

Caries experience and salivary physicochemical characteristics among overweight intermediate school females aged 13-15 years in Babylon – Iraq

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ABSTRACT

Background: Obesity is a serious public health concern that has reached epidemic proportions; the prevalence, as well as the severity of obesity in adolescents is increasing at an alarming rate. A close relationship was found between weight status and dental caries. Thus this research aimed to assess the prevalence and severity of dental caries among overweight adolescent females in relation to physicochemical characteristics of stimulated whole saliva in comparison with normal weight adolescent females.

Materials and methods: The total sample involved for nutritional status assessment is composed of 2678 females aged 13-15 years. This was performed using Body Mass Index specific for age and gender according to CDC growth chart (2000). The diagnosis and recording of dental caries was by using Decay, Missing, Filled surface index (DMFs); and according to the criteria of Manji et al (1989). Salivary samples were collected from 30 overweight females and their control under standardized conditions and then analyzed for measuring salivary flow rate and viscosity, in addition to estimation essential elements (zinc, copper, calcium, iron, and total protein).

Results: The caries experience among the overweight females was lower than that among the normal weight with non significant difference. Salivary analysis demonstrated that the salivary flow rate was non significantly higher among overweight females. The viscosity of saliva was having an equal value among both groups. The data analysis of salivary elements found that the zinc and copper concentrations were highly significant higher among the overweight females than that among the normal weight. The opposite result found concerning salivary calcium level with also highly significant difference; while the iron and total protein were non significantly lower among the overweight females. DMFs and its grades correlated negatively weak with salivary flow rate among overweight females; while concerning salivary viscosity, the correlation was direct weak with DMFs. Salivary copper, calcium and total protein showed an inverse correlation with dental caries.

Conclusion: The results of the current research revealed that overweight affect the caries experience. Several of salivary factors that found to be higher among the overweight females might play a role in protection of teeth from dental caries.

Key words: overweight, adolescents, dental caries. (J Bagh Coll Dentistry 2013; 25(3):130-133).

INTRODUCTION

Obesity or overweight is a complex, multifactorial disease that develops from the interaction between genotype and the environment ⁽¹⁾. A form of low-grade, systemic inflammation is linked to many types of chronic disease which associated with obesity ^(2, 3). Dental caries and obesity epidemics are multifactorial complex diseases and the dietary pattern is a common underlying etiologic factor in their causation ⁽⁴⁾. The term dental caries is used to describe the signs and symptoms of a localized chemical dissolution of the tooth surface caused by metabolic events taking place in the biofilm (dental plaque) covering the affected area; and the destruction can affect enamel, dentin and cementum ⁽⁵⁾. Researches which studied the relation between dental caries and overweight found a controversy ⁽⁶⁻⁸⁾. Saliva can be useful method in the evaluation of caries risk as well as in the diagnosis of other diseases ⁽⁹⁾; as, optimum salivary flow rate is responsible for establishing

protective environment against dental caries ⁽¹⁰⁾. Moreover, salivary composition also have essential role in dental caries occurrence ⁽¹¹⁻¹³⁾.

The global steady increase in the prevalence of adolescents overweight leads to inclination to know the prevalence of adolescent overweight in Iraq, in relation to oral health status and physicochemical properties of saliva; these reasons guided to designing this research.

MATERIALS AND METHODS

The sample size composed of 2678 females; they were distributed in secondary schools of Hilla center which randomly selected from different areas and represented 5% of the number of intermediate schools of Hilla center. The whole females aged 13-15 year old attending the selected secondary schools were examined for nutritional status assessment (BMI); then the overweight females and their age matching females from the same class were examined for the oral health status assessment. Then subgroups of 30 females from both overweight and normal weight groups were randomly selected for salivary analysis. The caries experience was recorded according to decay, missing, filled index (DMFs); and by using

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the criteria of Manjie et al. ⁽¹⁴⁾ which allow recording decayed lesion by severity.

The collection of stimulated salivary samples was performed under standard condition following instruction cited by Tenovuo and Lagerlof ⁽¹⁵⁾. The salivary flow rate was measured as milliliter per minute (ml / min); while viscosity was assessed by using Ostwald's viscometer ⁽¹⁶⁾. Target salivary elements were zinc, copper, calcium, iron and total protein which analyzed at The Poisoning Consultation Center / Specialized Surgeries Hospital. Salivary zinc, copper and calcium were analyzed by flame atomic using spectrophotometer flame atomic, using absorption spectrophotometer (Buck scientific, 210VGP, USA) following standardized procedure. The method used to determine the level of salivary iron and total protein by colometric method with using of special kits according to the manufactured instructions. Data analysis was conducted by application of SPSS program (version 18).

RESULTS

The prevalence of overweight in the present study was found to be 4.89% as only 129 females were found to be overweight. Data of present study showed that for the total sample the mean DMFs for the overweight females (9.40 ±5.90) was lower than that of the normal weight female (10.11±5.98), but the difference was not significant. Moreover, the same result was found concerning DMFs components and Ds grades as shown in Tables 1 and 2. Table 3 shows the physicochemical characteristics of saliva among overweight and normal weight females. In this table reveals that salivary flow rate among the overweight females in current study was higher than that among the normal weight with non significant difference. It was also found that the salivary viscosity had equal value among both groups of females. The concentrations of salivary copper and zinc in current study were highly significant higher among overweight females than normal weight ($t=12.00, 6.48, p< 0.01$); and concerning the calcium level, the opposite result found, as it was highly significant higher among normal weight than overweight females ($t= -5.56, p<0.01$). In addition to that, iron and total protein concentrations in saliva in this study were non significantly lower among overweight females. Table 4 reveals the correlations between DMFs and salivary physicochemical characteristics; in this table the flow rate was correlated in a negative direction and non significant, while salivary viscosity and DMFs were positively correlated among the overweight females.

