

Oral complications in diabetes mellitus

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterised by high blood glucose levels that can lead to various systemic complications. Among these complications, oral complications play an important role due to the high vascularisation and innervation of the oral cavity. Regular dental examinations, effective oral hygiene practices and treatments to regulate blood glucose levels are the main methods that contribute to the effective management of complications. Understanding the relationship between diabetes mellitus and oral health and implementing preventive strategies are crucial to improve the overall health and quality of life of individuals with diabetes mellitus. The aim of this review is to provide an overview of these oral complications and the problems they cause.

Keywords: HbA1c, complications, oral physiopathology

INTRODUCTION

Diabetes mellitus is a common metabolic disease in the population that occurs with impairment of insulin secretion or insulin activity or both.¹ It is characterised by high blood glucose levels and glycosuria. It is a disease that affects carbohydrate, fat and protein metabolisms and many other systems in the body and affects the quality of life negatively with severe complications. It may have an asymptomatic insidious onset and a family history is frequently present.² Diabetes mellitus (DM) is recognized as a major global health concern, affecting a significant portion of the population worldwide. Estimates from the International Diabetes Federation (IDF) suggest that the prevalence of diabetes will increase considerably by 2045, with projections indicating that approximately one in eight adults around 783 million individuals will be living with DM.³

DIABETES MELLITUS

According to the 2023 Guideline for the Diagnosis and Treatment of Diabetes, it is sufficient to meet only one of the following criteria to make a diagnosis of diabetes:⁴

- Glycosylated haemoglobin (HbA1c) value $\geq 6.5\%$
- Plasma glucose ≥ 126 mg/dl measured after 8 hours fasting
- Plasma glucose ≥ 200 mg/dl measured by oral glucose tolerance test after 75 grams of oral glucose intake following a 12-hour overnight fast
- Plasma glucose ≥ 200 mg/dl measured at any time of the day with diabetes symptoms is one of the diagnostic criteria.

Clinical symptoms include dry mouth, overeating or loss of appetite, excessive thirst, excessive urination, frequent

urination at night, weight loss, blurred vision, numbness in the feet, tingling, burning, urinary tract infections, itching, dry skin and fatigue.⁵

ORAL COMPLICATIONS

Many oral complications can occur in patients with poorly controlled diabetes. These include increased susceptibility to infection, delayed wound healing, xerostomia, increased periodontal disease, loss of attachment and alveolar bone resorption, recurrent periodontal abscesses, gingival overgrowth, oral candidiasis, acetone breath odour, increased salivary glucose levels, Plaque accumulation due to increased glucose in saliva and increase in caries development, taste disturbances, oral lichen planus, ulcerations, pulp infections, alveolitis, hyperkeratosis, erythroplakia, leukoplakia, lesions affecting the tongue (such as geographic tongue, tongue pain) and burning in the mouth.⁶

Xerostomia has a negative effect on the quality of life of patients by causing many problems including difficulty in eating, swallowing and speaking. An increase in salivary dysfunction has been found in diabetics with poor glycaemic control.⁷

The prevalence of dental caries is increased in diabetic patients (**Figure 1**). The factors that cause this include decreased salivary secretion and buffering capacity, increased salivary glucose level, increased levels of streptococci and lactobacilli, and pulp necrosis resulting from irreversible pulpitis may also be seen as a result of chronic hyperglycaemia.⁸ Apical abscesses formed after pulp necrosis may progress to lodge abscesses and osteomyelitis (**Figure 2**).³

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Figure 1. Root caries in the lower anterior teeth of a patient with diabetes⁹

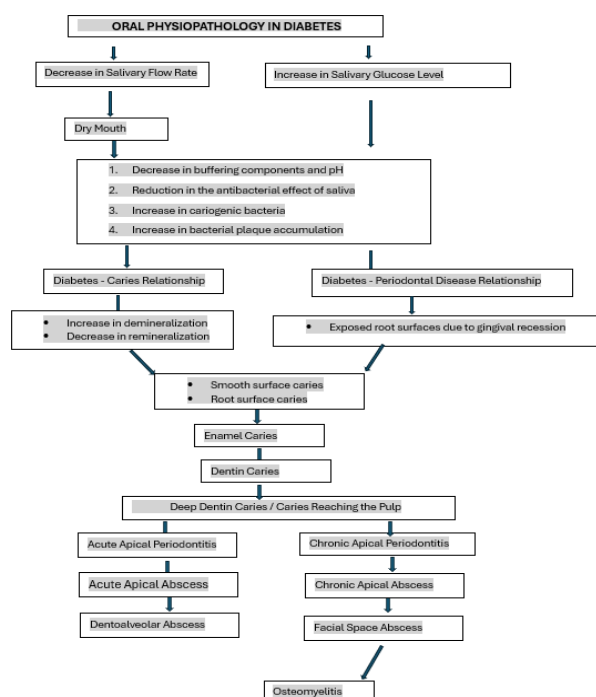


Figure 2. Oral physiopathology in diabetes⁴

Reduced saliva, an impaired defence mechanism and poor metabolic control may play an important role in the development of increased oral infections (Figure 3).¹⁰ Candida infection has been found to be more common in diabetic patients who smoke, use dentures, have poor glycaemic control and use steroids and broad-spectrum antibiotics.¹¹

