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## Oral health related quality of life in patients with diabetes mellitus type 2 in the year 2012

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** The aim of this study was investigation of oral and dental side effects of diabetes mellitus (DM) on oral health-related quality of life (OHQoL) in patients with DM type 2.

**METHODS:** In this descriptive, analytic study 121 patients were participated by consecutive method based on the type of diabetes and the age. After the subjects received adequate explanations about the necessity of carrying out such a study, a questionnaire was handed into each patient who gave their consent to take part in the study. Oral lesions consisted of ulcers, erythema, leukoplakia, erythroplakia, candidiasis, angular cheilitis, median rhomboid glossitis, and denture stomatitis based on oral examination. The OHQoL were surveyed by oral health impact profile (OHIP-14) questionnaire. Data were analyzed by Pearson's correlation test, T-test, and  $\chi^2$  by SPSS software.

**RESULTS:** A total of 121 patients with diabetes were evaluated in this study [31 males (25.6%) and 90 females (74.4%)]. In this study, there was no significant correlation between OHQoL and decayed, missing, and filled teeth (DMFT), periodontal disease index (PDI). OHQoL was associated with higher ages and higher levels of blood sugar ( $P = 0.002$ ,  $P = 0.016$ ). The average of OHIP score significantly was increased by xerostomia experience ( $P = 0.010$ ).

**CONCLUSION:** In this survey, the influence of oral manifestation on OHQoL was low. Xerostomia was the most important symptom in diabetic patients that causes decreasing OHQoL. Age and blood sugar had more influence on this matter as well.

**KEYWORDS:** Diabetes Mellitus; Oral Manifestation; Oral Health Related Quality of Life

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Diabetes is one of the most common chronic diseases.<sup>1</sup> This disease is a metabolic disease, with heterogeneous clinical and genetic characteristics. It is characterized by an abnormal increase in blood glucose concentrations (hyperglycemia) and disturbances in the regulation of carbohydrates, proteins, and lipids.<sup>2</sup> Since diabetes mellitus (DM) is associated with various complications such as cardiovascular, neurologic, renal, ocular and oral conditions, it is one of the most important health

problems worldwide.<sup>1</sup> It has been demonstrated that continuous hyperglycemia affects almost all the tissues of the body and is associated with major complications in different organs such as the eyes, nerves, kidneys, and blood vessels. These complications have a role in the higher rate of morbidity and mortality in diabetic patients.<sup>3</sup> Clinical manifestations of DM consist of a wide range of acute manifestations up to asymptomatic conditions that are only discovered during routine screening tests.<sup>2</sup> Health-related behaviors are necessary to

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prevent progression of disease and its complications.<sup>4,5</sup> Some of these care services include daily control of blood glucose levels, limited dietary regimens, use of oral medications, and injection of insulin and sports activities.<sup>6</sup>

At present more than 366 million people suffer from diabetes worldwide and it is estimated that it will increase to 552 million people by 2030.<sup>1</sup> The World Health Organization reported in the recent decade that 170 million people worldwide suffer from diabetes.<sup>7</sup> At present, more than 3 million people suffer from diabetes in Iran, which is considered one of the highest rates all over the world.<sup>8</sup>

The oral manifestations of diabetes consist of bacterial, viral and fungal infections, a delay in wound healing and an increase in the incidence and severity of dental caries, gingivitis, periodontal diseases, periapical abscesses and burning mouth syndrome.<sup>9</sup> Promotion of the quality of life of human beings is one of the aims of health systems at the beginning of the 21<sup>st</sup> century and evaluation of quality of life of patients with diabetes is an important component in the evaluation of the effect of health-care behaviors.<sup>3</sup>

Since oral problems are one of the consequences of inadequate control of diabetes, which can affect the oral function, facial appearance and social relationships of patients<sup>10</sup> and decrease the health-related quality of life and it can affect the overall quality of life of these patients and this issue has never been evaluated in Iran; the present study was undertaken to evaluate the effect of oral and dental complications of diabetes on oral health-related quality of life (OHQoL).

