

## TYPE 2 DIABETES MELLITUS AND ORAL HEALTH PROBLEMS CROSS-SECTIONAL STUDY

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### ABSTRACT

In Egypt, diabetes mellitus is considered to be a foremost health issue with a major influence on the disease and the rate of death. Diabetes mellitus is a communal disorder having affiliated oral disorders that influence dental care. The purpose of this study was to study the prevalence of oral changes in diabetes type 2 in the Egyptian participants to raise awareness between diabetic patients and dental professionals.

**Methods:** This was a cross-sectional study that was done on 200 patients who were diagnosed with diabetes mellitus type 2 at Diabetes and Endocrinology Clinic in Kasr Al Ainy, Cairo University Hospital over a period of 2 months from the first of September 2019 to the first of November 2019. Both genders were selected with age ranging from (32-60). A detailed oral examination was performed in accordance with international criteria.

**Results:** The most prevalent oral changes were caries (58%), periodontitis (56%), xerostomia (45%), taste dysfunction (32.5%), burning sensation (20%) and candida (15%).

**Conclusions:** This study exhibited that diabetes has harmful influences on oral health status; hence, dentists must be acquainted with the related oral disorders in patients with diabetes as chronic oral complications in these patients could worsen their glucose level and their prognosis. The dentists could have a helpful role in spotting the undiagnosed diabetic patients from the associated oral manifestations.

**KEYWORDS:** Diabetes type 2, changes, caries, periodontitis.

### INTRODUCTION

Diabetes mellitus (DM) is a vital public health concern for the past decades and a standard chronic metabolic malady worldwide<sup>(1)</sup>. DM could be a syndrome of abnormal carbohydrates,

fat and protein breakdown that leads to short and future complications because of the shortage of hypoglycemic agent either absolute or relative. The main types of diabetes are: type 1, indicating an absolute deficiency of insulin; type 2, due to

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resistance of insulin and a secretory fault of the insulin; and physiological state, a condition befell in pregnant females due to abnormal glucose tolerance <sup>(2)</sup>.

Any age can be tormented by DM, however adults are more prone to it. It was stated that this polygenic disease is taking into account to be pandemic by The World Health Organization (WHO) <sup>(3)</sup>. Over the past few decades the frequency of polygenic disease has intensely hyperbolic and it is predictable to triple within the next decade. The microvascular and macrovascular complications of the polygenic disease could be a leading reason of death <sup>(4,5)</sup>. Consequently, diagnosing and managing patients with polygenic disease could be a major role that may be done by the dental team. Additionally, as morbidity and mortality is for the reason that of poorly controlled DM, the diabetic patients ought to consult their dentists regarding aldohexose regulation improvement, oral and nutritional health maintaining and habitually aldohexose monitoring tests every day <sup>(6)</sup>.

Egypt was listed among the world's prime ten countries within the variety of patients with DM by the International Diabetes Federation (IDF) in 2013. The Middle East and North Africa (MENA) region has variety of patients that hyperbolic by ninety six percent from year 2013 to 2035 or from thirty four millions to sixty seven millions. The prevalence of DM in Egypt is around fifteen and half percent among adults between twenty and seventy nine years, with a yearly death of 86,478 related to DM <sup>(7)</sup>.

## MATERIALS AND METHODS

This was a cross sectional study at Diabetes an Endocrinology Clinic in Kasr Al Ainy, Cairo University Hospitals over a period of 2 months since the first of September 2019 to the first of November 2019 with a convenience sampling performed for

200 patients to detect the prevalence of oral diseases among type 2 diabetes patients and this was based on data from previous study by de Menezes Sousa <sup>(8)</sup>.

Inclusion criteria included Egyptian patients from both genders from age ranging from 32 to 60 years having DM type 2 according to **American Diabetes Association, 2019** <sup>(9)</sup>. Patients who had any other systemic diseases that could affect the prevalence of oral lesions or could have an impact on the oral cavity like hepatitis C, autoimmune conditions, malignancy and patients with a history of receiving chemotherapy or radiotherapy were excluded.

All participants came after overnight fasting on the day of examination. In a calm room (the room of the health visitor), a full history was taken from all the participants including: sociodemographic data, symptoms or signs related to diabetes or impaired glucose tolerance, family history and general medical examination. Demographic data were recorded in the form of age, sex and address and the medical records were assessed for metabolic condition and duration of diabetes. All the participants were asked about their feeling of burning sensation, taste dysfunction or dry mouth; then a comprehensive oral examination was performed using two plain mouth mirrors in order to view lesions, sharp explorer to reveal carious lesions and Williams graduated probe to investigate the periodontal condition more truthfully.

