The Effects of Obesity and Mothers' Education Levels on the Periodontal Health Status of Iraqi School-Aged Children

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ABSTRACT

Background: It is evident from the literature that an increased body mass index (BMI) and low socioeconomic status are potential risk factors for periodontal diseases. Most related studies are international and have investigated such associations in adults, and there have been few Iraqi studies targeting school-aged children.

Objective: To investigate the impact of paediatric obesity and mothers' educational levels on the periodontal health status of children.

Method: The study sample was composed of 300 children (152 males, 148 females) aged 6-12 years. The subjects' weight and height were measured, and the body mass index was calculated for each child to obtain a percentile ranking; the percentiles were used to allocate the total sample population into four subgroups (underweight, normal weight, overweight and obese). The children's periodontal health was assessed using the Plaque Index (PLI) and Gingival Index (GI), and the mothers' educational level was assessed by direct parental interview.

Results: Compared with the other categories of children, obese male (84.35) and overweight female (82.92) children had greater values for the PLI, while overweight children of both sexes (89.47 male, 92.11 female) had greater values of the GI. Male and female children with mothers who had the lowest level of education were found to have the highest values of PLI & GI. Non-significant differences were recorded between the male – female matched study groups with regard to the body mass index and mothers' educational levels.

Conclusions: Childhood obesity and socioeconomic disadvantages have negative impacts on children's gingival health in this representative sample.

Keywords: *Obesity, Mothers' Education, Plaque Index, Gingival Index, Body Mass Index, Iraq.*

Introduction

Periodontal diseases are a multifactorial entity in which host, microbial, environmental and socioeconomic factors control disease development and progression. Current approaches in dealing with chronic illness, such as periodontal diseases, are directed towards the identification and management of risk factors and disease modifiers, such as obesity and socioeconomic status, to establish a state of health in the young population[1,2].

In the Middle East, Iraq and other Arabic countries have high prevalence rates of childhood obesity[3-7].

Obesity refers to excess body fat that alters the balance of the affected individual. The most scientifically accurate method of determining the amount of fat mass in a subject is the Body Mass Index (BMI). The link between obesity and periodontal health has been explored extensively through several epidemiological and case-control studies[8,9], and it was found that obesity is a risk factor for periodontitis[10].

Previous studies revealed a link between socioeconomic status, as represented by mothers' educational levels, and children's oral health status [11-13] because the child's oral hygiene patterns are influenced by socioeconomic factors. Low familial socioeconomic status is associated with deficient oral hygiene and

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greater susceptibility to frequent oral diseases; the postulated explanations for that connection are the effects of limited knowledge concerning health and oral hygiene habits and economical restraints, which mean that those families cannot afford dental appointments or oral hygiene products [14].

To the best of our knowledge, only a limited number of Iraqi studies have linked BMI and mothers' educational levels to periodontal health status in Iraqi children. The present study aimed to investigate the association between obesity, mothers' educational level and periodontal health status in a sample of children aged 6-12 years.

Materials and Method

The present observational cross sectional study was conducted with children attending the Paediatrics and Prevention Dentistry Clinics of the Dentistry Department at Al Rafidain University College, Baghdad-Iraq.

The sample population was composed of 300 children (152 males, 148 females) with an age range of (6-12) years and a median age of 9 years. All the children and their parents who were willing to participate in the present study were enrolled after signing an informed consent form.

Through a questionnaire, the following were assessed: child's name, age, address, hospitalization history, medication history, and mothers' educational level. All the enrolled children were healthy and had a non-contributory medical history.

The children's weight and height were measured when they were dressed in light clothing and barefooted. Body weight was measured to the nearest 0.5 kg with a mechanical scale, and height was measured with a portable measuring unit to the nearest 0.5 cm.

The BMI was calculated according to the following formula: body weight/(height)^2 =BMI kg/m^2 [15]. According to the obtained BMI value, the following categories were defined: underweight (BMI < 18.5 kg/m^2), normal weight (BMI from 18.5 to 24.9 kg/m^2), overweight (BMI from 25 to 29.9 kg/m^2) and obese (BMI > 30 kg/ m^2). The BMI number was plotted on the BMI-for-age CDC Growth Charts for either girls or boys to obtain the percentile ranking [16]. For each gender, the children were stratified into four subgroups based on their percentile ranking: the underweight group was defined as below the 5th percentile, the normal weight group as between the 5th and 85th percentiles, the overweight group as between the 85th and 95th percentiles and the obese group as greater than or equal to the 95th percentile. Due to the lack of Iraqi reference values, the values of nutritional indicators were compared with international reference values using the CDC growth charts [17].

