Iranian J Publ Health, Vol. 38, No.3, 2009, pp.54-59 **Original Article**

Evaluation of Salivary Albumin in Diabetic Patients

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Abstract

Background: The clinical symptoms of diabetes mellitus in oral cavity are xerostomia, pathological changes in periodontal tissues and caries. It has been suggested that the determination of salvia`s components in diabetic patients may be useful in describing and further understanding the oral findings in this condition. The aim of this study was to detect differences between the salivary albumin in diabetic patients and healthy people.

Methods: A case-control study was carried out using data from Hamadan researches diabetes center in 2008. We selected 40 patients with type 1 diabetes mellitus aged 9-61 years, 40 patients with type2 aged 39-82 years and 40 healthy controls aged 20-67 years. Dental and oral status was assessed for all subjects. Completely unstimulated saliva samples were collected from diabetic patients and control subjects. Nephelometric method was used to determine salivary albumin concentration. Statistical analysis was done by SPSS.

Results: No significant difference in salivary albumin concentration was found between the control group and type1 diabetic patients but salivary albumin was significantly higher in type2 diabetic patients in compare with control groups (P= 0.017), also no significant difference was found between type1 and type2 diabetic patients. In diabetic patients, complain of dry mouth and burning feeling in mouth was significantly higher, as well as, dental examinations showed higher DMFT mean values than the controls.

Conclusion: Adults with type2 diabetes mellitus have higher concentration of salivary albumin that would play a helpful diagnostic role in oral findings of diabetic patients.

Keywords: *Albumin, Diabetes mellitus, Saliva*

Introduction

Diabetes mellitus is a syndrome characterized by abnormalities in carbohydrate, lipid and protein metabolism that results either from a profound or an absolute deficiency of insulin (type1) or from target tissue resistance to its cellular metabolic effects (type 2) (1, 2). Oral complications associated with diabetes that may be encountered by dental practitioners include xerostomia, tooth loss, gingivitis, periodontitis, odontogenic abscesses and soft tissue lesions of tongue and oral mucosa (1, 2). An estimated 135 million people worldwide had been diagnosed as diabetes in 1995, and this number is expected to rise to at least 300 million by the year 2025, on the other hand, it has been estimated that more than 70% of diabetic patients are living in developing countries (3). It has been reported that 2% of the Iranian population have diabetes and the prevalence of diagnosed diabetes for those over the age of 30 yr has been estimated to be 7.3% (3, 4). A number of investigations have been conducted on salivary output and its composition in both type 1 and type 2 diabetes mellitus.

Although differences in the output and composition of saliva from diabetic and nondiabetic subjects have been observed in a number of studies, many of these findings are contradictory (5). Albumin is the most osmotically active plasma protein. Another major function of albumin is as a general binding and transport protein (6). Factors that regulate albumin synthesis are nutrition, hormonal balance and osmotic pressure. In oral cavity, albumin is regarded as a serum ultrafiltrate to the mouth and it may diffuse into the mucosal secretions (7). Salivary albumin is increased in

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medically compromised patients whose general condition gets worse. Immunosuppression, radiotherapy and diabetes are examples of conditions in which high concentrations of salivary albumin have been detected (7). It may be hypothesized that salivary albumin can be used to assess the integrity of mucosal function in the mouth. In patients with periodontitis, either increased or normal salivary albumin levels have been reported (7). The aim of this study was to detect differences between salivary albumin in diabetic patients in comparison with healthy people that may be useful in describing and further understanding of oral findings in this condition.

Materials and Methods

The diabetic members of Hamadan Researches Diabetes Center have participated in the present study during the year of 2008. Participants were explained and asked to complete an informed consent form. They had comprehensive files included type of diabetes, the time of onset, therapeutic procedures, duration of treatment etc. We selected 40 subjects with type1 diabetes mellitus, 40 subjects with type 2 and totally 40 healthy controls. Because of the age and weight differences between type 1 and 2 diabetes, from the 40 healthy control subjects, 20 (10 males, 10 females) were selected as matched control 1 and 20 subjects (10 males, 10 females) were selected as matched control 2. Therefore, the patients with type 1 and 2 diabetes were matched with their control subjects according to the age, sex and weight.