## Statistical analysis

Information was fed to the computer system and analyzed using IBM SPSS software package version twenty. (Armonk, NY: IBM Corp) Qualitative information was designated in numbers and percent. Quantitative information was designated using range (minimum and maximum), mean, standard deviation and median.

**RESULTS**

*As showed in table (1, 2) Figure (1,2)*

TABLE (1): Distribution of the studied cases according to demographic data (n=200)

	No. (%)
<b>Age</b>	
Mean ± SD.	53.4 ± 6.7
Median (Min. – Max.)	55 (32 – 60)
<b>Sex</b>	
Female	126 (63%)
Male	74 (37%)

TABLE (2): Distribution of the studied cases according to different parameters (n = 200)

Oral Condition	No. (%)
Xerostomia	90 (45%)
Burning sensation	40 (20%)
Taste dysfunction	65 (32.5%)
Caries	116 (58%)
Periodontitis	112 (56%)
Candida	30 (15%)
Completely edentulous	11 (5.5%)



Fig. (1) : Showing periodontal condition.



Fig. (2): Showing pseudomembranous candidiasis on the lateral sides of the tongue.

**DISCUSSION**

Diabetes mellitus is one of the causes of death and disability all around the world <sup>(10)</sup>. The diabetes mellitus prevalence in 2011 worldwide was around 8% and is expected to increase by 10% in 2030. Low and middle-income countries harbor about 80% of diabetic patients <sup>(11)</sup>.

In the current study it was found that the female participants were more than males with percentage of 63% to 37 % respectively and this was in accordance with a previous study reported by **Mahmoud et al** <sup>(12)</sup> with 76.4 % females and 23.6 % males. This could attribute to the risk factors of diabetes type 2 like obesity and physical inactivity. **Demographic survey (2008)** that carried out in Egypt reported that nearly 50% of Egyptian men and 65%-80% of Egyptian women are obese or overweight <sup>(7)</sup>. It was found that 50% of the surveyed individuals have central obesity by The Egyptian National Hypertension Survey Program, which was conducted in Egyptian governorates and included 2313 adults over 25 years of age, therefore, obesity is considered to be associated with the increased risk of diabetes and cardiovascular disease <sup>(7)</sup>.

**Caries** was the most prevalent oral changes in the present study with percentage 58 % and this

was in agreement with several other authors<sup>(13-21)</sup>, while some authors have reported low prevalence of dental caries among diabetics<sup>(22-24)</sup>.

This could be explained by the more frequent meals in diabetic patients than normal patients and repeated intakes of even small amount of carbohydrates may be cariogenic when coupled with elevated blood glucose level and hyposalivation<sup>(25)</sup>. Fundamentally, changes in hydrogen ion concentration in the saliva of these groups of patients are predicted<sup>(26)</sup>. This reduction of hydrogen ion concentration can result in an extremely high cariogenic situation, and accordingly cariogenic bacteria like *Treponema denticola*, *Prevotella nigrescens*, many species of *Streptococci* will increase<sup>(27)</sup>. The proliferation of the latter species can result in a fair lower hydrogen ion concentration, and this spiteful sequence persists, moreover, it has an influence on the protective microflora of the oral cavity growing status<sup>(26)</sup>. Once analyzing some specific categories of diabetes, that is determined in diabetes type 2 there is a correlation with a substantially higher incidence of dental caries and crueller decay<sup>(30)</sup>.

**Periodontitis** was found in 112 patients out of 200 with prevalence 56 % and this was in accordance with previous studies<sup>(28-31)</sup>. Diabetes type two and periodontal disease appeared to be allied intensely, nevertheless, to take issue geographically, related to factors like genes, educational and ethnic variances<sup>(35)</sup>. There could be a causative bilateral relationship, as when the severity of one pathology is increased (diabetes or periodontitis) can adversely affect the severity of the other. On the opposite hand, the advance of glycemic management in diabetes type 2 is estimated once their periodontal disease is controlled<sup>(32)</sup>. Numerous mechanisms are planned to clarify the inflated vulnerability to periodontitis, as well as changes in the response of the host, subgingival micro-organisms, metabolism of collagen, vascularity, sulcular fluid of the gingiva and heredity conditions.

