Comparison of the Unstimulated whole Saliva Flow Rate in Diabetic Type II Patients with Healthy Individuals

Hakimeh Ahadian[1], Mohammad Hassan Akhavan Karbassi[1], Mohammad Afkhami-Ardekani[2], Zahra Haydaripoor[3], Maryam Jalili Sadrabad[4*], Khatereh Kheirollahi[4], Amin Davodi[5]

1- Assistant Professor, Department of Oral Medicine, School of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
2- Professor, Department of Endocrinology, School of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
3- Dentist, Yazd, Iran.
4- Postgraguate Student, Department of Oral Medicine, School of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
5- Undergraguate Student, School of Dentistry, Esfehan University of Medical Sciences, Esfehan, Iran.

*Correspondence:
Maryam Jalili, Postgraguate Student, Department of Oral Medicine, School of Dentistry, Shahid Sadoughi University of Medical sciences, Yazd, Iran.
Email: dr .njalili @ gmail.com
Tel: (98) 919 408 7407

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Abstract

Objective: Diabetes Mellitus is one of the most common metabolic disorders which have several oral complications such as hypofunction of salivary glands. The aim of present study was to compare the unstimulated whole saliva (UWS) flow rate in diabetic type II patients and healthy peoples who admitted in Yazd Diabetic center.

Materials and Methods: In this analytic-observational study, 78 patients with diabetic type II and 74 healthy people were selected. At first the xerostomia was checked and then the UWS flow rate was measured by spitting method. Data were analyzed by ANOVA, Chi-square and Multiple way variance tests using SPSS software version 11.

Results: the participants were between 30-69 years old including 103 female (diabetic (53), healthy (50)) and 49 male (diabetic (25), healthy (24)) were selected. The mean of UWS flow rate in diabetic patients was (0.07±0.03 ml/min) which was statistically less than healthy people (0.13±0.036 ml/min) (P< 0.002).The mean of UWS flow rate in relation to age was significantly different and adverse relationship between UWS flow rate and FBS was found in diabetic type 2 patients (P<0.000, r=-0.389). Also diabetic patients complain about xerstomia more than healthy people significantly (83% versus 28.4%, P< 0.001).

Conclusion: The complaint of xerstomia and decrease of UWS flow rate was more common in diabetic patients than healthy people; also good FBS control can prevent xerostomia.

Keywords: Xerostomia, Unstimulated whole saliva, Diabetes mellitus Type 2.

Introduction

Diabetes mellitus is a common metabolic disorder which it's micro and macro vascular changes cause different complications like: xerostomia, bacterial, viral and fungal infections, poor healing of lesions, increase risk of caries, periodontal disease and etc (1).

Polyuria, medication, vascular changes and autonomic neuropathy can cause decrease of saliva secretion in diabetics (2-3). Dysphagia,

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dysfunction in chewing and conversation, cervical caries, candidiasis and denture intolerance are complication of low saliva secretion which can affect patient's quality of life. Various studies have reported low saliva secretion in 40 to 62% of diabetic type 2 patients (4-8).

Khovidhunkit SO et al. investigate the prevalence of xerostomia and hyposalivation in patients with type 2 diabetes mellitus. Their results represented that xerostomia and hyposalivation were more prevalent in diabetic patients and associated with higher numbers of oral pathogens in the saliva (5).

In another study, Chávez EM et al. conducted a study about the effect of salivary flow in older type 2 diabetes adults and comparing flow rates in patients suffering from xerostomia. They concluded that older adults with poor control of diabetes may have impaired salivary flow in comparison with patients with better controlled diabetes (9).

In contrast with mentioned studies, Sousa MG et al. surveyed prevalence of oral soft tissue changes in type 2 diabetes mellitus patients and they claimed that changes are not related to diabetes (6).

Considering the prevalence of diabetic around world, especially in Yazd province (10), the aim of this study was to compare unstimulated whole saliva flow rate and xerstomia in healthy individuals and patients with diabetic type2.

Materials and Method

In this analytical-observation study, 152 people were included and divided in two groups of diabetics (78 paitents-53 women and 25 men) and healthy people (74 individuals-50 women and 24 men) based on convenient sampling. The groups were almost in equal situation (two groups were matched according to sex and age). Diabetic patients had diabetes type 2 at least in the previous 6 months without any other systemic diseases. The exclusion criteria were: having any systematic disorders (except type 2 diabetes), smoking, allergy, radiation therapy and any medication in the last 6 months (except hypoglycemic medication).

Basic information like: age, gender, the result of previous fasting glucose and duration of diabetes and xerostomia compliant.

Then the volumes of unstimulated whole salivary (UWS) (ml/min) were collected based on published procedure (10) and spiting method in 5 minutes. The saliva sampling was collected during 7:30-9 AM in the sterilized scaled tubes.

Finally the groups were compared based on age, gender and the mean UWS based on fasting glucose level by using SPSS software version 11 and statistical analysis of t-Test, Multiple way variance tests and Chi-square.

The t- test was done to compare the mean UWS based on diabetic or healthy groups and gender, Chi-square test was used for analyzing the distribution of xerostomia complaints between groups and analysis of variance was objected for comparing the mean UWS based on age.

