

## **Oral Manifestations in Diabetes Mellitus and Management Considerations: A Review**

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**Abstract:** Diabetes mellitus is a chronic metabolic disorder defined as an increase in sugar levels in the bloodstream brought on by either insufficient insulin secretion, resistance to insulin's effects, or both. All age groups are affected by the chronic condition known as diabetes mellitus. It is among the world's major causes of mortality and morbidity. Xerostomia, dental caries, periodontal disease, gingivitis, candidiasis, other oral infections, burning mouth syndrome, taste dysfunction, oral mucosal alterations, delayed wound healing, and localized osteitis are common oral manifestations of diabetes mellitus. Major complications impacting a patient's quality of life include oral complications in diabetic individuals. Long-term oral problems in these patients' harm blood glucose regulation, making oral complications care and prevention important. The dental professional should be familiar with DM's oral manifestations to identify this disease complication. This article not only discusses the oral manifestations but also discusses management considerations in diabetic patients which will help future dental professionals in dental practice. This article aims to spread knowledge and awareness about the potential oral manifestations of diabetes mellitus and treatment considerations.

**Keywords:** Diabetes mellitus, Oral manifestations, Diabetic patients, Periodontal disease, Xerostomia, Oral infections, Mucosal alteration

### **Introduction:**

Diabetes mellitus is a chronic metabolic disorder defined as an increase in sugar levels in the bloodstream brought on by either insufficient insulin secretion, resistance to insulin's effects, or both<sup>1</sup>. Hyperglycemia, glycosuria, polyuria, polyphagia, and polydipsia are symptoms of failure of the peripheral body to use the sugar in the cells, which causes sugar retention in the cells.<sup>2</sup> The degree and duration of hyperglycemia are typically inversely correlated with the severity of diabetes complications<sup>3,4</sup>. To varied degrees, disruptions in the metabolism of

proteins, carbs, and lipids accompany chronic hyperglycemia.<sup>5</sup> Diabetes is a global health concern that has a detrimental impact on patient survival, length of life, and healthcare costs. According to the International Diabetes Federation, India has 77 million diabetes patients, second only to China in the world. 8.8% of the population was affected by incidents overall in India in 2017, according to IDF6. Diabetes is growing more prevalent worldwide. Six Currently, 422 million people worldwide suffer with diabetes. The World Health Organisation reports that the number of persons over the age of 18 who have diabetes has increased and is predicted to reach 439 million by 2030, or almost 10% of the adult population.<sup>6</sup> Consequently, the frequency of oral symptoms in diabetic patient also increasing. There is frequently an inverse relationship between the severity of diabetes complications and the level and duration of hyperglycemia. Common oral signs of diabetic mouth syndrome (DM) include xerostomia, dental caries, periodontal disease, gingivitis, candidiasis, other oral infections, burning mouth syndrome, taste dysfunction, altered oral mucosa, delayed wound healing, and localised osteitis.<sup>7,8</sup> The only things that can be addressed are the signs and symptoms of diabetes. The earlier a patient's ailment is detected, the better their prognosis is since the repercussions are less severe and easier to cure in the early stages of the illness.<sup>8</sup> To recognise early indications of the condition, the dentist should be knowledgeable about the oral manifestations of diabetes mellitus. The practitioner must also know how the controlled illness affects therapy while caring for DM patients. This review article focuses on common oral manifestations of diabetes.

