

## Diabetes Mellitus Affect the Oral Cavity - A Review

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**Abstract:** Diabetes Mellitus can be considered as the most common metabolic disorder which is characterized by deranged carbohydrate, protein and fat metabolism. In this disorder due to absolute or relative lack of insulin various complications take place which include an array of changes in oral cavity such as periodontitis, dental decay, hypo salivation etc. As a consequence of decreased salivary flow various alterations in oral cavity take place such as taste alteration, halitosis, various infections and many more; which alters the quality of life of diabetes patients. Hence dentists may play a major role to reduce the mortality and morbidity related to diabetes by early diagnosis of this disorder and appropriate referral.

**Key words:** Dentist • Diabetes • Hypo Salivation • Periodontitis Oral Cavity

### INTRODUCTION

Diabetes mellitus can be described as a group of metabolic disorders with one common manifestation that is hyperglycemia.[1]

According to World Health Organization Diabetes mellitus is “a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentration of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves”[2].

Over past few decades the prevalence of diabetes mellitus in India has increased in such an alarming extent that as per recent date India can be titled as “Diabetic Capital of the World”. [3]

The report published by the International Diabetes Federation (IDF) and the Madras Diabetes Research Foundation stated that, in 2011 India had 62.4 million people with type 2 diabetes compared with 50.8 million the previous year. As per the prediction of IDF India will have 100 million people with diabetes by 2030 [4, 5].

Though the classical triad of diabetes consists of polyuria (Frequent urination), polydipsia (Increased thirst) and polyphagia (Increased hunger) various oral

changes have been reported to be associated with diabetes mellitus.

The diagnosis as diabetes is confirmed by fasting plasma glucose level =126mg/dl, 2-hour value of =200 mg/dl in 75 g oral glucose tolerance test (OGTT), casual plasma glucose level of =200 mg/dl or level of glycated haemoglobin (HbA1C) =6.5% [6].

**History of Diabetes:** The history of diabetes started date back to antiquity. The papyrus of ancient Egypt discovered by Georg Ebers in 1862 AD described about a state which resembles diabetes mellitus at the time of 1550 B.C.

Later Aretaeus of 2<sup>nd</sup> century described the detail of this disorder and introduced the term diabetes. As per his description, “Diabetes is a dreadful affliction, not very frequently among men, being a melting down of the flesh and limbs into urine”.

In ancient India Sanskrit literature of the 5<sup>th</sup> - 6<sup>th</sup> century AD during the period of Susruta, Charaka and Vaghbata was first to report this disease with the name “Madhumeha” [7, 8].

The modern era of diabetes started with the observation by Thomas Willi, who declared diabetes as primarily a disease of the blood and not originating from the kidneys in 1776.

In the modern history of diabetes, Cullen first classified diabetes into two types based on the urine of patients.

Asper his classification, two types of diabetes are, diabetes with the urine of “the smell; color and flavour of honey” and diabetes, with limpid but not sweet urine.

Later in 1936, Diabetics were divided into two types based on “insulin sensitivity” and oral medications for diabetics were introduced in 1955.

Today researchers have progressed a lot. Work is in progress to discover an insulin patch, inhaled insulin and many more [7, 8].

**Classifications of Diabetes Mellitus:** The first widely accepted classification of diabetes mellitus was published by WHO in 1980. They divided diabetes mellitus as

- Insulin-Dependent Diabetes Mellitus (IDDM) Or Type-1 And
- Non-Insulin-Dependent Diabetes Mellitus (NIDDM) Or Type-2.

The present classification system which is followed worldwide includes four types of diabetes mellitus: type 1, type 2, “other specific types” and gestational diabetes. “Other specific types” contains diabetes mellitus of various known etiologies [9].

#### **Etiology and Pathophysiology of Diabetes Mellitus**

**Type-1 Diabetes Mellitus:** Etiopathogenesis of type-1 diabetes can be explained based upon genetics, autoimmunity and environmental factors.

Type-1 diabetes is a polygenic disorder. Various studies have shown that this disease is highly associated with human leukocyte antigen (HLA) alleles DR3 and DR4 [10].

Local inflammation, autoantibody production, specific T cell responses takes place in this disease which favour of autoimmunity as etiologic factor [10].