The mothers' educational levels (MEs) were categorized into five levels based on a modified Kuppuswamy's scale: 1 for illiterate (neither read nor writes), 2 for completed primary school, 3 for completed secondary school, 4 for who completed higher education, and 5 for education beyond college (Diploma, M.Sc., and Ph.D.)[18].

Periodontal health status was assessed using the plaque index (PI) developed by Sillness and Löe in 1964 [19] and the gingival index (GI) developed by Löe and Sillness in 1963 [20]. Ramfjord's index teeth [21] were examined as representatives of the whole dentition; only fully erupted teeth were scored, and in cases of partially erupted or missing index teeth, that segment was excluded. The periodontal examination was conducted in the dental clinic in a dental chair under artificial light by the researchers using plane dental mirrors and colourcoded WHO probes. The data were tested for normality of distribution with the Shapiro-Wilk test. For the descriptive statistics, the following tests were applied: mean, median, number, percentage and P-value; a value of $p < 0.05$ was considered statistically significant. For the inferential statistics, the following tests were applied: the Mann-Whitney U, Dunn-Bonferroni, and Chi-square tests. All statistical analyses were performed with SPSS version 21.0.

Results

As illustrated in Table (1), greater values for the PLI were recorded for male children in the obese group (84.35) than in the normal weight (82.92), overweight (74.26) and underweight (64.98) groups, with no significant differences among the groups. Among female children, the highest PLI was recorded in the overweight group (82.92) compared with the underweight (68.31) and normal weight (74.97) groups, with no significant differences among the groups.

Table 1: Sample Characteristics Categorized By Gender, PLI, GI and BMI

Gender		Nutrition	N	Mean Rank	Chi-square	Df	P value
Male	PLI	Underweight	46	64.98	5.604	3	.133
		Normal	77	82.92			
		Overweight	19	74.26			
		Obese	10	84.35			
	GI	Underweight	46	70.93	3.110	3	.375
		Normal	77	77.70			
		Overweight	19	89.47			
		Obese	10	68.20			
Female	PLI	Underweight	32	68.31	1.449	2	.484
		Normal	98	74.97			
		Overweight	18	82.92			
	GI	Underweight	32	76.13	4.156	2	.125
		Normal	98	70.73			
		Overweight	18	92.11			

Abbreviations: N: number, DF: degree of freedom, PLI: plaque index and GI: gingival index

Regarding the GI, the highest values were recorded for children of both sexes in the overweight groups (89.47 male, 92.11 female), followed by the normal weight (77.70), underweight (70.93) and obese (68.20) groups for male children, with no significant differences among the groups, and followed by the underweight (76.13) and normal weight (70.73) groups for female children, with no significant differences among the groups.

Table (2) illustrates that there were no statistically significant differences between males and females with regard to the health parameters when the data were stratified according to BMI.

Table 2: Inter-Sex Comparison of Periodontal Health Parameters According to BMI

Nutrition		Gender				Mann-Whitney U test	P value
		M		F			
		N	Mean Rank	N	Mean Rank		
Underweight	PLI	46	39.57	32	39.41	.032	.975
	GI	46	39.25	32	39.86	.125	.901
Normal	PLI	77	93.86	98	83.40	1.380	.167

	GI	77	94.89	98	82.59	1.655	.098
Overweight	PLI	19	19.32	18	18.67	.219	.826
	GI	19	19.16	18	18.83	.098	.922
Obese	PLI	10	5.50	0[a]	.00	---	---
	GI	10	5.50	0[a]	.00	---	---

Abbreviations: M: male and F: female

The descriptive statistics for the periodontal health parameters according to the ME are illustrated in Table (3). Among the groups stratified by ME level, male children with mothers with MEs of 1 were found to have the highest values of PLI and GI values, with a significant difference among the groups. Similarly, among the groups stratified by ME level, female children with mothers with the lowest ME (1) were found to have the highest PLI and GI values, with a highly significant difference among the study groups.

