

# Review Article

## Diabetes & Dental diseases

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### Abstract

Diabetes is a metabolic disorder that can affect every aspect of life including the oral cavity. Dental problems in diabetic individuals are so rampant that periodontitis is considered as the sixth complication of diabetes. The objective of this review is to highlight the dental problems frequently seen in diabetes and the importance of maintaining the oral health care of diabetic individuals.

**Key-words:** Diabetes, Periodontitis, Xerostomia, Dental caries, Lichen planus

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Diabetes mellitus, is a group of metabolic diseases in which there is an abnormal elevation of blood glucose levels, either because of the autoimmune destruction of insulin producing beta cells of islets of Langerhans or peripheral resistance to insulin action. This high blood sugar produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger).<sup>1</sup>

Diabetes mellitus arguably has become the most significant pandemic in the last 30 years. Increasing prevalence of diabetes mellitus, along with its co-morbidities, in the population has made it an important public health issue. Phase one results of the Indian Council of Medical Research – India Diabetes (ICMR-INDIAB) Study indicates that diabetes prevalence in India is progressing rapidly across the nation, reaching a total of 62.4 million persons with diabetes in 2011. The prevalence of diabetes in Tamil Nadu was 10.4 per cent, in Maharashtra it was 8.4 per cent, in Jharkhand, 5.3 per cent, and in terms of percentage, highest in Chandigarh at 13.<sup>6,2</sup> Diabetes is a syndrome in which chronic hyperglycemia leads to long-term damage to various organs including the heart, eyes, kidneys, nerves, and vascular system. Numerous oral changes have also been seen in diabetes patients

The most common oral health problems associated with diabetes are periodontal (gum) disease, salivary gland dysfunction; fungal infections, dental decay and delayed healing; taste impairment, cheilosis, mucosal drying and crack, burning mouth and tongue and alterations in the flora of oral cavity, with greater predominance of *Candida albicans*, staphylococci and hemolytic streptococci.<sup>3,4</sup> Diabetic individuals also show gingival polyps, enlarged gingiva, abscess formation, periodontitis and loosened teeth.

### Long-term diabetic complication

### Microvascular disease

### Peripheral neuropathy

(Ref. Rees TD.<sup>5</sup>)

### Periodontal disease and diabetes- a two way relationship

The first oral complication of diabetes is periodontal disease, which stems from a chronic inflammation caused by various types of bacteria and microbes in the mouths of diabetics. In fact, periodontal disease is frequently referred to as "the sixth complication of diabetes" along with neuropathy, nephropathy, retinopathy, and micro- and macrovascular diseases.<sup>6,7</sup>

Oral implications

Xerostomia

Greater susceptibility of oral tissues to trauma

More opportunistic infections (e.g., candidiasis)

Lichen planus and lichenoid reactions

Greater accumulation of plaque

Greater risk of caries

Delayed wound healing

Greater susceptibility to periodontal disease

Oral paresthesia, including burning mouth or tongue

Altered taste sensations

The increased susceptibility of periodontal patients with diabetes is due to polymorphonuclear leukocyte deficiencies resulting in impaired chemotaxis, defective phagocytosis or impaired adherence.<sup>4</sup>

Recent data indicate that periodontitis may cause changes in systemic physiology. The interrelationships between periodontitis and diabetes provide an example of systemic disease predisposing to oral infection, and once that infection is established, the oral infection exacerbates systemic disease. These diseases are thought to be associated biologically, and a number of reviews and studies have proposed mechanisms to explain the relationship, including 1) microvascular disease, 2) changes in components of gingival crevicular fluid, 3) changes in collagen metabolism, 4) an altered host response, 5) altered subgingival flora, 6) genetic predisposition, and 7) nonenzymatic glycation.<sup>8</sup>

Accumulation of advanced glycation end products (AGEs) as a result of the chronic hyperglycemic state or diabetes, coupled with the presence of infection and an exaggerated host response, may provide a viable explanation for the clinical outcomes observed in diabetic patients with periodontal disease.<sup>8</sup>

Both animal models and humans suggest that hyperglycemia, in combination with elevations of serum low density lipoproteins and triglycerides, leads to the formation of advanced glycation end products (AGEs) which may alter macrophage phenotype. This may be responsible for dysregulation of macrophage cytokine production and increased inflammatory tissue destruction and alveolar bone loss.(Figure 1)