Since this study was a part of a comprehensive study of oral health, data on many other aspects of oral health were also collected. These include an assessment of dental and gingival status and complain of dry feeling and burning sensation in the mouth. Dental examination included the decayed, 32 missing and filled teeth (DMFT) based on clinical observation using a dental mirror and explorer (8). Periodontal examination included 1) Gingival index: each randomly selected site was given a score from 0 to 3 according to Loe and Silness and 2) Attachment loss (the distance between cementoenamel junction and bottom of the pocket) (9).

The diabetic patients were those subjects who reported no health problems except diabetes and were not taking medications except those controlled diabetes. Also the years since diagnosis (duration of disease) were between 5-10 yr, hence there were not any complications of diabetes among the selected patients. The control (non-diabetic) groups were those subjects who referred to the diabetes center for their blood sugar evaluation and other screening tests. In addition, they reported no health problems and did not take any medications other than vitamins or occasional analgesics. All studied subjects were refrained from eating, drinking smoking and performing any oral hygienic procedures after midnight prior to the collection.

Unstimulated whole saliva was collected from each subject between 8-10 a.m. At first, the patients were asked to swallow saliva, then stay motionless and allow the saliva to drain passively for 5 min over the lower lip in to pre weighed test tube fitted with a funnel (10). Saliva samples were then centrifuged and the supernatants were immediately deep-frozen (-70 ºC) and stored for later analysis. Albumin was assessed by the nephelometric method (MIN-INEPH TM HUMAN microalbumin kit, Binding site Ltd, Birmingham, UK) (11).

The data were analyzed via SPSS for windows (version 13). The statistical signification was measured using chi-squared test for qualitative variables and *t*-test for quantitative variables considering any *P* value, which was less than 0.05 as significant.

Results

The demographic data in patients with diabetes and control subjects and results of oral symptoms based on interview are given in (Table1). However, there were no significant differences in periodontal status between diabetic, non-diabetic subjects, in most cases, the diabetic patients had worse dental and oral health status, and higher DMFT mean values than the control subject (Table2). The salivary albumin values for each group are shown in Table 3. No significant differences were seen in salivary albumin between type1 diabetic patients and control group. Salivary albumin was significantly higher in type 2 diabetic patients compare with control group (P= 0.017). However, salivary albumin was higher in Type 2 diabetic patients compare with Type 1 but statistically no significant differences was observed between two groups.

Table1: Characteristics and interview data of patients with diabetes mellitus and control subjects Characteristics

Characteristics	**Type1 diabetes (n=40)**	**Control 1 subjects (n=20)**	**Type2 diabetes (n=40)**	**Control 2 subject (n=20)**
Age (y) mean, (SD range)	[a]28.8±11.63,(9-61)	[a]27.65±5.65,(20-38)	[b]54.02±10.10,(39-82)	[b]54.3±7.11,(40-67)
Sex (male/female)	[c](19.21)	c(10.10)	d(20.20)	d(10.10)
Weight (Kg) mean, (SD range)	62.92±9.92,(28-6)	62.55±13.59,(47-80)	61.35±11.43,(50-86)	71.9±10.31,(54-90)
Sensation of dry mouth n (%)	20(50%)	0	28(70%)	0
Burning tongue n (%)	3(7.5%)	0	13(32.5%)	0

a,b,c,d,e,f : Values with the same superscript letters were not significantly different (P> 0/05).