Many pathophysiological mechanisms (impaired function of neutrophil, reduced phagocytosis and leukotaxis) even have been involved within the inflated loss of alveolar bone in diabetic patients<sup>(33,34)</sup>.

**Burning sensation** was reported in 40 out of 200 of our patients with prevalence 20 % and this was in accordance with other previous studies<sup>(12, 35, 36, 37)</sup> with prevalence (18.8%, 17.8%, 17.2% and 10% respectively). But, the results were conflicting with one study reported in Kingdom of Saudi Arabia who reported a percentage (39%)<sup>(38)</sup>. This conflict in the prevalence of burning sensation can be attributed to the variability in symptomatology, lack of precise diagnostic criteria, and the different population<sup>(39)</sup>.

The precise explanation for burning mouth is unidentified; however it may be due to many reasons like xerostomia, menopause, candidiasis, diabetes, therapy of cancer, psychological issues and reflux of acid. BMS is categorized into 2 types: 1ry idiopathic, and 2ry due to systemic procedure; 2ry type of BMS has been rumored to occur with diabetes. It might unfavorably have an effect on the flexibility to keep up healthy oral status in diabetic patients. The other explanation of BMS in patients with diabetes is diabetic neuropathy. The nerve injury in diabetic neuropathy has been rumored to indicate a rise within the Langerhans cells that are related with immune disruption.<sup>(39, 40)</sup> Thus, any patients who have BMS symptoms should be critically screened for diabetes.

**Xerostomia** was found in 90 patients out of 200 with prevalence 45% and this was in agreement with previous studies with prevalence of (51%, 47.4%, 34% and 43.8% respectively)<sup>(41-44)</sup>. Diabetic patients have complained of having dry mouth, or xerostomia, and have suffered from dysfunction in their salivary glands<sup>(45,46)</sup>. The reason is unknown, but it could be due to polyuria, autonomic neuropathies, and microvascular changes and variations in the salivary glands basement membranes<sup>(47,48)</sup>.

**Taste dysfunction** was reported in 65 out of 200 patients with prevalence of 32.5% which was in consistent with previous studies with prevalence of (40.4%, 33% and 40% respectively) <sup>(12, 38, 48)</sup>. Alteration in the sense of taste in diabetic patients could attributed to the neuropathic mechanism in the nerves that are responsible for taste. Altered taste sensation had the strongest association with length of diabetes and diabetic neuropathy <sup>(49)</sup>, likewise because dehydration of mucosa, reduced production of gustin, lack of zinc and coating of the tongue <sup>(41)</sup>.

**Candida** was found in thirty out of two hundred patients in our study with prevalence of 15 % and it was in accordance with other studies which reported prevalence (15%, 24% and 21% respectively) <sup>(43,37,50)</sup>.

The prevalence of candidiasis in diabetic patients has been documented several years ago<sup>(51)</sup>. Candidiasis is widely predominant among diabetic patients particularly smokers, dentures wearers, those with poor glycemic control and the diabetic patients on steroids and broad spectrum antibiotics <sup>(52)</sup>. Furthermore, diabetic patients had salivary dysfunction that could be due to the greater prevalence of candida in diabetic patients. It is obvious from previous scholarships that locally and systematically disposing influences that could increase the rate of fungal infections risk in diabetic patients <sup>(53)</sup>.

## CONCLUSIONS

The consequences of poor oral health could also be additionally severe in diabetes patients attributable to advanced age and impaired glucose levels which will increase the chance for general consequences of oral and dental pathologic conditions. Dentist should recruit the diabetic patients to keep their oral cavity in a good and healthy status and counseling them towards a proper diet. Meeting these patients' oral health needs is of predominate importance, since this is able to improve the oral health-related

quality of life, and this might be achieved by putting in associate integrated oral health intervention involving general health care practitioners and dentists.

## RECOMMENDATIONS

1. Appropriate and effective oro-dental health care programs oriented to the diabetic patients and tested in clinical trials.
2. A national oral health promotion campaign should be carried out targeting diabetic patients to raise their awareness of the need for dental visits (even if they are edentulous).
3. An adequate number of trained hygienist and dental assistants are also of importance in the outpatient clinics to participate in the treatment plans.
4. The present study is recommended to be applied in other governorates because it may help in the awareness with the extent of presence of different oral lesions throughout republic.

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