



## Prevalence of Oral Manifestations of Diabetic Patients in a Group of Egyptian Population

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### ABSTRACT

**Purpose:** This study aimed to assess the prevalence of oral manifestations of diabetic patients in a group of Egyptian population. **Subjects and Methods:** A cross-sectional study was conducted on 245 diabetic Egyptian patients. They were recruited from outpatient clinic of the Faculty of Dental Medicine for girls and Al-Azhar university hospitals. We assessed prevalence by collecting data from patients by questionnaire then clinical examination. We used HbA1c test to show its relation with oral manifestations. **Results:** The most frequent oral symptoms were xerostomia 77.1%, followed by toothache 51.1%, taste abnormality 50.2%, tender gum 38.8%, halitosis 32.7%, burning sensation 6.5% and mouth soreness 5.7%. While the most frequent dental findings were plaque accumulation in 92.1% followed by calculus deposition in 86.3%, bleeding with probing in 85.1%, dental caries in 62.6%, tooth mobility in 28.6% and finally gingival recession in 28.2%. Almost uncontrolled patients had more frequent manifestations than controlled ones. **Conclusion:** DM associated many oral manifestations and they are more prevalent in uncontrolled diabetic patients.

### INTRODUCTION

The term diabetes mellitus describes a group of metabolic diseases characterized by hyperglycemia resulting from a deficiency of insulin secretion caused by either pancreatic  $\beta$ -cell dysfunction or resistance

### KEYWORDS

*Diabetes Mellitus,  
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to the action of insulin or both. DM is clinically and genetically heterogeneous group of metabolic disorders manifested by abnormally high levels of glucose in the blood <sup>(1)</sup>.

The estimated numbers of people suffering from diabetes have increased from 108 million in 1980 to 422 million in 2014 in the world. The prevalence was 425 million people with diabetes in 2017, which is expected to rise to 629 million by 2045<sup>(2)</sup>. In Eastern Mediterranean Region, where Egypt resides. It is predicted to double from 8.2 million to 16.7 million by 2045<sup>(3)</sup>.

Oral manifestations of DM affecting hard and soft tissues of the oral cavity which include periodontal disease, dry mouth, candidiasis, bone loss, tooth mobility, halitosis, sensory disorders, taste problems, delayed wound healing, salivary gland dysfunction, oral pathologies and oral infections <sup>(4,5)</sup>. DM promote periodontitis through an inflammatory response to the periodontal microflora and hyperglycemia induced vascular changes. DM makes destruction of connective tissue surrounding the teeth and the condition gradually leads to tooth loss. Studies show that diabetes increases the risk of progressing periodontitis by 86% and that incidence increases more in case of uncontrolled diabetes <sup>(6)</sup>.

DM is associated with high morbidity due to a broad range of complications, such as retinopathy, nephropathy, neuropathy and cardiovascular diseases <sup>(7)</sup>. Uncontrolled diabetic patients are more prone to infections such as bacterial, fungal and viral due to defect immune response as a consequence of the hyperglycemia, glycemic control decreases the susceptibility to infection <sup>(8)</sup>. Oral mucosal lesion prevalence in specific population group is mandatory to understand its extension and characteristics, it is also essential for improvement of oral health promotion and prevention programs<sup>(9)</sup>. So, we aimed to study the prevalence of oral manifestations of diabetic patients in a group of Egyptian population.

## SUBJECTS AND METHODS

### Study Design and population:

The current study is a cross sectional one which was carried out on 245 attendants of outpatient clinics of Faculty of Dental Medicine for girls and internal medicine outpatient clinics of Al-Azhar university hospitals. **Ethical approval** was obtained from the Research Ethics Committee (REC17-116) of the Faculty of Dental Medicine of Al-Azhar University for Girls. The study was explained to all participants and they signed informed consent denoting their agreement to participate in the study.

### Inclusion and exclusion criteria:

#### *Inclusion Criteria:*

- Previously diagnosed as diabetic patient.
- Both sex Egyptian.
- Physically capable of undergoing examination and open the mouth.
- Agreement to participate in the study.

#### **Exclusion criteria:**

- Pregnant or lactating females.
- Smokers.
- Alcoholics
- Immunologically related disorders as lichen planus.
- Any immunocompromised patients.

### Sample size calculation and sampling technique

#### **Sample size calculation:**

Sample size was decided by using Epi info software version 6.0 (CDC, Atlanta, GA, USA, 1996) taking in consideration the prevalence of oral manifestations among diabetic patients to be 80% with 5% margin of error, 95% confidence level and 80% power of the study.