## Methods

In the present descriptive, analytical, cross-sectional study, the OHQoL of diabetic patients was evaluated based on periodontal and oral disease parameters. A total of 121 patients with diabetes, who were 17-75 years of age, were consecutively selected from

those referring to public hospitals in Kerman, Iran. The diagnostic criteria in diabetic group were as follows: Hemoglobin A1c of 6.5% or higher; fasting plasma glucose (FPG) of 126 mg/dl or higher in two occasions or 2-hour FPG of 200 mg/dl or higher in two occasions; patients with classic symptoms and signs of hyperglycemia, hyperglycemia crises and a random plasma glucose level of 200 mg/dl or higher.<sup>11</sup> In addition, the subjects reported minimum use of medications to control other systemic conditions and did not use any medications with oral manifestations. The exclusion criteria consisted of the following: patients taking any medications with oral manifestations, smokers, and patients with mental problems.

After the subjects received adequate explanations about the necessity of carrying out such a study, a questionnaire was handed into each patient who gave their consent to take part in the study. The questionnaire consisted of sections on oral lesions, the status of teeth including decayed, missing, and filled teeth (DMFT) index and supporting tissues, i.e., periodontal disease index (PDI) index. Oral lesions consisted of ulcers, erythema, leukoplakia, erythroplakia, and candidiasis (angular cheilitis, median rhomboid glossitis, and denture stomatitis).<sup>9</sup> Questionnaire was given after oral examination and in the case of the illiterate or less educated were completed by a family member.

The clinical examination was carried out under field conditions in the dentistry unit by resident of oral medicine, whereas the observations were recorded by a trained assistant. Using a set of equipment including a unit lamp as source of illumination, mirror dentistry and dental probes, patients were examined while seated on a unit. To evaluate the status of teeth in relation to the presence of caries, DMFT index was used based WHO instructions. Tooth-supporting tissues were examined using periodontal indexes and 6 teeth were assessed, which included maxillary left central and first

premolar, maxillary right first molar, mandibular left first molar and mandibular left central and first premolar teeth.<sup>12</sup> In this study, xerostomia was confirmed, if based on FOX questionnaire, the patient provided at least one positive response to three questions.<sup>13</sup>

To assess OHQoL, the Persian version of the valid questionnaire oral health impact profile (OHIP)-14 was used, which consists of 14 questions. The interviewees were asked to rate the questions on the questionnaire as follows: very often = 4, in fairly often = 3, occasionally = 2, hardly ever = 1, and never = 0. Therefore, the total score on the questionnaire would be 0-56. A higher score indicates compromised OHQoL.<sup>14</sup> Data were analyzed by Pearson's correlation test, T-test, and  $\chi^2$  by SPSS software (version 17, SPSS Inc., Chicago, IL, USA).

## Results

A total of 121 patients with diabetes were evaluated with 31 males (25.6%) and 90 females (74.4%). The age range of the subjects was 18-78 years with a mean and standard deviation (SD) of  $52.07 \pm 11.35$  years. In relation to educational status, 37 subjects (30.6%) were illiterate, 52 (43.0%) were literate with some school education, 24 (19.8%) were high school graduates, and 8 (6.6%) were university graduates. The mean and SD of blood glucose levels was  $284 \pm 106$  with minimum and maximum levels of 126 and 700, respectively. 45 patients (37.2%) used both insulin and oral medications; 36 patients (29.8%) received only insulin and 40

(33.1%) took only medications. On the whole, 24 patients (19.8%) had no history of other conditions and the remainder had one or more other conditions.

53 patients (43.8%) were edentulous. The mean  $\pm$  SD of DMFT index (excluding edentulous patients) was  $10.66 \pm 5.65$ , with a minimum and maximum of 2 and 30, respectively. Mean and SD of PDI (excluding edentulous patients) was  $4.99 \pm 0.95$ , with minimum and maximum of 1 and 6, respectively. 76 patients (62.8%) had no symptoms and signs of candidiasis and the remainder (31.0%) had one symptom or sign or more than one symptom or sign (14.0%) (Table 1). 22 patients (18.2%) had burning sensation in the oral cavity. Table 1 presents the locations of burning sensation in the oral cavity. The most sign was tongue blade sign (Table 1).