Concerning the correlations of saliva's constituents with DMFs; they were in a positive direction with zinc and iron, but in a negative direction with copper, calcium and total protein.

DISCUSSION

The prevalence and the experience of dental caries among the overweight females in the current study were non- significantly higher than that among the normal weight females; this goes in accordance with previous studies ^(8,17) and in non accordance with other studies ^(18, 19). The low caries prevalence among overweight females in this study could be attributed to type of diet, as that Rolland-Cachera et al. ⁽²⁰⁾ showed that overweight is associated with high dietary fat intake. On other hand, fat in foods was associated with inhibition of both sulcal and buccolingual (smooth-surface) caries ⁽²¹⁾; one can explain that from the result of Bowen's study ⁽²²⁾, which found that presence of fat in experimental diets has been shown to affect their cariogenicity, and its effects have been ascribed to enhanced clearance of sugars from the mouth and also several fatty acids express a potent antibacterial effect. Other cause could be the salivary flow rate; data analysis of the present study showed that the salivary flow rate among the overweight females was higher than that among the normal weight with non significant difference between them.

Moreover, the correlation between the salivary flow rate and dental caries in the present research showed an inverse relation among the overweight females; and this result was also in agreement with previous studies ^(8, 23). This could be attributed to that higher the flow rate, faster the clearance, higher the buffer capacity ^(24, 25). Additionally, another explanation could be that highly significant levels of salivary zinc and copper among the overweight; and the correlation between the salivary zinc and dental caries among the overweight females revealed a significant positive correlation concerning D₁, and a negative non significant relation concerning D₄ which in agreement with Al-Saddi ⁽⁸⁾. This may be explained by study of Lippert ⁽²⁶⁾ which found that zinc enhanced remineralization and exhibited detrimental effects on remineralization in a dose-response manner, also zinc showed extensive remineralization of deeper parts within the lesions at the expense of remineralization near the surface. On other hand, the copper concentration in saliva in present study showed an inverse correlation between salivary copper and dental caries among the overweight females; this may be related to its effect in suppression of biofilm growth ⁽¹¹⁾.

So, one can expect that these high levels of salivary zinc and copper could be one of reasons for low dental caries, as these two elements are

considered important elements in the healthy teeth (27-29).

Table 1. Caries experience (DMFs) and its components among the overweight and normal weight females

DMFs components	Overweight				Normal weight				t- value	Sig.
	No.	mean	± SD	± SE	No.	mean	± SD	± SE		
Ds	129	8.88	5.67	0.5	129	9.46	5.98	0.49	-0.82	0.41
Ms	129	0.35	1.42	0.13	129	0.47	1.71	0.15	-0.6	0.55
Fs	129	0.17	0.64	0.06	129	0.23	1.1	0.1	-0.55	0.58
DMFs	129	9.4	5.9	0.52	129	10.11	5.98	0.53	-0.95	0.34

*d.f= 256

Table 2. Grades of Ds (D₁, D₂, D₃, and D₄) among the overweight and normal weight females

Ds grades	Overweight				Normal weight				t- value	Sig.
	No.	mean	± SD	± SE	No.	mean	± SD	± SE		
D ₁	129	7.36	5.38	0.48	129	7.38	4.99	0.44	-0.02	0.98
D ₂	129	0.91	1.14	0.10	129	1.02	1.36	0.12	-0.75	0.46
D ₃	129	0.29	0.95	0.08	129	0.39	1.12	0.10	-0.72	0.47
D ₄	129	0.32	1.46	0.13	129	0.67	1.72	0.15	-1.76	0.08

*d.f= 256

Table 3. The physicochemical characteristics among overweight and normal weight females

Parameters	Overweight				Normal weight				t- value	Sig.
	No.	mean	± SD	± SE	No.	mean	± SD	± SE		
SFR*	30	0.57	0.26	0.05	30	0.55	0.25	0.05	0.33	0.74
viscosity	30	0.02	0.01	0.00	30	0.02	0.01	0.00	0.41	0.68
Copper	30	4.18	0.51	0.09	30	2.65	0.49	0.09	12.00**	0.00
Zinc	30	5.91	0.81	0.15	30	4.70	0.62	0.11	6.48**	0.00
Calcium	30	1.47	0.97	0.18	30	3.04	1.20	0.22	-5.56**	0.00
Iron	30	32.05	7.89	1.44	30	34.40	9.69	1.77	-1.03	0.31
Total protein	30	0.40	0.09	0.02	30	0.43	0.06	0.01	-1.47	0.15

*Salivary flow rate, **Highly significant, # d.f= 58

Table 4. Correlation coefficient between the salivary physicochemical characteristics and caries experience (Ds and DMFs)

Parameters	Ds				DMFs			
	overweight		Normal weight		overweight		Normal weight	
	r	p	r	p	r	p	r	p
SFR*	-0.35	0.06	-0.05	0.79	-0.33	0.07	-0.06	0.76
viscosity	-0.03	0.86	-0.31	0.09	0.07	0.71	-0.28	0.13
Copper	-0.24	0.20	0.08	0.66	-0.23	0.23	0.15	0.43
Zinc	0.36	0.05	-0.07	0.70	0.43**	0.02	-0.17	0.37
Calcium	-0.09	0.63	0.44**	0.02	-0.06	0.76	0.44**	0.02
Iron	0.10	0.61	-0.14	0.47	0.08	0.69	-0.18	0.34
Total protein	-0.07	0.73	0.25	0.18	-0.02	0.93	0.23	0.23

*Salivary flow rate, ** Significant (p<0.05).

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