**Sampling technique:**

All eligible patients attended the out-patient clinics in three randomly chosen days per week were recruited.

**Data collection procedures:**

Data were collected via constructed interviewing questionnaire then oral and dental examination done to detect any abnormalities. The periodontal status was assessed by checking pocket depth through CPITN. In epidemiological surveys, 10 index teeth were examined, but only the worst finding from the index teeth was recorded per sextant of teeth. only the worst finding from all the teeth in a sextant was recorded. Codes were used (0, healthy gingivae; 1, gingival bleeding on probing; 2, calculus; 3, periodontal pocket 4 - 5 mm; 4, periodontal pocket  $\geq 6$  mm).

**Laboratory investigation:**

We assessed glycemic control through HbA1c test which was considered to be controlled if HbA1c was  $< 7.0$  and uncontrolled  $\geq 7.0$ .

**Statistical analysis:**

Data collected were reviewed and coded, and statistical analysis of collected data were done by using SPSS program (statistical package of social science; SPSS Inc., Chicago, IL, USA) version 16 for Microsoft Windows. Frequency of occurrence and mean and standard deviation were used for describing qualitative and quantitative data respectively. Data were analyzed using Chi-square test and student's t-test for both types of data respectively. Bivariable was performed to determine significant association and reported as significant at a p-value of  $< 0.05$  and 95% CI.

**RESULTS**

A total of 245 (149 females and 96 males) diabetic Egyptian patients were included in the study. Their mean age was  $49.59 \pm 12.78$  years (ranged between 10-86 years). T1DM was 42 patients (17.1%) and T2DM was 203 patients (82.9%). Controlled diabetes were 59 patients (24.1%), while uncontrolled diabetes were 186 patients (75.9%). There were 18 edentulous patients and 227 dentated patients.

Assessment of oral health status in those patients evidenced 11.4% received health education and 22.4% followed instruction of physician. In this study, 49.8% brushing their teeth, 2.2% only flossing their teeth, and 3.1% checkup teeth regularly. Most patients received health education, followed instructions, brushing their teeth and regularly checkup was glycemic controlled.

As regard oral symptoms, the most frequent symptoms observed among diabetic patients were xerostomia 77.1%, followed by toothache 51.1%, taste abnormality 50.2%, tender gum 38.8%, halitosis 32.7%, burning sensation 6.5% and mouth soreness 5.7% and these findings were significantly higher among controlled diabetics than uncontrolled ones as seen in table 1.

As regard dental finding of the studied sample, the most common dental finding was plaque accumulation in 92.1% followed by calculus deposition in 86.3%, Bleeding with probing in 85.1%, dental caries in 62.6%, tooth mobility in 28.6% and finally gingival recession in 28.2% with significantly higher figures among uncontrolled patients than their counterparts as seen in table 2.

As regard CPITN, there were 7.9% healthy gingiva mostly were controlled DM, 2.6% had bleeding gingiva, 25.1% had calculus, 34.4% had periodontal pocket 4-5mm and 30% had periodontal pocket  $> 6$ mm. we found highly significant association between periodontal condition and glycemic control as p value  $\leq 0.05$  as seen in table 3.

**Table (1): Oral symptoms in relation to glycemic control of the studied sample**

Oral symptoms with glycemic control	No. 245(%)	Controlled	Uncontrolled	P-value
<b>Xerostomia</b>				
Yes	189(77.1%)	25(42.4%)	164(88.2%)	0.000*
No	56(22.9%)	34(57.6%)	22(11.8%)	
<b>Taste abnormalities</b>				
Yes	123(50.2%)	13(22%)	110(59.1%)	0.000*
No	122(49.8%)	46(78%)	76(40.9%)	
<b>Tender Gum</b>				
Yes	95(38.8%)	8(13.6%)	87(46.8%)	0.000*
No	150(61.2%)	51(86.4%)	99(53.2%)	
<b>Halitosis</b>				
Yes	80(32.7%)	8(13.6%)	72(38.7%)	0.000*
No	165(67.3%)	51(86.4%)	114(61.3%)	
<b>Burning sensation</b>				
Yes	16(6.5%)	1(1.7%)	15(8.1%)	0.128
No	229(93.5%)	58(98.3%)	171(91.9%)	
<b>Mouth soreness</b>				
Yes	14(5.7%)	2(3.4%)	12(6.5%)	0.528
No	231(94.3%)	57(96.6%)	174(93.5%)	
<b>**Toothache</b>	<b>No. 227(%)</b>			
Yes	116(51.1%)	13(23.2%)	103(60.2%)	0.000*
No	111(48.9%)	43(76.8%)	68(39.8%)	

\*significant difference ( $p$ -value  $\leq 0.05$ ).