Table 3: Sample Characteristics Categorized By Sex, PLI, GI and Mothers' Educational Level

Sex		ME	N	Mean Rank	Chi-square	P value
M	PLI	1.00	11	114.79	12.747	.013[S]
		2.00	19	73.92		
		3.00	53	72.68		
		4.00	62	81.57		
		5.00	7	46.41		
	GI	1.00	11	113.00	10.930	.027 [S]
		2.00	19	72.26		
		3.00	53	70.15		
		4.00	62	82.81		
		5.00	7	55.65		
F	PLI	1.00	4	128.00	22.960	.000[HS]
		2.00	18	82.19		
		3.00	46	60.09		
		4.00	69	72.62		
		5.00	11	114.55		
	GI	1.00	4	118.36	20.296	.000 [HS]
		2.00	18	81.81		
		3.00	46	64.50		

		4.00	69	69.96		
		5.00	11	104.25		

Abbreviations: ME: mother's education

As shown in Table (4), the male–female comparisons with the Mann-Whitney U test revealed that there were no statistically significant differences in periodontal health parameters between male and female children stratified according to ME, with the following exceptions: a highly significant difference between the PLI scores male and female children in the ME level 1 group, a significant difference in the PLI scores of male and female children in the ME level 3 group and a significant difference in the GI scores of male and female children in the ME level 4 group.

Table 4: Inter-Sex Comparison of Periodontal Heath Parameters According to Mothers' Education Levels

Mother's Education level		**Sex**				**Mann-Whitney U test**	**P value**
		Male		**Female**			
		N	**Mean Rank**	**N**	**Mean Rank**		
1.00	PLI	11	6.36	4	12.50	2.402	.018
	GI	11	6.82	4	11.25	1.800	.104
2.00	PLI	19	18.74	18	19.28	.155	.893
	GI	19	18.24	18	19.81	.463	.663
3.00	PLI	53	55.19	46	44.02	2.047	.041
	GI	53	53.53	46	45.93	1.386	.166
4.00	PLI	62	71.65	69	60.92	1.692	.091
	GI	62	73.60	69	59.17	2.297	.022
5.00	PLI	7	9.43	11	9.55	.047	1.000
	GI	7	7.29	11	10.91	1.453	.179

Discussion

The microbial biofilm undoubtedly plays a role in the pathogenesis of periodontal diseases. Researchers emphasizing the importance of the microbial biofilm among a long list of other secondary aetiologic factors or risk factors that co-determine the initiation, progression and clinical picture of periodontal diseases. These risk factors negatively affect both the tissue and the immune response of the host, increasing his/her susceptibility to the disease process (23). Since childhood is the critical period during which an individual acquires the knowledge and habits that are later reflected in his/ her health behaviour patterns as an adult (2), two of the aforementioned critical determinants of childhood periodontal health, namely, obesity and ME level, were assessed in a total of 300 school-aged children Iraqi.

The results of this study confirm that among children stratified by BMI, both obese and overweight children have the highest values for the PLI and GI, revealing the presence of an association between poor periodontal health status and increased BMI; these results agree with those of accordance with the results of multiple studies [6,22,23].

The negative impact of paediatric obesity on gingival health can be explained first by the metabolic profile related to the biological consequences of an unhealthy diet, including impaired glucose tolerance due to excess sugar and an abnormally high lipid profile, which in turn affects the inflammatory profile, resulting in a deficient immune response, such as hyperactive macrophages, altered microcirculation and the secretion of pro-inflammatory substances, such as TNF-a, IL- 6 and C-reactive protein by the adipose tissue, which act as an endocrine organ (21). Second, a lifestyle with the reduced exercise greatly affects periodontal health (24). Third, periodontal health can be affected by the attitude towards general and oral health, including nutritional awareness, the practice of oral hygiene procedures at home, and understanding the need for periodic dental and medical check-up.