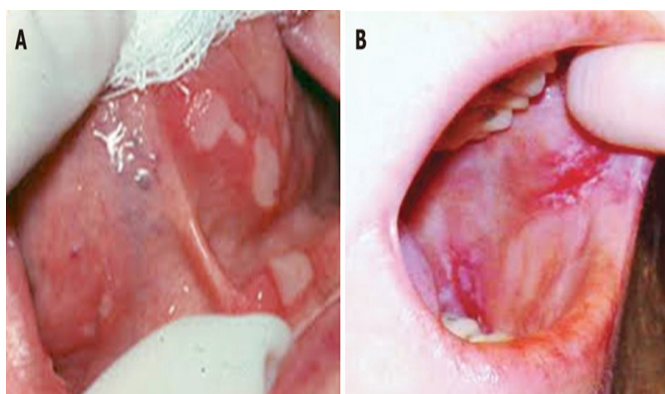


Figure 3. Recurrent aphthous stomatitis, oral lichen planus¹²

The complaint of burning mouth in diabetics is attributed to poor glycaemic control, metabolic changes in the oral mucosa, angiopathy, candida infection and neuropathy.⁸ Patients with diabetes may experience impairment in the perception of sweet and salty flavours.¹³ Disorders in taste perception may occur due to a decrease in the amount of saliva and neuropathy.⁴

Fissured tongue, geographic tongue, recurrent aphthae, lichen planus and similar lesions may also be associated with diabetes (Figure 4).¹⁰



Figure 4. A 32-year-old male patient diagnosed with diabetes mellitus with papillary atrophy in the central area along the central longitudinal fissure of the tongue¹⁴

Impairment of the immune system in diabetes, microcirculatory changes with decreased blood flow, dry mouth, changes in the flow and composition of saliva and smoking are thought to be effective in the aetiology of these lesions.⁸

Delayed healing of mouth sores is also a common condition in diabetes. Factors that delay wound healing in the body in general in diabetes are also valid in the mouth. Delayed vascularisation and impaired defence response, decreased blood flow and hypoxia are effective factors.¹⁵

There is a bidirectional relationship between diabetes and periodontal diseases that affects each other in many ways. It is estimated that the risk of developing periodontal disease increases 2-3 times in diabetic individuals.¹⁶ Diabetes increases susceptibility to periodontal disease through various biological mechanisms. These include impaired neutrophil function, increased collagenase activity, and alterations in the subgingival microbiota. Elevated glucose levels in the gingival crevicular fluid create a favorable environment for the proliferation of pathogenic bacteria responsible for periodontitis. Moreover, alterations in the inflammatory response in diabetic patients lead to increased production of proinflammatory cytokines, contributing to the tissue destruction observed in periodontal disease.¹⁷ Periodontal disease is considered the sixth most common complication in patients with diabetes.¹⁸ Increased gingival infection, loss of attachment and alveolar bone resorption, and recurrent periodontal abscesses are common complications in diabetic patients. The severity of periodontal disease also increases especially in long-term diabetic patients with poor

blood glucose control (Figure 5).¹⁹ According to the new classification of periodontitis, the level of glycaemic control in diabetes affects the grading of periodontitis.²⁰



Figure 5. Patient with uncontrolled type 2 diabetes and no previous professional dental care²¹

It has been observed in many studies that oral flora also changes in patients with diabetes. Although specific bacterial species increased and decreased in the studies, it was observed that pathogenic species increased.² Microenvironments high in glucose may determine the habitat to favour filtration and anaerobic growing bacteria that feed on glucose-rich food. This is supported by the high numbers of *Propionibacterium*, *Corynebacterium*, *Sphingomonas*, *Capno-cytophaga*, *Neisseria*, *Pseudomonas* and *Bergeyella* in hyperglycaemic subjects.²²

CONCLUSION

Chronic and lifelong diabetes is a global public health problem with its increasing prevalence. For this reason, measures to be taken for prevention, treatments in case of disease and prevention of related complications are of great importance. The status of oral dental health is very important in glycaemic control and nutrition of patients with diabetes. Because it is very difficult to regulate blood sugar in a patient who cannot be properly nourished without diet control. For this reason, it is important that diabetic patients are informed about possible oral complications, pay much more attention to oral dental health compared to healthy individuals, and do not neglect dentist controls and treatments. In this regard, dentists and medical doctors should work in coordination and inform the patient.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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