\*\* Edentulous patients 18(7.3%).

**Table (2): Dental findings in relation to glycemic control of the studied sample**

Dental findings with glycemic control	**No.227(%)	Controlled	Uncontrolled	P-value
<b>Plaque</b>				
Yes	209(92.1%)	46(82.1%)	163(95.3%)	0.002*
No	18(7.9%)	10(17.9%)	8(4.7%)	
<b>Calculus</b>				
Yes	196(86.3%)	44(78.6%)	152(88.9%)	0.050*
No	31(13.7%)	12(21.4%)	19(11.1%)	
<b>Bleeding Gingiva</b>				
Yes	193(85.1%)	42(75%)	151(88.3%)	0.015*
No	34(14.9%)	14(25%)	20(11.7%)	
<b>Tooth Mobility</b>				
Yes	65(28.6%)	3(5.4%)	62(36.3%)	0.000*
No	162(71.4%)	53(94.6%)	109(63.7%)	
<b>Gingival Recession</b>				
Yes	64(28.2%)	7(12.5%)	57(33.3%)	0.003*
No	163(71.8%)	49(87.5%)	114(66.7%)	
<b>Dental Caries</b>				
Yes	142(62.6%)	27(48.2%)	115(67.3%)	0.011*
No	85(37.4%)	29(51.8%)	56(32.7%)	

\*significant difference ( $p$ -value  $\leq 0.05$ ).

\*\* Edentulous patients 18(7.3%).

**Table (3)** CPITN in relation to glycemic control of the studied sample

CPITN score with glycemic control	**No. 227(%)	Controlled	Uncontrolled	P-value
0(healthy gingiva)	18 (7.9%)	10(17.9%)	8(4.7%)	<b>0.000*</b>
1(bleeding gingiva)	6 (2.6%)	1(1.8%)	5(2.9%)	
2(calculus)	57 (25.1%)	33(58.9%)	24(14%)	
3(pocket 4-5mm)	78 (34.4%)	7(12.5%)	71(41.5%)	
4(pocket >6mm)	68 (30%)	5(8.9%)	63(36.9%)	

\*Significant difference ( $p\text{-value} \leq 0.05$ ).

\*\* Edentulous patients 18(7.3%).

Most common mucosal finding, Fordyce's granules were 15.5% then white patches 15.1%, angular cheilitis 7.8%, oral ulcers 5.3%, melanin pigmentation 4.9% and other mucosal finding was 3.7% as fissured tongue, glazed tongue and

discoloration of tongue. We found oral ulcers were significantly more frequent among uncontrolled glycemic patients but all other findings were insignificant as  $p\text{-value} > 0.05$  as seen in table 4.

**Table (4):** Mucosal findings in relation to glycemic control of the studied sample

Mucosal findings with glycemic control	No. 245(%)	Controlled	Uncontrolled	P-value
<b>Oral Ulcers</b>				0.042*
Yes	13(5.3%)	0	13(7%)	
No	232(94.7%)	59(100%)	173(93%)	
<b>Fordyce's Granules</b>				0.726
Yes	38(15.5%)	10(16.9%)	28(15.1%)	
No	207(84.5%)	49(83.1%)	158(84.9%)	
<b>White Patches</b>				0.103
Yes	37(15.1%)	5(8.5%)	32(17.2%)	
No	208(84.9%)	54(91.5%)	154(82.8%)	
<b>Angular Cheilitis</b>				0.577
Yes	19(7.8%)	3(5.1%)	16(8.6%)	
No	226(92.2%)	56(94.9%)	170(91.4%)	
<b>Melanin Pigmentation</b>				0.736
Yes	12(4.9%)	2(3.4%)	10(5.4%)	
No	233(95.1%)	57(96.6%)	176(94.6%)	
<b>Others***</b>				0.453
Yes	9(3.7%)	3(5.1%)	6(3.2%)	
No	236(96.3%)	56(94.9%)	180(96.8%)	

\*significant difference ( $p\text{-value} \leq 0.05$ ).

\*\*\*Others were fissured tongue, glazed tongue, brown discoloration of the tongue.