On the other hand congenital rubella infection can be explained as a clearly defined environmental factor which increases the risk for developing type-1 diabetes [10].

**Type-2 Diabetes Mellitus:** The etiology of type-2 is commonly explained as a combination of genetic and various environmental factors. The genetic factors are related to impaired insulin secretion and insulin resistance. On the other hand, environmental factors are age, obesity, overeating, lack of exercise and stress related [11].

**Complication of Diabetes:** Chronic systemic complications of diabetes can be classified as macroangiopathies, microangiopathies and neuropathy. Macroangiopathies includes atherosclerosis, myocardial disease, ischemic heart disease, cerebrovascular diseases, intermittent claudication and gangrene of the feet. [12]

Retinopathy, nephropathy and capillary basement membrane thickening are considered as microangiopathies.

On the other hand peripheral sensory neuropathy, femoral neuropathy, cardiac autonomic disturbance and autonomic neuropathy are known as neuropathic diseases.

Autonomic neuropathy in Diabetes Mellitus includes postural hypotension, impotence, diabetic diarrhoea, urinary retention, gustatory sweating as well as abnormal pupillary reflexes [13].

Diabetes also increases the risk of cancer, musculoskeletal disorders, emotional difficulties as well as pregnancy related complications [14].

**Oral Manifestation of Diabetes Mellitus:** Numerous oral changes are associated with diabetes mellitus. These complications include periodontal diseases, dental caries, burning mouth syndrome, impaired healing, various potentially malignant disorders, dysfunction of salivary flow and opportunistic fungal infections [15,16].

Among fungal infections, Oral Candidiasis and Candida species related complications are most common. Candida species related complications are median rhomboid glossitis, denture stomatitis, angular cheilitis as well as pseudomembranous candidiasis.

Bjelland *et al.* [17], Brian *et al.* [18] and Anirudh *et al.* [19] reviewed diabetes mellitus and periodontal diseases and concluded that diabetes mellitus and periodontitis each had an influence on the other either independently or by less understood complicated mechanism.

Various authors have suggested that influence of diabetes mellitus on periodontal diseases could be due to the formation of advanced glycation end products (AGE) as a result of hyperglycemia/hyperlipidemia. These products by binding to receptors transform macrophages to produce various inflammatory cytokines such as interleukin-1, interleukin-6 as well as tumor necrosis factor-alpha; which could be responsible for periodontitis.

Contradictory opinion exists regarding association of dental caries and diabetes mellitus. Various authors have suggested that due to reduced sugar ingestion occurrence of decay is low in Diabetes Mellitus patients.

Muhammad *et al.* [20] in their study found that salivary pH, flow rate and calcium levels were low in diabetics as compared to controls. They stated that the optimum salivary calcium level might supply calcium continuously to arrest the demineralization of tooth to reduce the dental caries occurrence. Hence risk of dental caries is increased in Diabetes Mellitus.

Various studies have shown that in diabetes mellitus the most prominent manifestation is xerostomia which invariably causes glossodynia, ulcers and denture intolerance.

Different authors have found higher prevalence of potentially malignant disorders in type-2 diabetes mellitus patients as compared to normal population. This could be attributed to progressive atrophy of oral mucosa due to xerostomia in Diabetes Patients which can increase permeability of oral mucosa to carcinogens [21].

On the other hand, few authors hypothesized that in Diabetes Mellitus increased blood glucose levels may cause excessive free radical formation as well as reduced activity of antioxidant, which causes oxidative damage to DNA to facilitate carcinogenesis [22,23].

In diabetes mellitus taste alterations has reported. This is due to deficiency or absence of gustin which constantly maturates taste papillae.

Diabetes is also associated with delayed wound healing.

## CONCLUSION

The knowledge on pathophysiology of diabetes mellitus and oral manifestation is of great importance to dentist as well as general practitioner. A number of patients with undetected, poorly controlled disease are frequently encountered with variety of oral changes. If the state of diabetes is not detected for these patients, dental emergency can turn into medical emergency.

Hence medical as well as dental professionals should receive a more expanded knowledge on various changes of oral cavity in diabetes mellitus.

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