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Selected Salivary Antioxidants and Caries Experience among a Group of Obese Females Aged 20-22 years

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Abstract: ***Background: Obesityand dental caries are diseases of multifactorial etiology. Their development is affected by nutritional factors. The aim of this study was the assessment of selected salivary antioxidants and dental caries among a group of obese females aged 20-22 years in comparison with normal weight females. Materials and methods: The total sample composed of 80 females with an age range 20-22 years old. Body weight was assessed using the Body Mass Index (BMI). Collection of unstimulated salivary samples was carried out under standardized conditions. Salivary flow rate was measured then salivary samples were analyzed to determine the concentration of salivary antioxidants (total protein and uric acid). The diagnosis and recording of dental carieswas carried out through the application of DMFS according to criteria of Manji et al (1989). Data analysis was conducted by application of SPSS program (SPSS version 18). Results: Salivary analysis demonstrated that the level of salivary total protein was lower among obese females compared to the normal weight females with statistically highly significant difference (p<0.01), while salivary uric acid was statistically highly significantly higher among the obese than the normal weight females (p<0.01). Salivary flow rate was statistically highly significantly higher among the obese than the normal weight females (p<0.01). The data analysis of the present study found that the caries experience (DMFS) was lower among the obese compared to the normal weight females with statistically highly significant difference (p<0.01). Conclusion: The results of this research revealed that salivary antioxidant (uric acid) and salivary flow rate were higher among obese females than normal weight females which may play a role in protection oral tissue from oral diseases.***

Keywords: Obesity, dental caries, salivary antioxidants, salivary flow rate.

1. Introduction

Obesity is a chronic disease characterized by excess body fat, due to positive shift of the energy resulting from an increase in energy input, decrease in energy output [(1)]. It is considered as a major public health problem and associated with an increased risk of morbidity and mortality [(2)]. The incidence of obesity has increased making obesity a worldwide epidemic [(3)]. Furthermore, obesity is a multifactorial disorder; it is the result of a joint effect of genetic and environmental factors [(4)] and it is a risk factor for several chronic disease, most notably hypertension, type 2diabetes, dyslipidemia and coronary heart disease [(5)].

It is a well-known fact that reactive oxygen species cause membrane destruction by oxidation of polyunsaturated fatty acids contained in the phospholipids portion of the cell membrane through a process known as lipid peroxidation [(6)].

The imbalance between the production of free radicals and the ability of the body to neutralize their harmful effects through antioxidants generation is termed oxidative stress [(7)].

Increased oxidative stress and low-grade silent inflammation in accumulated fatty tissues due to high levels of reactive oxygen species in the body as a result of the unavailability of antioxidants is the underlying cause of obesity associated metabolic syndromes [(8)]. In addition to that, oxidative stress implicated in the pathogenesis of oral diseases [(9)].

Several aspects of oral health are related to obesity including dental caries. Dental caries is a major public health problem and one of the most common infectious and communicable diseases which affect all age groups [(10)]. Obesity and dental caries are both multifactorial diseases and are associated with poor dietary habits [(11)],there is a controversy in relation between obesity and dental caries. Several studies found that obese subjects are more likely to have dental caries than the normal weight ones [(12, 13)].

While other studies found that there is an inverse relation between dental caries and body weight [(14, 15)].

Saliva is a biological fluid in oral cavity composed of mixture of secretary product from major and minor salivary glands which essential for oral health through various mechanisms such as salivary flow rate, buffer capacity and defense function through antibacterial factor and salivary antioxidant system [(16)]. The specific role of antioxidant is to neutralize rampaging free radical and thus reducing its capacity to damage [(17)]. It was found that the susceptibility to dental caries can be reduced by the effect of salivary antioxidant [(18)]. As far as it is known, there was no previous Iraqi study concerning the relation of salivary antioxidants (uric acid and total protein) with dental caries among obese adult females, therefore, this study was carried out.

