

Oral Symptoms and Mucosal Lesions in Patients with Diabetes Mellitus Type 2

SUMMARY

Background: Good glycoregulation at patients with diabetes mellitus is essential for prevention of many complications, including those in oral cavity. Results of numerous studies indicate that xerostomia and neurosensory oral disorders are present in type 2 diabetics. A review of the literature shows contradictory results about prevalence of oral mucosal lesions in diabetics. The aim of this study was to evaluate the presence of xerostomia, neurosensory disorders and mucosal lesions in oral cavity of type 2 diabetics. **Material and Methods:** This study involved 90 adults, 60 with type 2 diabetes and 30 healthy subjects, aged 45-65 years. With regard to value of HbA1c level diabetics were divided into two groups: 30 subjects with satisfactory glycoregulation ($HbA1c < 9\%$) and 30 subjects with poor glycoregulation ($HbA1c \geq 9\%$). All patients recruited into the study completed a questionnaire that included their demographic, medical and oral health data. Clinical examination of the oral mucosa was performed by a single examiner. **Results:** In relation to the presence of xerostomia and dysgeusia between satisfactory controlled diabetics and healthy subjects a significant difference was observed ($p < 0.05$). Compared with healthy subjects, poor controlled diabetics had significantly higher presence of xerostomia ($p < 0.001$) and neurosensory disorders ($p < 0.05$). A higher prevalence of oral mucosal lesions was found in poor controlled diabetics, but significant difference between groups was not observed ($p > 0.05$). A significant positive correlation was revealed between smoking and glossodynia as well as smoking and glossopyrosis ($p > 0.05$). **Conclusion:** Glycemic control level seems to influence the susceptibility of type 2 diabetics to xerostomia and neurosensory disorders. Less clear is whether diabetes are corelated to oral mucosal lesions.

Keywords: Diabetes Mellitus, Xerostomia, Glossodynia, Dysgeusia, Oral Mucosa

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Introduction

Diabetes Mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism¹. Chronic hyperglycemia leads to many complications, including those in oral cavity, therefore metabolic control is very important. Possible mechanisms that may be associated with some oral manifestations of diabetes are impaired chemotaxis as well as adherence and phagocytosis of neutrophil², increased collagenase activity together with a

decrease in collagen synthesis³, diabetic microangiopathy and neuropathy⁴.

Dry mouth or xerostomia is often present in patients with diabetes. It is believed that a decrease in saliva secretion by 50% below the normal range leads to xerostomia⁵. Shepard was the first one who described xerostomia in 1942 as a feature of uncontrolled diabetes⁶. It seems that oral dryness in type 2 DM is particularly influenced by xerogenic drugs and autonomic neuropathy. Moreover, neurosensory disorders such as burning mouth sensation and taste alteration are present in diabetics⁷.

In patients with diabetes, a pain or burning is usually expressed on the tongue (glossodynia and glossopyrosis), but other parts of the mouth may be affected as well. The underlying cause of these sensation in diabetics could be diabetic neuropathy.

Many factors might have been implicated in altered taste sensation in the oral cavity. One study reports that one-third of patients with diabetes have dysgeusia⁸, but not all studies describe these changes and their prevalence is unknown. Although the physiology of dysgeusia is not completely understood, relationship between dysgeusia and diabetic neuropathy has been described in earlier studies⁹. Taste alteration is reported to be more prevalent especially in poor controlled diabetics¹⁰.

A number of oral mucosal lesions, including lichen planus, recurrent aphthous stomatitis¹¹ and angular cheilitis¹² have been reported in diabetic patients, but there is no consensus whether oral mucosal lesions are more prevalent in diabetics than in healthy subjects. The relationship between diabetes and oral mucosal lesions is still unclear.

The aim of this study was to evaluate the presence of xerostomia, neurosensory disorders and mucosal lesions in oral cavity of type 2 diabetics.

Material and Methods

Study design and participants

The present study was approved by the institutional committee of ethics (No. 01-8/140 issued on 24th of December 2009) and was conducted in accordance with the Helsinki Declaration of 1975, as revised 1983.