Table 2: DMFT mean values in diabetic patients and control subjects

Groups	**DMFT**	**Max**	**Min**
Patients with Type1 diabetes	10.16 ± 4.52	22	2
Patients with Type2 diabetes	13.42 ± 5.09	24	5
Control 1 Subjects	8.26 ± 3.85	15	1
Control 2 subject	10.55 ± 2.59	16	5

Table 3: Salivary albumin values in diabetic patients & Control subjects

Groups	**no**	**Salivary albumin concentration Mean ± SD**	***P***
Type1 diabetes	40	64.42 ± 32.60	0.99
Control 1 subject	20	64.50 ± 38.40	Non-significant
Type2 diabetes	40	73.47 ± 31.35	0.017
Control 2 subjects	20	53.40 ± 25.97	Significant
Type1 diabetes	40	64.42 ± 32.60	0. 21
Type2 diabetes	40	73.47 ± 31.35	Non-significant

Discussion

Several authors have shown biochemical changes in saliva of diabetic patients. The results of many cases differ from one study to another. These may be due to the diversity in selection criteria of the samples and the type of design of each study (12).

We used unstimulated saliva as a test sample that was more difficult than the stimulated saliva to collect enough for various laboratory analysis.

Our observations suggested that there was significant within- subjective variation in salivary albumin levels. Control of salivary secretion is by the autonomic nervous system. It is possible that neuropathies affecting the sympathetic or parasympathetic nervous system could have differential effects on the flow or composition of saliva (13). Albumin is often used as a marker for the degree of mucositis or inflammation in the oral cavity (14). According to the results of this study, no significant difference in salivary albumin was found between type1 diabetic patients and control group, which matches the results of Belazi et al. (15) and Fisher et al. (16). These results are in contrast with Tenovuo's (17) and Harrison's (18). This contradiction can be explained by the fact that the studies included type 1 diabetic patients conducted in different stages of disease and different metabolic control status. The salivary albumin of type 2 diabetic patients was significantly higher in comparison with control group. These results are in agreement with reports of Ben-Arch (19) and Dodd's et al. (13). Typically, albumin; as a serum protein; is substantially increased, like lactoferrine, with acute inflammation of the salivary glands. This suggests that low-grade infection of the salivary glands causing increased leakage of serum proteins into the saliva that is common finding in diabetic patients (13). Although, Meurman et al. (20), Carda et al. (21) and Collin et al. (22) reported that no difference in salivary albumin was found between type 2 diabetic patients and control group. This conflict could be explained by the different type of saliva, stages of the disease and metabolic control status of patients.

In the present study, no difference in salivary albumin was found between type 1 and type 2 diabetic patients. This result may be explained by the difference in metabolic status, mean of age, medication used stages of disease and different etiology and pathogenesis of diabetes. Although comparison of salivary albumin between type1 and type 2 diabetic patients has been less examined by investigators, Ben- Aryeh et al. (19) found a significant positive correlation between the gingival index and the salivary albumin in type1 and type 2 diabetic patients. However, not all studies have reported such an association and there are conflicting data between different studies (9, 23).

In diabetic patients, complain of dry mouth and burning tongue was significantly higher. This confirms the results of previous investigators (12, 24). Diabetic individuals are susceptible to dehydration which has been demonstrated to cause decreased salivary flow rates; this might explain the excess complain of dry mouth (25). Focal sensory neuropathies and microvascular changes may play a role in advanced diabetic individual's inability to detect xerostomia. Oral mucosal and barore ceptor changes could also contribute to a decreased perception of xerostomia in older diabetic patients (25).

DMFT mean value of all diabetic patients was higher than that of control groups. Collin et al. (22) reported that patients with diabetes had fewer remaining teeth; also with the same results of other studies (19, 26, 27). Chavez et al. (25) concluded that restriction of ingestion of refined carbohydrates reduced root caries in patients with diabetes. The higher DMFT scores in diabetic patients may be due to the level of blood sugar control, oral microbial and salivary disturbances, diet, age, oral hygiene and type of diabetes.

In conclusion, the present study showed that the salivary albumin might play a significant role in describing of oral findings of diabetic patients.

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The authors declare that there is no conflict of interests.

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