The study was approved by the local ethics committee and conducted in accordance with the rules of Shahid Sadoughi Yazd University of Medical Sciences. An informed consent was signed by patients, and the study has been ethically approved by Shahid Sadoughi Yazd dental.

Results

The result of study showed significant differences in the mean UWS between groups (P<0.001). The mean UWS were 0.0709ml/min in diabetic group and 0.13ml/min in healthy group.

The mean UWS based on gender did not show any significant differences (P>0.05) in contrast with UWS based on age (P<0.001) (table1). Also the mean UWS based on fasting glucose revealed significant difference between two groups (P<0.001) (table2).

About 83% of diabetics (57 patients) and 28.4% of healthy people (21 individuals) complained about xerostomia which is significant difference statistically (P<0.002).

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Table1. The unstimulated whole saliva (ml/min) mean based on fasting blood sugar (FBS)

FBS level	Number	Mean ±SD*
200FBS≤	25	0.09 ±0.034
200>FBS	53	0.06±0.032

(*P*-value <0.001 via chi-square)
*: standard deviation

Table2. The unstimulated whole saliva (ml/min) mean based on age distributions

Age	Healthy people		Diabetic patients	
	Number	Mean ±SD*	Number	Mean ±SD*
30-44	24	0.15±0.03	19	0.08±0.03
45-54	25	0.14±0.03	29	0.07±0.03
55-69	25	0.12±0.03	30	0.06±0.04

(*P*-value<0.001 via T–test)
*: Standard Deviation

Based on Pearson correlation coefficient, the value of UWS had inverse correlation with fast blood glucose (FBS) (P<0.001; r=-0.386)

Discussion

Salivary function is critical for the maintenance of oral and systemic health. It is important for digestion, mastication, taste, speech and protection of oral hard and soft tissue (11). In diabetic patients these functions may be lost, because of the probable decreased saliva secretion.

The sample size of current study was similar to many other ones (1,9,12-17) and lower than some other studies (18-20).

The age and gender distribution of our study was not different like previous studies(17,21) and with omitting interventional factors, making parallel situation was possible for both group which is a superiority for present study(14-15,18-19,21,22).

The saliva samples collected based on spitting method which is a convenient, reliable and repeatable method for quantitative evaluation of saliva secretion (15,17,19,21-27).

The mean of UWS in diabetic patients (0.07ml/min) were significantly lower than healthy individuals(0.13ml/min) which is according with results of some studies (4,5,9,15,16,19,20,22,27,28).

Sreebny LM et al. concluded that the salivary flow rates of diabetic patients was consistently lower than non diabetic persons .The mean resting and whole saliva flow rate was under normal level in 43% of diabetic subjects who complain from xerostomia (29).

In Lin CC et al. study a remarkable decrease in secretion and absorption of TC99 of salivary glands in diabetic patients who suffered from xerostomia was observed in comparison with NIDDM group without xerostomia. This result is a confirmation of xerostomia involvement in diabetic patients (13).

In Tenovu et al. study stimulated saliva from parotid gland was observed but in present study UWS was evaluated which is more efficient and repeatable method (17). So, differences between types of measured saliva (stimulated saliva of parotid versus UWS) result are inconsistent.

Despite previous studies (7,9) the correlation between xerostomia and age was evaluated in present study and significant differences was found between age groups in UWS volume (table 2). Also, increased salivary gland damages secondary to diabetes complications such as vascular changes and autonomic neuropathy is very important. Significant decrease in UWS due to increase of age might be related to changes which are happened in aged salivary glands.

In the present study like Borrel LN's study no significant differences were found based on gender.

Chavez EM et al. in 2001 & 2000 (9,13) observed significant decrease of UWS in diabetic patients with FBS>200mg/dl in comparison with diabetic patients with FBS<200mg/dl. This fact is due to more metabolically changes of salivary glands, autonomic neuropathy and dehydrations of

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diabetic patients with poor blood sugar control. Present study confirmed it too (30).
Blood sugar control can improved microangiopathy but not macroangiopathy .low levels of UWS in individual with FBS>200mg/dl indicate persistent diabetes complication effects on salivary glands with increased salivary gland dysfunctions due to aging (table 2).
Also Moor PA (19), Sreebny LM and colleagues in 2001 (21) stated existence of correlations between xerostomia and controlling blood sugar.
Xerostomia complaints (a common manifestation of DM) might be due to three reasons: oral sensory dysfunctions, dehydration, decreased saliva and salivary composition changes. (31)
The present study like some previous ones (21) confirms significant inverse Correlation between UWS and FBS in diabetic patients.
In this study, diabetic patients complained about xerostomia more significantly than healthy individuals which can be explained by significant difference of UWS between both groups. This result is in accordance with many other studies (4,5,9,12,14,18,19,21,24,28,32) too.

Conclusion

It can be concluded that informing diabetic patients for preventing hyperglycemia complications in oral cavity is necessary, because the amount of SWU in DM type 2 patients were significantly lower and xerostomia complaints were more than healthy people.

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