This study was designed as a cross-sectional study. A total of 90 adults, aged 45-65 years, participated in the study. The study group included 30 satisfactory controlled diabetes mellitus type 2 patients (HbA1c<9%) and 30 poor controlled diabetes mellitus type 2 patients (HbA1c≥9%), who were recruited from the Department of Endocrinology University hospital Foca, Republic of Srpska, Bosnia and Herzegovina. The 9% cut-off point has been suggested to represent an indicator for ineffective blood glucose management in type 2 diabetes¹³. The mean duration of diabetes was 8.57±7.44 years in patients with satisfactory glycoregulation and 9.18±6.97 in patients with poor glycoregulation. The control group consisted of 30 healthy individuals who visited Dental Clinic, Faculty of medicine Foca, University East Sarajevo, for regular check up.

After the study was explained to the patients, written informed consent was obtained from all.

The presence of other systemic disorder or severe mental illness, pregnancy, signs or symptoms of AIDS and antibiotic administration during the last 6 months were exclusion criteria in this study.

All recruited patients completed a questionnaire that included their demographic and tobacco history data as well as oral health data which included a list of questions about their subjective oral symptoms. Some of the questions regarding dry mouth were patterned after those of Zielinski et al.¹⁴: Does your mouth frequently feel dry? Does your mouth feel dry when you are eating a meal? Do you have difficulties swallowing dry foods? Does oral dryness wakes you from sleep at night? A response of "yes" to two or more questions was considered positive for xerostomia. Also, the questions of dry mouth-associated complaints were included¹⁵: Do you have a painful tongue sensation? Do you have a burning tongue sensation? Do you have a taste alteration? Painful tongue sensation and burning tongue sensation are also referred as glossodynia and glossopyrosis respectively. All symptoms was evaluated with binary response options.

In relation to diabetes mellitus, data included a level of metabolic control and duration of diabetes according to their medical records. Clinical examination was performed by a single examiner on Dental Clinic, Faculty of Medicine Foca, University of East Sarajevo, Republic of Srpska, Bosnia and Herzegovina according to WHO criteria¹⁶ and included inspection of the soft tissues. Two mouth mirrors were used as well as digital palpation for the examination of particular lesions. The following oral mucosal changes were recorded: angular cheilitis (fissures or inflammation at lip corners), possible lichenoid lesion (white areas of the mucosa that do not wipe off, lacey or patch-like white pattern over reddened surface) and aphtae (ulcer(s) on oral mucosa except gingiva and hard palate).

Statistical analyses

All statistical analyses were performed with SPSS version 19.0 for Windows. Results were expressed as mean values ± standard deviation (SD) for numerical variables and as percentage for attributive variables. The differences between the groups were assessed by One Way ANOVA, T test and chi-square test. Spearman's correlation coefficient were obtained in order to assess the relationship between smoking and oral complaints as well as smoking and mucosal lesions. The value of p<0.05 was considered statistically significant.

Results

Table 1. shows sociodemographic characteristics of all respondents. Statistically significant difference was observed for smoking habits and average of age between the groups, while significant difference was not observed for gender.

Table 1. Sociodemographic characteristics of the sample

Variables		All patients	SCD	PCD	HS	p
Age ($\bar{X}\pm SD$)		57.58 \pm 7.19	59.50 \pm 6.64	60.73 \pm 5.89	52.50 \pm 6.27	p* $<$ 0.05
Gender (%)	Male	57.8	53.3	43.3	30.0	p** $>$ 0.05
	Female	42.2	46.7	56.7	70.0	
Smoking (%)	Yes	38.9	33.3	46.7	36.7	p** $<$ 0.05
	No	61.1	66.7	53.3	63.3	

*ANOVA; ** χ^2 test; SCD-satisfactory controlled diabetics; PCD-poor controlled diabetics; HS-healthy subjects;

Table 2. shows the presence of xerostomia and neurosensory disorders in all patients. A statistically significant difference was observed between healthy subjects and diabetics with satisfactory glycoregulation, except for glossodynia and glossopyrosis. Compared with healthy subjects, poor controlled diabetics had significantly higher presence of xerostomia and neurosensory disorders.