Table 2 shows the different oral condition according score of OHIP-14. Based on Fox questionnaire, 9.57% of the subjects had xerostomia. There were no significant relationships between scores of OHQoL and affliction with candidiasis and history of frequent abscess; however, the mean score of OHQoL had significant relationships with xerostomia, tongue blade sign, and burning sensation in the oral cavity. In this context, the life quality score was higher in patients with xerostomia, positive tongue blade sign and burning sensation, i.e., they had lower quality of life. The mean  $\pm$  SD of the total score on OHIP-14 questionnaire was  $6.50 \pm 3.63$ , with a minimum and maximum of zero and 41, respectively.

**Table 1.** The frequency of oral candidiasis, oral sore location and selected oral lesions or signs in patients with DM

Candidiasis	n (%)	Oral sore location	n (%)	Selected oral lesions or signs	n (%)
Hyperplastic	0 (0)	Tongue	19 (15.7)	White plaque	1 (0.8)
Erythematosis	10 (8.3)	Floor of mouth	3 (2.5)	Erythematose plaque	0 (0)
Trush	3 (2.5)	Hard and soft palate	2 (1.7)	Lichenoid lesions	3 (2.5)
MRG	20 (16.5)	Buccal, lip and vestibule mucosa	3 (2.5)	Ulcer	0 (0)
Denture stomatitis	23 (19.0)	-	-	Frequent abscess	14 (11.6)
Angular cheilitis	8 (6.6)	-	-	Tongue blade sign	59 (48.8)

DM: Diabetes mellitus

A total of 56 subjects (46.3%) scored zero on the questionnaire. The mean score range of each question was 0.07-0.56. These two extremes belonged to questions 10 and 3, respectively. Table 3 shows the frequency, average, and SD of answers to OHIP-14 questionnaire.

**Table 2.** Comparison of oral health quality of life according to selected oral lesions and signs

Variations	Mean ± SD	P*
Candidiasis		
Yes	6.01 ± 3.25	0.350
No	7.23 ± 6.01	
Xerostomia (Fox Q)		
Yes	3.25 ± 1.45	0.005
No	7.75 ± 5.22	
Sore mouth		
Yes	6.50 ± 3.10	0.003
No	6.16 ± 6.02	
History of frequent abscess		
Yes	6.42 ± 3.51	0.780
No	7.40 ± 4.57	
Tongue blade sign		
Yes	4.29 ± 2.03	0.031
No	7.92 ± 5.32	

\*Independent t-test, SD: Standard deviation

There was no significant relationship between the age, sex and educational status on one hand and blood glucose level. There was no significant relationship between the mean scores of OHQoL on one hand and gender and educational status of subjects on the other. There was a weak but significant

relationship between the score of OHQoL and blood glucose level and age, i.e., with an increase in age and blood glucose level the score of OHQoL increased, indicating a decrease in OHQoL. In this context, the correlation coefficients of blood glucose level and age with the relevant score on OHIP-14 questionnaire were 0.28 ( $P = 0.002$ ) and 0.22 ( $P = 0.016$ ), respectively. There was no significant relationship between the score of OHQoL and the type of medications taken, a history of other conditions and edentulism. There were no significant relationships between scores of OHQoL and PDI and DMFT indexes; in this context, the correlation coefficients between DMFT and PDI on the one hand and OHIP-14 questionnaire scores on the other hand were  $-0.7$  ( $P = 0.570$ ) and  $0.16$  ( $P = 0.200$ ).

## Discussion

This study was carried out on 121 diabetic patients with a mean age of 52.07 years. In this study, the mean ± SD of the total score of OHQoL was  $3.63 \pm 6.50$  with minimum and maximum of zero and 41, respectively. In a study by Allen et al.,<sup>15</sup> too, diabetes had not significantly affected the OHQoL of patients. Sandberg et al.<sup>16</sup> evaluated the effect of diabetes on the OHQoL and reported that patients' satisfaction with the oral and dental status was similar in diabetic and non-diabetic patients.