2. Materials and Methods

The total sample for this study consisted of eighty females aged 20-22 years at College of Islamic Sciences/Baghdad University. They were divided into two groups: the study group which included forty obese females and the control group which included forty normal weight females. A

number of females were excluded from the study due to pregnancy, mensuration and presence of any systemic disease which may affect oral health condition [19]. Anthropometric measurements included measurement of weight and height according to Trowbidge [20] using electronic scale and height measuring tape. Body Mass Index (BMI) is a number calculated from person's weight and height, according to this formula:

BMI (Kg/m^2)=Body weight (Kg)/ (height)^2 (m) [21].
Females were chosen for BMI measurements according to World Health Organization [22] which identify the obesity at BMI≥30 kg/m^2 while the normal weight at BMI between 18.5-24.9 Kg/m^2.

The collection of unstimulated salivary sample was performed under standardized condition following the instructions cited by Navazesh and Kumar [23].Salivary flow rate was expressed as milliter per minute (ml/min). Then salivary samples were taken to the laboratory for biochemical analysis at the Poisoning Consultation Center/Gazi Al-Hariry hospital. Salivary antioxidants (salivary total protein and uric acid) were determined calorimetrically by using the spectrophotometer (Cecil CE 1011, UK). Salivary total protein level was measured using a ready kit (Spinreact, Spain) while salivary uric acid level was measured using a ready kit (Biosystems, Spain) according to the manufactured instructions. The diagnosis and recording of dental caries was according to Manji et al [24]. Data analysis was conducted by application of SPSS program (SPSS version 18). Independent sample T-test (Student T-test and Welch T-test) was applied.

3. Results

Result of the current study revealed that the mean value of salivary total protein was statistically highly significantly lower among the obese than that of the normal weight females (P<0.01), while the mean value ofuricacid was statistically highly significantly higher among the obese than that of the normal weight females (P<0.01) as shown in Table 1. The mean value of salivary flow rate was higher among the obese than that of the normal weight females with statistically highly significant difference (P<0.01) as shown in Table 2.

Data of present study showed that the caries experience represented by DS, MS components and DMFS for the obese was lower than that of the normal weight females with statistically highly significant difference for DS and DMFS (p<0.01). On the other hand, FS mean value was higher among the obese in comparison with normal weight females with statistically not significant difference (P>0.05) as shown in Table 3. The mean values of D_1, D_2, D_3, D_4 gradesamong the obese were lower than those among the normal weight females with statistically highly significant difference for D_2 grade (P<0.01) and significant difference for D_1 and D_3 grades (P<0.05) as shown in Table 4.

Table 1: The concentration of salivary antioxidants among the obese and normal weight females

Variables	*Obese*		*Normal weight*		*Statistical test*		
	Mean	±SD	Mean	±SD	t-test	P-value	df
Total protein (mg/dl)	503.14	37.54	556.19	32.14	-6.79**	0.001	78
Uric acid (mg/dl)	4.26	0.90	3.66	0.67	3.34**	0.000	78

**= Highly significant at P<0.01

Table 2: The salivary flow rate among the obese and normal weight females

Variables	Obese		Normal weight		Statistical test		
	Mean	±SD	Mean	±SD	t-test	P-value	df
SFR (ml/min)	0.38	0.04	0.34	0.05	4.35**	0.000	78

**= Highly significant at P<0.01

Table 3: Caries experience (DMFS) and its components among the obese and normal weight females

variables	Obese		Normal weight		statistical test		
	Mean	±SD	Mean	±SD	t-test	P-value	df
DS	5.08	1.85	7.88	3.09	-4.92**	0.000	63.68
MS	0.88	1.92	1.50	2.32	-1.31#	0.194	75.41
FS	2.05	1.75	1.40	1.60	1.73#	0.087	78
DMFS	8.03	3.03	10.80	3.93	-3.53**	0.001	78

**** = Highly significant at P<0.01 # = Not significant at P>0.05**

Table 4: Grades of DS (D_1, D_2, D_3 and D_4) among the obese and normal weight females