Table 2. Presence of xerostomia and neurosensory disorders in patients

Variables (%)		SCD	PCD	HS	p*
Xerostomia	yes	53.3	83.3	20.0	SCD:HS $<$ 0.05
	no	46.7	16.7	80.0	PCD:HS $<$ 0.001
Glossodynia	yes	13.3	26.7	3.3	SCD:HS $>$ 0.05
	no	86.7	73.3	96.7	PCD:HS $<$ 0.05
Glossopyrosis	yes	13.3	26.7	3.3	SCD:HS $>$ 0.05
	no	86.7	73.3	96.7	PCD:HS $<$ 0.05
Dysgeusia	yes	30.0	30.0	3.3	SCD:HS $<$ 0.05
	no	70.0	70.0	96.7	PCD:HS $<$ 0.05

* χ^2 test; SCD- satisfactory controlled diabetics; PCD-poor controlled diabetics; HS-healthy subjects;

The frequency of oral mucosal lesions in all respondents are presented in Table 3. Poor controlled diabetics had higher prevalence of oral mucosal lesions, than satisfactory controlled diabetics and healthy subjects, but statistically significant difference between the groups was not observed.

Table 3. Presence of oral mucosal lesions in patients

	Oral mucosal lesions			p*
	LP (%)	RAS (%)	AH (%)	
SCD	6.7	10.0	3.3	p $>$ 0.05
PCD	10.0	10.0	6.7	
HS	6.7	6.7	0.0	

* χ^2 test; LP-Lichen planus;RAS-recurrent aphthous stomatitis;AH-angular cheilitis; SCD- satisfactory controlled diabetics; PCD-poor controlled diabetics; HS-healthy subjects

Spearman's correlation revealed a statistically significant correlation between smoking and glossodynia as well as smoking and glossopyrosis. For all other variables investigated (xerostomia, dysgeusia and mucosal lesions), we observed a positive but nonsignificant correlation between them and smoking (Table 4).

Table 4. Correlation between smoking and oral complaints as well as smoking and mucosal lesions

	Xerostomia	Glossodynia	Glossopyrosis	Dysgeusia	Mucosal lesions
Smoking	0.079	0.256*	0.256*	0.090	0.042

* p $<$ 0.05; Spearman's correlation coefficient

Discussion

Xerostomia is one of DM oral manifestations. Its presence can lead to numerous clinical and social problems and certainly may have a negative impact on patients' quality of life. It is a result of reduction in saliva secretion, although it may occur in presence of a normal saliva flow rate as well¹⁷. In fact, autonomic neuropathies diminish the ability to respond to a salivary stimulus, but also microvascular changes may compromise the ability of salivary glands to respond to neural and hormonal stimulation in poor controlled diabetics¹⁸. Xerostomia may also be caused by administration of drugs. Drug-induced xerostomia occurs most often as a result of reversible action of drugs on the neural mechanism responsible for salivation. Medications with anticholinergic activity, such as tricyclic antidepressants, anxiolytics and antihypertensives exhibit the greatest xerogenic potential¹⁹. Presence of xerostomia can contribute to many clinical problems such as difficulty in eating, swallowing and speaking. Some patients may have a halitosis, burning sensation and altered taste perception¹⁵.

The results of our study showed a higher presence of xerostomia in diabetics. The highest percentage of patients with xerostomia was observed in the group of diabetics with poor glycemic control (83.3%). Numerous studies reported a significantly higher presence of xerostomia in patients with diabetes compared to healthy subjects²⁰⁻²². Carda et al. observed presence of xerostomia in 76.4% diabetics, while the presence was significantly less (18.7%) in healthy subjects²³. These findings are similar to those by Sandberg et al., which was conducted on 102 patients suffering from type 2 diabetes and 102 healthy subjects²⁴. Results of their study show that xerostomia was present in 53% diabetics and in 28% healthy respondents.