## DISCUSSION

The first objective of the current study was to assess prevalence of oral manifestations among group of Egyptian diabetic patients and the second objective was to evaluate the association between these oral manifestations and glycemic control through HbA1c test. Results verified these objectives; those patients had many oral manifestations and their prevalence was high in uncontrolled patients compared to the controlled one.

As regard to oral symptoms, Xerostomia was the most frequent oral symptoms observed in diabetic patients, it was 77.1% this high prevalence may be due to diabetic neuropathy, medication, polyuria and dehydration. This finding agreed with the studies conducted by Lakdawala et al 2018<sup>(10)</sup> and Madathil et al 2020<sup>(11)</sup>.

Taste abnormalities were prevalent among 50.2% of studied sample. They were higher in uncontrolled patients (59.1%) compared to controlled one (22%), which agreed with the study done by Shrimali et al<sup>(12)</sup> this high prevalence because of hyposalivation and neuropathy.

Halitosis was present by 32.7% in studied sample, its prevalence was higher in uncontrolled diabetes (38.7%) compared to controlled one (13.6%), while Sura AA et al. 2015<sup>(13)</sup> assessed 60.1% she attributed this prevalence to the side effect of diabetic treatment especially insulin injection. Halitosis may occur due to high ketone levels that cause bad breath.

The most frequent dental findings in the studied sample were plaque accumulation, calculus deposition, bleeding gingiva on probing, tooth mobility, gingival recession and dental caries. All these findings were high in uncontrolled patients and significant differences with glycemic control. periodontal status assessed by CPITN. Scores 0,1,2 were more in controlled diabetic patients, while scores 3 and 4 were higher in uncontrolled one. There was significant relation between periodontal condition and glycemic control, this finding agreed

with Ravindran et al<sup>(14)</sup> who assessed this score and had similar result. This finding due to bidirectional relationship between periodontal disease and DM<sup>(15)</sup>.

Dental caries was significantly associated with glycemic control, this agreed with Yonekura et.al<sup>(16)</sup>. This occurred due to impaired salivary gland function and bacterial invasion that lead to decrease in enamel mineralization and eventual tooth decay.

The most frequent mucosal findings in studied sample respectively were Fordyce's granules, white patches, angular cheilitis, oral ulcers, melanin pigmentation and others as tongue lesions. White patches, angular cheilitis and oral ulcers were more in uncontrolled patients compared to controlled one, this agreed with a study done by Gupta S et al.<sup>(17)</sup>.

White patches in our study were in the form of oral candidiasis and oral lichen planus, it was higher in uncontrolled than a controlled one. As saliva decrease the pathogenicity of some microorganisms will be increase and development of new species might occur so opportunistic infection will be increase and impair immune response these factors lead to appearance of white lesions.

Prevalence of oral ulcers in the studied sample were 5.3%, this may be due to poor wound healing and defect in the immune response. This result agreed with Vasconcelos et al.<sup>(18)</sup> which was 5.4%. Melanin pigmentation of oral mucosa was 4.9% in studied sample, despite Silva et al.<sup>(19)</sup> assessed it as 13.7% this high prevalence may be due to racial origin which is commonly observed in the Brazilian population.

Other tongue abnormalities as the fissured tongue and glazed tongue was found in 3.7% of the studied sample. The pathogenesis of fissured tongue can be developmental, as a result of aging or changes in the environment. This agreed with Vasconcelos et al.<sup>(18)</sup> which was 3.3% but Soliman et al<sup>(20)</sup> had higher frequency of these abnormalities (36.2%) it may be due to difference in nationality as he conducted his assessment in Jeddah city.

## CONCLUSION

The most important complications noticed in diabetic patients were Periodontitis, xerostomia, taste abnormality, halitosis and white patches. Uncontrolled patients presented with severe manifestations than controlled one. These findings highlight the necessity for regular clinical examinations to ensure early diagnosis and management of oral mucosal lesions in those patients.

## RECOMMENDATIONS

In the light of the previous discussion we recommend the following:

1. Special health educational programs for diabetic patients recommended for increasing knowledge about oral complications of diabetes and encourage them for periodic check-up to prevent any complications and ensure early diagnosis and management of oral mucosal lesions among them.
2. Most Egyptian use phones, so using mobile applications, reminders and education material can be effective if this technology is properly used for education of the patient and importance of glycemic control.
3. Dental education through the mass media about oral hygiene measures with special emphasis on diabetic patient.

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