

REVIEW ARTICLE

Diabetes Mellitus Leading Expiry of Oral Health

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ABSTRACT

Diabetes mellitus is a group of metabolic disorders characterised by abnormal secretion and metabolic action of insulin. Diabetes mellitus is a chronic disease affecting all age groups. It is one of the leading causes of mortality and morbidity worldwide. Diabetic patients increase their body's susceptibility to infection and it is a risk factor for periodontal diseases and oral infections. It alters the oral health to a great extent. This article gives an overview of the pathophysiology, oral manifestations and complications of the diabetes mellitus.

Keywords: Diabetes Mellitus, Oral health, Oral infections

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INTRODUCTION

Diabetes mellitus (DM) is a complex metabolic disorder characterized by a chronic hyperglycemia and relative or absolute insufficiency of insulin secretion and / or concomitant resistance to metabolic action of insulin on target tissues.¹ Diabetes is a silent epidemic which has a huge impact on the public health, as it is one of the leading causes of mortality and morbidity worldwide due to its macrovascular and microvascular complications.

The worldwide figure affected by diabetes is predicted to be 300 million by 2025 and at least 366 million by 2030.² Diabetes mellitus affects the multiple organs which includes eyes, kidney, nerves, heart, brain and blood vessels. Diabetes has profound effects on oral tissues, particularly in individuals with poor glycemic control.³ There are various inflammatory and soft tissue pathologies in oral cavity which are associated with prevalence of diabetes. Periodontal disease is the sixth most common disease following the other oral manifestations such as xerostomia, caries.⁴

Early identification and/or management of these oral lesions may help in the early diagnosis of diabetes and in maintaining better glycaemic control. Therefore, diabetic microvascular and macrovascular complications need to be identified and included in the final care of diabetes in order to fight against this chronic metabolic disease effectively.⁵ So, this article aims to review and increase the awareness of oral manifestations and complications of diabetes mellitus.

CLASSIFICATION OF DIABETES

The American Diabetes Association has proposed a classification based on disease etiology which includes two major forms- TYPE 1 and TYPE 2 Diabetes. Type 1 is due to absolute insulin deficiency and is auto immune in nature leading to destruction of beta cells in the pancreas. Type 2 Is due to relative insulin deficiency that may be associated with varying degrees of insulin action defects known as insulin resistance. Other specific forms are diabetes secondary to autoimmune endocrinopathies, infection (congenital rubella, cytomegalovirus, coxsackie virus), genetic disease and DM induced by drugs or pregnancy.⁶

PATHOPHYSIOLOGY

Type 1 Diabetes is caused by insulin deficiency, due to autoimmune destruction of pancreatic- β cells mediated by T-cells and humoral mediators (Tumor necrosis factor, Interleukin-1, Nitric oxide).⁷ The pathophysiology of type 2 diabetes is characterised by

- A decreased response of peripheral tissues to insulin (insulin resistance)
- Beta cell dysfunction that is manifested as inadequate insulin secretion in the face of insulin resistance and hyperglycemia.

Insulin resistance generally develops due to hyperglycemia and is usually accompanied by the mechanism of compensatory beta cell hyperfunction and hyperinsulinemia in the early stages of the development of diabetes (FIG I)⁸