The second variable explored in this study was the ME level as a representative of the sample population's socioeconomic status. Our study revealed that ME level had a major impact on the child's oral health, as the highest values for the PLI and GI were recorded in children of mothers with the lowest ME level, reflecting the pivotal role of the mother as the main caregiver in the family. Mothers are generally responsible for the implementation of oral health behaviours in their children. A mother with a low level of education may not be well informed regarding good oral hygiene practices; hence, it is expected for her offspring to exhibit deficient oral health attitudes due to the limited availability of information.

Conclusion

Childhood obesity and socioeconomic disadvantages had negative impacts on children's gingival health in the representative sample. Both obesity and periodontal diseases can be prevented; prevention first starts in the home and family, so it is of prime importance to carefully supervise and check the oral health, healthcare attitudes and dietary profiles of all children, with special attention paid to overweight/obese children to prevent future systemic and oral health problems.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

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REFERENCES

1. Gundala R, Chava VK. Effect of lifestyle, education and socioeconomic status on periodontal health. *Contemp Clic Dent.* 2010;1(1):23-26.

2. Cascaes AM, Peres KG, Peres MA, et al. Validity of 5-year-old children's oral hygiene pattern referred by mothers. *Rev Saude Publica.* 2011;45(4):668675.

3. Al-Haddad FH, Little BB, Abdul Ghafoor AG. Childhood obesity in United Arab Emirates schoolchildren: a national study. *Ann Hum Biol.* 2005;32(1):72-79.

4. Hammad SS, Berry DC. The Child Obesity Epidemic in Saudi Arabia: A Review of the Literature. *J Transcult Nurs.* 2016;28(5):505-515.

5. Khadri FA, Gopinath VK, Hector MP, Davenport ES. Evaluating the risk factors that link obesity and dental caries in 11–17-year-old school going children in the United Arab Emirates. *Eur J Dent.* 2018;12(2):217-224.

6. Lafta RK, Kadhim MJ. Childhood obesity in Iraq: prevalence and possible risk factors.. *Ann Saudi Med.* 2005;25(5):389-393.

7. Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. *J. Clin. Endocrinol. Metab.* 2008;93(11 Suppl 1):S9-30.

8. Al-Zahrani MS, Bissada NF, Borawskit EA. Obesity and periodontal disease in young, middle-aged, and older adults. *J Periodontol.* 2003;74(5):610-615.

9. Saito T, Shimazaki Y. Metabolic disorders related to obesity and periodontal disease. *Periodontol 2000.* 2007;43:254-266.

10. Nishida N, Tanaka M, Hayashi N, et al. Determination of smoking and obesity as periodontitis risks using the classification and regression tree method. *J Periodontol.* 2005;76(6):923-928.

11. Cochrane SH, Leslie J, O'Hara DJ. Parental education and child health: intracountry evidence. *Health Policy.* 1982;2 (3-4):213-250.

12. Barlow R. Empirical findings on the association between education and child health status: Discussion. *Health Policy.* 1982;2(3):375-378.

13. Paula JS, Ambrosano GM, Mialhe FL. The impact of social determinants on schoolchildren's oral health in Brazil. *Braz Oral Res.* 2015;29:1-9.

14. Ardérius A, Veiga N, Godinho M, Ribeiro C. The influence of parent's educational level in children's oral health behavior. *Public Health Res.* 2015;5(1):28-31.

15. WHO. *The management of nutrition in major emergencies.* Geneva: World health organization; 2000.

16. Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC Growth Charts for the United States: methods and development. *Vital and health statistics Series 11, Data from the National Health Survey.* 2002(246):1-190.

17. Al-Shammary ZM, El-Samarrai SK. CariesExperiences and Dental Treatment Needs among (16-18 Years Old) in High School Girls in AlMussayb City, Babylon Governorate. *J. Baghdad Coll. Dent.* 2015;27(4):147-149.

18. Kumar N, Shekhar C, Kumar P, Kundu AS. Kuppuswamy's socioeconomic status scale-updating for 2007. *Indian J Pediatr.* 2007;74(12):1131-1132.

19. Silness J, Löe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand*. 1964;22(1):121-135.

20. Löe H, Silness J. Periodontal disease in pregnancy I. Prevalence and severity. *Acta Odontol Scand*.1963;21(6):533-551.

21. Ramfjord SP. Indices for prevalence and incidence of periodontal disease. *J Periodontol.* 1959;30(1):51-59.