Variables	Obese		Normal weight		Statistical test		
	Mean	± ±SD	Mean	±SD	t-test	P-value	df
D_1	3.95	1.06	4.60	1.63	-2.11*	0.038	67.02
D_2	0.55	0.75	1.35	1.21	-3.55**	0.001	65.08
D_3	0.20	0.56	0.78	1.39	-2.43*	0.019	51.56
D_4	0.38	1.33	1.15	2.35	-1.81#	0.074	61.79

***= Significant at P< 0.05**
****= Highly significant at P<0.01**
#= Not significant at P>0.05

4. Discussion

In the current study, data analysis showed that the concentration of salivary total protein was lower among the obese group than that among the normal weight group. The same result was also reported by other study [25] among overweight females but contradict with other studies among obese children and adults [26, 27]. This could be attributed to the fact that the elevated free radical generation with obesity resulting in higher lipid peroxidation so salivary antioxidants would be exhausted in reaction with the elevated free radicals [28]. The present study found that the level of uric acid was higher among the obese than that among the normal weight females. The same result was also reported by other studies [29, 30]. On the other hand, this result was inconsistent with the result of other study [27]. An elevated level of salivary uric acid among the obese female might be related to the fact that the body raises the level of its antioxidant systems to combat the oxidative damage [31], since uric acid is a powerful and dominant antioxidant in the body [32]. Another explanation for the elevated uric acid concentration in saliva among obese females is that the elevated uric acid is closely associated with fat accumulation [33]. Obese adipose

tissue is characterized by active fatty acids synthesis. It is presumed that fatty acids synthesis is closely associated with purine synthesis and uric acid is the final product of purine metabolism, thus, accelerating uric acid production [34]. Salivary flow rate was higher among the obese group compared with the normal weight group with statistically highly significant difference between them. The same result was also reported by other studies [27, 35]. But contradict with findings of other studies [15, 29]. The obese subjects may have a larger salivary gland and this could be the reason for the increase in the salivary flow rate [36].

In the current study, dental caries experience for the study group was lower than that for the control group with statistically highly significant difference between them. This result was also reported by other studies among children and adolescents [14, 15] but contradict with the finding of other studies among adolescents and adults [37, 38]. The decreased dental caries experience among obese females could be attributed to many findings that illustrated by the data of the present study, these include:

1) Higher antioxidant protection as indicated by statistically highly significantly higher level of salivary uric acid among obese females. It was reported that antioxidants might adversely affect the oxidative carbohydrate metabolism within dental plaque [39], since oral streptococci can adapt their sugar metabolism to act under both aerobic and anaerobic conditions, therefore, when antioxidants inhibit aerobic carbohydrate metabolism this will impact on oxidation-reduction balance within the cell thereby affecting bacteria metabolism and energy generation leading to cell death and consequently reducing dental caries [40].
2) Highly significantly decreased amount of salivary total protein among obese females. This could be attributed to the function of certain protein, as total salivary protein include several types of protein with different mechanisms and functions, these functions may depend on the molecule's location or site of their action. Certain proteins such as agglutinins and adhesins play a detrimental role by increasing the colonization of microorganisms [41]. Moreover, when total protein level of saliva reduced, this leads to reduced saliva viscosity and elevated saliva quantities which in turn lead to increased salivary cleansing action of saliva [42] resulting in a decrease in dental caries.
3) Increased salivary flow rate among obese females in comparison with those in the control group. Salivary flow rate plays an important role in dental caries susceptibility through its cleansing activity that is very important in the clearance of food debris and bacteria [43].
4) Type of diet: The obese subjects were reported to consume more fast foods which contain unacceptable high levels of fats [44], which have an anticariogenic effect. Fats were found to reduce dental caries through a variety of mechanisms [45].
5) Tack care of the external appearance: From this study observation, most of obese females were looking in a well dressing and good general cleanliness. This could be due to that obese are often stigmatized by their peers, which can increase the likelihood of poor self-esteem, depression and risk of social discrimination [46], Consequently, obese females may be more interested about their general looking, as part of which the oral cavity [15]. This fact is supported by the finding of the present study in which higher FS and lower MS components were reported among obese females.

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