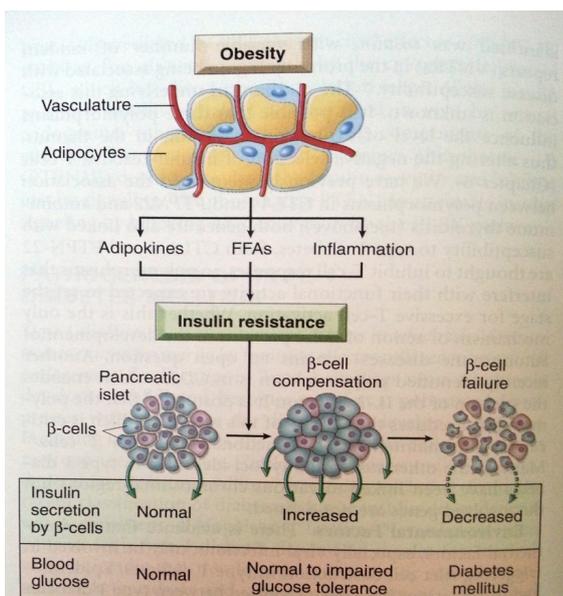


Figure-I: Development of Type 2 Diabetes Mellitus

DIAGNOSTIC CRITERIA FOR DIABETES

Fasting plasma glucose, 2 hour plasma glucose during an Oral Glucose Tolerance Test (OGTT), Random plasma glucose levels and glycated haemoglobin (HbA1c) are the diagnostic methods used for diabetes. American Diabetes Association has suggested some of the criteria for the diagnosis of diabetes.⁹ (Table 1)

ORAL MANIFESTATIONS OF DIABETES DIABETES AND PERIODONTITIS

Diabetes mellitus has been associated with advanced periodontal disease since 1892.¹⁰ Periodontitis refers to inflammation of the tissues that surround and supports the teeth. Periodontitis represents the first 'classic' complication which is initiated by the enlarged velvety red gingiva that bleed readily and may represent the first sign of disease onset.¹¹ The proposed mechanism behind the onset includes¹²:

1. Changed functions of PMN leucocytes and increased concentrations of inflammatory inducing cytokines which contribute to whole inflammatory state.
2. Excessive activity of proteolytic enzymes affecting the periodontium
3. Changes in collagen metabolism
4. Altered host response
5. Altered subgingival flora

Periodontitis is the major cause behind early exfoliation of the tooth in diabetic individuals as it is responsible for increased mobility. Periodontitis has been reported as the 6th complication of diabetes for which type 2 diabetes is considered a major risk factor. Periodontal therapy is a choice to maintain the gingival and as well as glycemic status in such patients.¹³

DIABETES AND DELAYED WOUND HEALING

The process of wound healing occurs as a sequential cascade of overlapping processes and requires the co-ordinated completion of a variety of cellular activities, including phagocytosis, chemotaxis, mitogenesis, collagen synthesis. These activities do not occur in a random fashion but, rather, in a carefully regulated and reproducible cascade that correlates with the appearance of different cell types in the wound. These distinct biologic mechanisms are involved in all healing processes however, they are significant differences in the contribution of each mechanism, depending on the type of wound. The impairment of healing and the lack of resistance to infection in patients with diabetes represent a familiar clinical problem. Experimental data include that it is not the hyperglycemia found in

Table-1: Criteria for Diagnosis of Diabetes Mellitus

S.No	Criteria for Diagnosis
1)	Symptoms of diabetes plus casual venous <i>plasma</i> glucose ≥ 11.1 mmol/l (200 mg/dl). Casual is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss
2)	Fasting <i>plasma</i> glucose ≥ 7.0 mmol/l (126mg/dl) or whole blood ≥ 6.1 mmol/l (110mg/dl). Fasting is defined as no calorie intake for at least 8 hours
3)	2 hour <i>plasma</i> glucose ≥ 11.1 mmol/l (200mg/dl) during oral glucose tolerance test using 75 g glucose load In the absence of symptoms, these criteria should be confirmed by repeat testing on a different day. If the fasting or random values are not diagnostic, the 2 hour value post-glucose load should be used

Note:Fasting plasma glucose < 6.1 mmol/l—normalFasting plasma glucose ≥ 6.1 and < 7.0 mmol/l—impaired fasting blood glucoseFasting plasma glucose ≥ 7.0 mmol/l—provisional diagnosis of diabetes; the diagnosis must be confirmed

diabetes that inhibits wound healing but, rather, the lack of insulin that may be important which also includes changes in collagen metabolism which is responsible for delayed wound healing. Studies on wound treated with antibodies to insulin showed delayed wound healing while insulin itself has been shown to improve skin healing when applied topically to wounds in diabetic mice.⁸

DIABETES AND XEROSTOMIA, SALIVARY GLAND ABNORMALITIES

Xerostomia is dryness of the mouth which is a patient's subjective feeling. It can be seen in both type 1 and type 2 diabetic individuals. Polyuria, polydipsia and the resulting dehydration may

significantly contribute to the oral dryness. Factors that contribute for oral dryness are drugs, salivary hypofunction, undesirable hormonal, microvascular and neuronal changes. Persistent xerostomia compromises the protective function of saliva, thereby increasing the susceptibility for dental caries, oral mucosal soreness and altered taste perception.^{14,15}