### **Xerostomia:**

Approximately 34% to 51% of individuals with diabetes worldwide are thought to have xerostomia. Reduced salivary flow from salivary dysfunction modifies the composition of saliva.<sup>9</sup> Although the exact cause is uncertain, there are a number of potential causes. Additionally, polyuria, autonomic neuropathies, microvascular issues, and modifications to the salivary glands may be connected to it. Diabetic patients with poor glycemic control exhibit the highest level of salivary dysfunction.<sup>10</sup>

**Management of Xerostomia:** Every patient with xerostomia must adhere to preventative measures to stop the onset of oral infections linked to the condition. In particular, practicing strict oral hygiene and receiving regular dental treatment, including checkups every 4-6 months, is crucial. To reduce or discourage their consumption, patients must be informed

about dietary sugars and refined carbohydrates' role in the emergence of caries. The topical fluorides can help in the treatment of hyposalivation-induced caries. Topical fluorides such as fluoridated toothpaste, daily fluoridated mouthwashes, and fluoridated gel can be used. Xerostomia-induced caries have been brought on by radiation therapy.<sup>11</sup> Salivary Stimulants: These stimulate saliva, topical treatments, saliva substitutes, and systemic sialogogues are currently available alternatives for treatment and symptom management<sup>12</sup>. Water consumption, drinking often, and staying hydrated are necessary treatments for symptoms of dry mouth. These actions help minimize symptoms and prevent oral problems.<sup>12</sup> Lifestyle modifications play an important role in the management of diabetes and xerostomia. Systemic Sialogogues Cevimeline is normally prescribed at a dose of 30 mg once a day for at least three months, and pilocarpine is typically given at a dose of 5 mg three times per day for at least three months.<sup>13</sup> Topical intraoral agents such as chewing gum, saliva stimulants, and alternatives. Furthermore, sugar-free gel, mouthwash, toothpaste, and oral sprays, particularly those containing oxygenated glycerol triester, can be utilized in management. Additional topical treatments that comprise olive oil, betaine, and xylitol may be useful in treating secondary xerostomia caused by drug use.<sup>14,15</sup>

### **Dental caries**

Compared to non-diabetic patients, diabetic patients have a higher prevalence of carious lesions. Diabetes increases the risk of developing new dental decay as well as recurring decay. Reduced salivary cleaning and buffering ability, elevated levels of oral microbes, and increased carbohydrate content could all contribute to an increase in dental cavities.<sup>16</sup> Pulp necrosis may be the outcome of persistent hyperglycemia. Patients with diabetes have an increased risk of developing radiolucent periapical lesions and apical periodontitis.<sup>17,18</sup> Limiting or reducing the amount of sugars in the diet is crucial. Therefore, it's critical to educate patients about the role that carbohydrates and sweets play in dental caries. The topical administration of fluorides and appropriate brushing practices help to treat caries.

**Periodontitis:** Studies have shown that the prevalence of severe periodontitis was higher in diabetes patients than in nondiabetics. The onset and advancement of gingivitis, periodontitis, and alveolar bone loss have been associated with poor glycemic management. Patients with type 1 and type 2 diabetes have a more incidence and prevalence of periodontal disease,

according to reports.<sup>19</sup> Diabetes has been designated periodontal disease as its sixth major consequence.<sup>20</sup> Decreased metabolic regulation increases the severity of the disease. Periodontitis and other gum diseases are more likely to develop and advance in the diabetic population. Periodontal infection is linked to a disturbance in glycemic control. Treatment for infections results in a reduction in inflammation, which then lowers insulin resistance, which lowers glucose levels. Hence, there is a reciprocal association between diabetes and periodontal disease.<sup>21</sup> In addition to lowering blood glucose levels, periodontal treatment can keep the patient's overall health and prevent tooth loss.<sup>22</sup>

**Oral infections:** Different oral infections are more likely to develop in patients with diabetes. Many factors are responsible for the infection development, including decreased salivary flow rate, lack of anti-microbial properties, impaired defense mechanisms, and poor metabolic management.<sup>23,24</sup>

**Oral candidiasis:** A common fungus infection known as oral candidiasis is opportunistic and caused by *Candida albicans*. The type-1 diabetic population had increased candida colonization rates (84%) than those with the type-2 diabetic population (68%), while non-diabetic patients had a colonization rate of roughly 27%.<sup>10,25</sup> Impairment of blood glucose levels and the immune system result in *Candida* infection. A dry mouth caused by poor glycemic control in diabetes individuals raises the density of candida species and results in oral candidiasis.<sup>25,26</sup> Patients with diabetes who use tobacco and its products, denture wearer, patients with poor blood glucose control, patients on steroids, and patients on broad-spectrum antibiotics are more likely to have *Candida* infection.<sup>27</sup>