**Table 3.** Answers to the OHIP-14 questionnaire

Questions	Never	Hardly ever	Occasionally	Fairly often	Very often	Mean ± SD
1. Had trouble pronouncing some words	95	1.7	2.5	0.8	0	$0.90 \pm 0.43$
2. Felt sense of taste had worsened	81	9.9	5.8	0.8	2.5	$0.34 \pm 0.83$
3. Had painful aches	57.9	29.8	10.7	1.7	0	$0.56 \pm 0.75$
4. Found it uncomfortable to eat food	57.9	29.8	10.7	1.7	0	$0.36 \pm 0.68$
5. Been self-conscious	73.3	19.2	6.7	0	0.8	$0.42 \pm 0.68$
6. Felt tensed	67.8	23.1	8.3	0.8	0	$0.35 \pm 0.76$
7. Diet has been unsatisfactory	79.2	9.2	10.0	0.8	0.8	$0.31 \pm 0.73$
8. Had to interrupt meals	80.2	11.6	5.8	1.7	0.8	$0.23 \pm 0.62$
9. Found it difficult to relax	85.1	8.3	3.3	1.7	1.7	$0.26 \pm 0.75$
10. Been a bit embarrassed	93.4	5.8	0.8	0	0	$0.07 \pm 0.29$
11. Been a bit irritable	88.4	9.1	2.5	0	0	$0.14 \pm 0.41$
12. Had difficulty doing usual jobs	86.8	9.1	3.3	0	0.8	$0.19 \pm 0.57$
13. Felt life, less satisfying	85.1	10.7	3.3	0	0.8	$0.21 \pm 0.58$
14. Been totally unable to function	95.9	0.8	1.7	1.7	0	$0.09 \pm 0.46$

SD: Standard deviation; OHIP: Oral health impact profile

The subjects' OHQoL decreased with age. In a study by Allen et al.<sup>15</sup> on type II diabetic patients, the mean age of the subjects was 56 years, somewhat consistent with that in the present study. It appears aging results in more oral problem due to different reasons, including a decreased attention to oral hygiene status by patients.

In this study, the mean score of quality of life had no significant relationship with patients' gender and educational status, consistent with the results of a study by Bosic-zivanovic,<sup>17</sup> in which there was no relationship between gender and type II DM.

In this study, the mean  $\pm$  SD of DMFI (after exclusion of edentulous patients) was  $10.66 \pm 5.65$ , with no significant relationship between DMFI and OHQoL. Stojanovic et al.<sup>18</sup> showed that the extent of caries and probing depth were higher in patients with weak diabetic control.

In the present study, the mean  $\pm$  SD of PDI (after excluding edentulous patients) was  $4.99 \pm 0.95$ , with no significant relationship between PDI and OHQoL in diabetic patients. In studies by Drumond et al.,<sup>19</sup> Li et al.,<sup>20</sup> and Saini et al.<sup>21</sup> the OHQoL in diabetic patients with periodontitis was lower compared to those without periodontitis.

In the present study, the mean score of OHQoL exhibited a significant relationship with xerostomia based on FOX questionnaire and tongue blade sign; in this context, the score of OHQoL was higher in patients with xerostomia and positive tongue blade sign, i.e., they had lower quality of life. In a study by Busato et al.,<sup>22</sup> too, diabetic patients had a higher rate of xerostomia; in this context, xerostomia had exerted a significantly negative effect on the OHQoL. In a study by Bajaj et al.,<sup>23</sup> xerostomia was more severe in diabetic patients with higher blood glucose levels. In addition, Dorocka-Bobkowska et al.<sup>24</sup> sensation in the oral cavity were the most common complaints of patients with

type II DM. An increase in blood glucose levels results in polyuria, which leads to the excretion of extracellular fluids and hyposalivation, in turn, giving rise to xerostomia. Xerostomia in diabetic patients leads to social and clinical problems, with negative effects on OHQoL.<sup>9,24</sup>

In the present study, 18.2% of subjects had burning sensation in the oral cavity and 37.2% had one or more than one type of oral candidiasis; however, there was no significant relationship between the mean score of OHQoL and burning sensation and candidiasis. No studies have evaluated the effect of burning sensation and candidiasis on OHQoL in diabetic patients.

In the present study, there were lichenoid reactions in 3 patients and leukoplakia in one patient; however, there was no significant relationship between the mean score of OHQoL and the presence of leukoplakia and lichenoid lesions. No similar study was found but in a study by Saini, two patients of 420 diabetic patients had lichen planus, with no significant relationship between diabetes and these lesions.<sup>21</sup>

## Conclusion

This study showed the low influence of different oral manifestation on quality of life in diabetic patients. Xerostomia, age and blood sugar have more effect on OHQoL.

## Conflict of Interests

Authors have no conflict of interest.

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