.152	2.677	1.633/0.10
	tall	38	1.394	2.199	
Ms	normal	184	0.081	0.822	0.610/0.54
	tall	38	0	0	
Fs	normal	184	0.087	0.447	-1.4441/0.15

	tall	38	0.21	0.622	
DMFT	normal	184	1.527	1.567	1.813/0.07
	tall	38	1.026	1.46	
DMFS	normal	184	2.29	2.776	1.414/0.15
	tall	38	1.61	2.499	
Gingival index (GI)	normal	193	1.109	0.513	1.544/0.12
	tall	43	0.98	0.406	
Plaque index (PII)	normal	193	1.386	0.59	-0.180/0.85
	tall	43	1.404	0.635	

Table 4: Correlations between oral health finding and body surface area using different formulas.

Body surface area	Values	dmfs	dmft	DMFT	DMFS	GI	PII
Du bois	R	-0.029	-0.05	0.077	0.068	0.125	-0.139*
	P	0.657	0.437	0.246	0.308	0.052	0.031
Mosteller	R	-0.032	-0.047	0.053	0.045	0.113	-0.141*
	P	0.618	0.472	0.427	0.502	0.082	0.029
Haycock	R	-0.034	-0.045	0.043	0.035	0.107	-0.141*
	P	0.602	0.489	0.525	0.603	0.099	0.029
Gehan and George	R	-0.033	-0.046	0.046	0.038	0.109	-0.141*
	P	0.607	0.483	0.49	0.568	0.093	0.029
Boyd	R	-0.035	-0.044	0.034	0.027	0.102	-0.142*
	P	0.588	0.501	0.611	0.689	0.114	0.028
Fujimoto	R	-0.03	-0.049	0.071	0.062	0.122	-0.140*
	P	0.646	0.446	0.29	0.356	0.059	0.03
Takahira	R	-0.029	-0.05	0.077	0.068	0.125	-0.139*
	P	0.657	0.437	0.246	0.308	0.052	0.031
Schlich	R	-0.028	-0.059	0.109	0.096	0.107	-0.139*
	P	0.661	0.363	0.101	0.149	0.099	0.031
*Significant (p<0.05)							

DISCUSSION

In the current study, gingival inflammation was similar for normal weight and overweight children. This result is in agreement with other study [21,22] while previous systematic review revealed significant positive correlations between periodontal disease and obesity in children [9]. The differences between the results could be explained by the methods of gingival health assessment and the age range of children studied. Regarding weight for age, only gingival and plaque indices were compared in this measurement as this parameter is not indicating a chronic condition; just a recent change in weight which is not suitable to be compared with a chronic dental disease as dental caries.

In this work, caries experience was higher in normal weight children than overweight. This result disagrees with other studies which included that overweight and obese children had more caries than normal weight [3,7,23]. However, this relationship is not clearly understood, due to multifactorial nature of dental caries. The common diet also includes foods loaded with fat but low amounts of carbohydrates. This could increase the body weight and not affect dental caries.

To our knowledge, this is the first work to determine correlations between body surface areas in different formulas among children with oral health status. Significant negative correlations were seen between body surface areas and dental plaque in the eight used formulas. In a recent study, a positive correlation was observed between body surface area and vitamin D level

and calcium absorption [24], which (vitamin D) in turn, was inversely associated with dental plaque which could explain the result of our work [25].

CONCLUSION

The study suggests that there is no relationship between obesity and dental caries in children. Normal weight children could have higher prevalence of dental caries. In addition to that, higher body surface area could have less dental plaque. However, further studies are needed to confirm the relationship between anthropometric measurement and oral health status with multiple oral biomarkers.

FUNDING

The study is self-funded.

ETHICAL APPROVAL

The study was approved by the scientific committee in the Department of Pedodontic and Preventive Dentistry, College of Dentistry, University of Baghdad, Iraq.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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