**Management:** Hb1Ac and random blood glucose levels for the patient should be tracked and managed. Polyenes, including nystatin and amphotericin B, are antifungal medications frequently used in topical antifungal regimens. Clotrimazole, Miconazole, Ketoconazole, Fluconazole, and Itraconazole are different medications. Those who wear dentures should remove them before going to bed at night. The tissue-fitting surfaces of the dentures should be gently washed to eliminate any debris after being treated in disinfectants for an entire night. Systemic antifungal therapy can be necessary if topical antifungal therapy doesn't work after 10 days.<sup>28,29</sup> The medicine of preference for treating oral candidiasis systemically was found to be fluconazole.

Burning mouth syndrome Intense burning in the oral mucosa and a lack of clinical symptoms are the hallmarks of burning mouth syndrome. Systemic, local, and psychological elements

like stress, anxiety, and depression are involved in its aetiology.<sup>30</sup> Poor blood glucose levels, changes in intraoral mucosal metabolism, angiopathy, candidiasis infection, and neuropathy are all linked to burning sensations. Neuropathic pain may feel searing, tingling, electric shock-like, or stabbing. The degree of sleep disruption, anxiety, and depression correlates with these pain sensations, which impact physical and psychological processes.<sup>31,32</sup> Management of this syndrome includes topical therapies, systemic therapies, and therapeutic approaches. Topical therapy includes clonazepam, capsaicin, and low-level laser therapy found to be an effective treatment modality. Systemic therapy includes Clonazepam, Alpha Lipoic Acid, Gabapentin, and Amitriptyline. When used to treat burning mouth symptoms, topical bupivacaine may be an efficient topical anesthetic. Cognitive behavioral therapy may also help treat emotional and physical symptoms of depression and anxiety.<sup>33</sup>

**Taste disturbance or dysfunction** Although taste perception has an inherited tendency, neuropathies can impact it. Diabetes and the onset of obesity have both been linked to taste changes. 5.7% of pre-diabetic or diabetic patients had impairment in sweet taste, and 8.6% had a salt taste impairment, according to a cross-sectional study.<sup>33</sup> Raised detection thresholds or altered taste perception can result from salivary malfunction. The threshold of taste also rises as a result of neuropathy. This sensory deficiency results in difficulty maintaining a healthy diet and can impair glucose levels.

**Management:** Blood glucose levels in diabetic individuals should be maintained and kept stable because treatment is always based on the underlying cause of the taste impairment. Transcranial magnetic stimulation, the administration of zinc gluconate, and antidepressants are among the treatment options. The only well-studied medication for treating idiopathic taste abnormalities is likely zinc.<sup>34</sup> Oral mucosa alterations Mucosal diseases may be more common in patients, and they may also recover more slowly, have impaired salivary function, or both. These changes include fissured and coated tongue, irritant fibroma, traumatic ulcer, recurrent aphthous ulcerations, and lichen planus.<sup>35</sup> Because type 1 diabetes is considered an autoimmune disease and oral lichen planus has an underlying autoimmune mechanism, it affects patients with type 1 diabetes more commonly than patients with type 2 diabetes. Diabetes patients' immunological response alters as a result of acute hyperglycemia<sup>10</sup>. Therefore, healthy lifestyle practices are important in managing oral mucosal alterations in diabetic patients. The cause of the infection should be treated, and if required, symptomatic treatment should be given to relieve pain and burning.<sup>34,35</sup>