Oral dysesthesia or burning mouth sensation have been reported in patients with diabetes, but prevalence data are not available. In fact, neuropathy may lead to glossodynia and glossopyrosis caused by pathological changes involving the nerves in the oral region. In fact, neuropathy may lead to glossodynia and glossopyrosis caused by pathological changes involving the nerves in the oral region. Our study pointed out significantly higher presence of glossodynia and glossopyrosis in diabetics, especially in poor controlled ones. Similar results were obtained by Collin's et al.⁷. In their study, conducted in 45 patients with type II diabetes and 77 healthy subjects, the authors observed a significantly greater presence of glossodynia in diabetics (17.8%) compared to healthy subjects (5.6%). There is substantial evidence that smoking habit in diabetic patients significantly increases the risk of xerostomia⁴ and some mucosal disorders²⁴. But, results of our study indicate a significant positive correlation only between smoking and glossodynia as well as between smoking and glossopyrosis.

The main cause of taste disorders in patients with diabetes is unknown, but it is assumed that it is a congenital or acquired disorders of taste or peripheral neuropathy. Also, decreased salivary flow results in altered taste sensation. Saliva has important role in the maintenance of the milieu of taste receptors. It is secreted in response to food, assisting intake and initiating the digestion of starch and lipids and acts as a solvent of taste substances and affects taste sensitivity²⁵. In our research, analyzing the presence of dysgeusia, we observed significantly less presence in the healthy subjects, while both groups of diabetics were equally affected, what is in accordance with the results reported by Gondivkar et al.¹⁰. Authors included 120 patients aged 25-55 years in their study and diagnosed dysgeusia in 62.5% of patients with diabetes and 12.5% healthy subjects, whereby statistically significant difference between groups was observed. Some studies indicate an association of taste alteration with the level of HbA1c^{10,26}, while different results were obtained by Perros et al. who revealed no association between the HbA1c level and taste disorders²⁷.

Studies have reported decreased phagocytic activity of neutrophils in diabetics. Also, collagen synthesis is under the influence of the glucose level which may lead to increased susceptibility to infections and impaired wound healing. Previous studies reported contradictory results about oral mucosal lesions prevalence in patients with diabetes mellitus type 2. In our oral mucosal lesions frequency analysis, diabetics had a greater presence of oral mucosal lesions, but there was no significant difference between the groups. Other studies have also found that patents with type 2 DM did not have an increased presence of oral lesions²⁸. Some studies however, demonstrated significantly higher prevalence of mucosal changes in diabetics. Bastos et al. observed 146 patients suffering from type 2 diabetes and 111 healthy subjects²⁹. In their study, lichen planus was diagnosed in 6.1% of diabetics, while in the group of healthy individuals there were no respondents with this oral lesion. More over, angular cheillitis was present in 15.0% diabetics and 9.0% healthy subjects. However, the review of literature show conflicting results regarding the presence of oral mucosal lesions in type 2 diabetics. Thus, for example, the prevalence of lichen planus varies from 1.6% to as much as 85%³⁰. Some authors believe that the higher prevalence of oral lesions is associated with poor metabolic control of the disease^{31,32}. Others believe that the key is in the immune response such as lower chemotaxis and phagocytosis and the involvement of microcirculation with the reduction of blood supply, which contributes to diabetics becoming more prone to infections and alterations in the oral cavity^{29,33}.

Conclusions

The results of this study indicate that patients with diabetes mellitus type 2 are more susceptible to oral changes, especially poor controlled ones. Glycemic control level seems to influence the susceptibility of type 2 diabetics to xerostomia and neurosensory disorders. Less clear is whether diabetes is correlated to oral mucosal lesions. However, it was not possible to observe a clear relationship between the frequency of oral mucosal lesions related to diabetes mellitus type 2, probably due to small sample size.

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