Non neoplastic and non inflammatory bilateral parotid gland enlargement was reported way back in 1900's and termed as 'Sialadenosis'.¹⁰ A compensatory hyperplasia resulting from reduced insulin level and xerostomia has been hypothesized as a probable cause. It has been reported that with control of the diabetic state one half of the cases show slight reduction in glandular size.³

DIABETES AND DENTAL CARIES

Lot of studies has been done regarding the prevalence of dental caries in diabetic patients. According to such studies there is increased glucose levels in saliva and gingival crevicular fluids, altered plaque microflora, reduced salivary flow, greater number of *Streptococcus mutans* and *Lactobacilli* as well as poor metabolic control of diabetes predispose this group of the population to dental caries.^{10,14,16}

DIABETES AND ORAL INFECTIONS

Clinically diabetes indicates their likelihood for the development of some mucosal disorders. A higher prevalence of oral lichen planus especially the erosive type, oral fungal infections and recurrent aphthous stomatitis has been reported.¹⁷ The associated syndrome with DM is Grinspan's Syndrome, lichen planus and hypertension completes the triad for this syndrome. Documentation has been done in the past that prevalence of lichen planus in diabetics is 10-85%.¹⁸ Lichenoid reactions may be encountered in diabetics resulting from the use of nonsteroidal anti-inflammatory drugs, angiotensin-converting enzyme inhibitors, chlorpropamide and other oral hypoglycemic or antihypertensive medications, which resolve once the drug is withdrawn. Albrecht M et al have reported an increased prevalence of oral leukoplakia in diabetics (6.2%)

as compared to non-diabetic controls (2.2%) and a prevalence of 1% for oral lichen planus in 1600 patients with diabetes mellitus.¹⁹

Oral candidiasis is the most common opportunistic fungal infections in diabetes which is caused by *C.albicans* mainly, followed by zygomycosis and aspergillosis. Studies have shown increased oral candidal carriage in diabetics as compared to non diabetics.^{20,21}

Factors that favor increased candidal carriage in diabetics include neutrophil dysfunction, altered host resistance due to smoking, denture-wear, hyperglycemia, increased salivary glucose levels, impaired antifungal immunoglobulins in the saliva, salivary hypofunction and use of immunosuppressant medications. Proper antifungals should be advised and the most important is to find the underlying cause behind it.²²

Fissured tongue, indicates multiple fissures or furrows which are present on the dorsum of the tongue which is frequently seen in type 1 diabetics.²³ Burning mouth syndrome characteristically described by the patient as a burning sensation of the oral mucosa in the absence of clinically apparent mucosal alterations. females that to perimenopausal and postmenopausal are more affected BMS in the diabetic has been attributed to peripheral neuropathies associated with diabetes. BMS appears to be slightly more common in type-1 diabetic population.²⁴⁻²⁶

The micro vascular abnormalities are diabetic retinopathy and diabetic nephropathy whereas macrovascular abnormalities are due to accelerated atherosclerosis which results in increased incidence of stroke and myocardial infarction. The presence of oral manifestations in patients of DM indicates poorly controlled glycemic status and requires evaluation to detect long-term complications. Knowledge for such population of oral health with diabetes is generally poor and now there is the need for appropriate health education and health promotion to improve the oral health status of such diabetic patients.²⁶

RECENT ADVANCES

Recent research has validated the use of fasting

salivary glucose level which can be used as a non invasive diagnostic, as well as monitoring tool to assess the glycemic status of diabetes mellitus patients which will facilitate timely interventions to prevent or delay the disease progression and its complications.³

CONCLUSION

Diabetes mellitus is a chronic, non-communicable and endemic disease. Type 2 compared to type 1 diabetes mellitus is more prevalent worldwide and increasing, especially in India. Prevention and management of oral complications, especially periodontal disease, in patients with diabetes is important due to their possible adverse effect on glycaemic control. It is of paramount importance to provide good oral care to combat complications, prevent morbidity and mortality and therefore improve the quality life of an individual.

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