**Poor oral wound healing:** One well-known concern with oral surgery in diabetic individuals is the slow or impaired healing of tissues. Delay in vascularization, decreased flow of blood and hypoxia, a decrease in innate immunity, reduction in growth factor synthesis, and stress are all risk factors for delayed repair. Drugs have demonstrated the capacity to enhance skin repair mechanisms. Inhibitors of dipeptidyl peptidase 4 are used systemically to treat poor wound healing. Drugs used topically include statins, phenytoin, and metformin.<sup>36</sup>

Localized Osteitis Diabetes causes the development of dry sockets, which results in slower healing and a more compromised immune system<sup>37</sup>. Increased synthesis of matrix metalloproteinases (MMPs), such as collagenase, and lower osteocalcin levels, an anabolic bone hormone, are the main causes of localized osteitis<sup>37-39</sup>. Many methods of management may be considered the best for treating dry sockets. Chlorhexidine gluconate 0.2% rinses before surgery are recommended, as is the use of gel afterward. Using the right antibiotics can help in dry socket treatment. Alveolar osteitis can be treated with laser therapy and alvogyl, among other treatments. Platelet-rich plasma and platelet-rich fibrin are other management options. Also, zinc oxide eugenol and high growth factor plasma can be used. Tranexamic acid and other alternatives like ozone gas may be helpful.<sup>35,36</sup>

**General management considerations for diabetic patients:** Before, during, and after any dental treatment, the points that should be taken into consideration are:<sup>37</sup>

- 1) Consult with the patient's medical doctor to discuss glycemic control.
- 2) Verify that the patient had meals and taken their prescriptions before therapy.
- 3) Update medical histories and medications and review systems at every appointment.
- 4) Immediately prevent, treat, and eradicate infections and diseases.
- 5) Be cautious of and ready to handle hypoglycemia.
- 6) Never recommend or use anything that contains aspirin.
- 7) Obtain profound local anesthesia.
- 8) Keep the oral cavity healthy and give extensive preventative treatment.
- 9) Encourage regular food and medication adherence before and after appointments.
- 10) check for blood sugar levels with a glucometer if the patient is high risk or on insulin or undergoing surgery.

**Emergency Management of Hypoglycemia in Dental Office:** In case of any emergency in a dental setup, immediately stop dental treatment. In awake patients, give fifteen gm of carbohydrates orally. In addition, 180 ml of orange juice, a glucose tablet, 15–25 ml of sugar, or a simple sugar candy can be given. If required, repeat the carbohydrate dose and monitor blood sugar.<sup>38</sup> If necessary, a clinician should seek emergency medical aid for a patient who is not cooperating. An intravenous infusion of 20 to 50 mL of a 50% dextrose solution after injecting 1 mg of glucagon subcutaneously or intramuscularly. While treating an unconscious patient, inject 20–50 mL of a 50% dextrose solution and 1 mg of glucagon subcutaneously or intramuscularly at nearly any location.<sup>39,40</sup>

**CONCLUSION:** Common oral signs of diabetic mouth syndrome (DM) include xerostomia, dental caries, periodontal disease, gingivitis, candidiasis, other oral infections, burning mouth syndrome, taste dysfunction, altered oral mucosa, delayed wound healing, and localised osteitis. In individuals with diabetes mellitus, oral problems are considered serious repercussions of the disease and may have a detrimental effect on the patient's quality of life. Therefore, it's critical to manage and prevent dental issues linked to diabetes. By taking care of their patients' oral health, dentists can reduce diabetes-related morbidity and mortality. Improving glycemic management reduces the risk of issues such as candidiasis and xerostomia. It is impossible to ignore the generally higher prevalence of the oral health issues we discussed, even though this is only seldom the case. We frequently cannot confirm or disprove apparent correlations between DM and oral illnesses and disorders because of a lack of high-quality studies. Consequently, an extensive, well-designed study is required. Although this review has shed some light on the subject, it will still be difficult for diabetes care professionals to identify the warning signs and symptoms of oral problems. To handle potential oral consequences, we thus strongly recommend an interdisciplinary approach between DM care experts and dental field professionals, as is the case for wellknown diabetic complications.

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