The primary reparative cell in the periodontium, the fibroblast, does not function properly in high glucose environments. Furthermore, the collagen that is produced by these fibroblasts is susceptible to rapid degradation by matrix metalloproteinase enzymes, the production of which is elevated in diabetes. This results in the cross linking of collagen and AGEs resulting in decreased collagen turnover. So collagen in diabetic patients is aged and more susceptible to breakdown.<sup>9</sup>

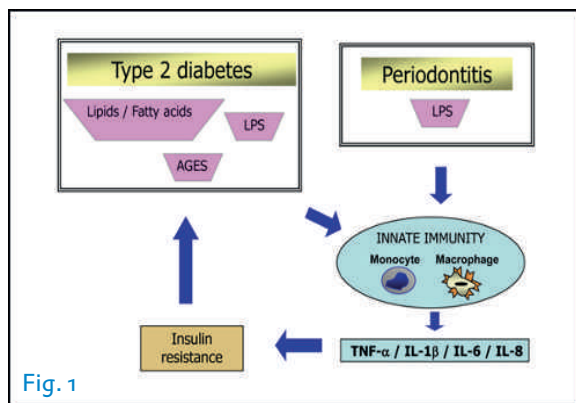


Fig. 1

Periodontitis-induced bacteremia/endotoxemia has been shown to cause elevations of serum proinflammatory cytokines such as interleukin-1 beta (IL-1 beta) and tumor necrosis factor-alpha

(TNF-alpha), which have been demonstrated to produce alterations in lipid metabolism leading to hyperlipidemia. These cytokines can produce an insulin resistance syndrome similar to that observed in diabetes and initiate destruction of pancreatic beta cells leading to the development of diabetes. Thus, there is potential for periodontitis to exacerbate diabetes-induced hyperlipidemia, immune cell alterations, and diminished tissue repair capacity.<sup>10</sup> Patients with diabetes show increased incidence of gingival inflammation, gingival polyps, multiple periodontal abscess, enlarged gingiva.(Figure 2



Fig. 2

### Xerostomia

Xerostomia, more commonly referred to as dry mouth, is a common complaint among ambulatory diabetic patients associated with the poor salivary flow and with other oral and extraoral symptoms of desiccation. The oral dryness may occur due to disturbances in glycemic control.<sup>11</sup>

The breath of people with diabetes often smells fruity, which may be a result of xerostomia or a change in the thickness of saliva in diabetics. Xerostomia can lead to markedly increased dental caries, parotid gland enlargement, inflammation and fissuring of the lips (cheilitis), inflammation or ulcers of the tongue and buccal mucosa, oral candidiasis, salivary gland infection (sialadenitis), halitosis, and cracking and fissuring of the oral mucosa.<sup>12</sup>

Xerostomia leads to a marked increase in tooth decay.<sup>13</sup> Xerostomia can actually make diabetes worse and that salivatin, a peptide found in human saliva, plays a role in making glucose-stimulated insulin release possible. Salivatin is believed to lower blood sugar after a meal and helps keep blood sugar levels even, a function that appears to be damaged by diabetes.<sup>14</sup> Subjects with type 1 diabetes who had developed neuropathy more often reported symptoms of dry mouth as well as symptoms of decreased salivary flow rates.<sup>15</sup>

Etiology of xerostomia is associated with a non inflammatory, non neoplastic enlargement of the parotid gland believed to occur in 25% of patients with moderate to severe diabetes and especially in patients with type 1 diabetes and poor metabolic control.<sup>16</sup>

## Dental caries

Optimum salivary flow rate is responsible for establishing protective environment against dental caries. As xerostomia is observed in diabetes, the individuals are predisposed to the development of dental caries. The relationship between diabetes mellitus and dental caries prevalence is less clear.<sup>17</sup>

## Fungal infections

It has generally been assumed that oral candidiasis occurs with increased frequency in patients with diabetes mellitus.<sup>18</sup> Oral candidiasis, a fungal infection in the mouth, appears to occur more frequently among people with diabetes, including those who wear dentures. Diminished salivary flow and an increase in salivary glucose levels create an attractive environment for fungal infections such as thrush.<sup>19</sup> Thrush produces white (or sometimes red) patches in the mouth that may be sore or may become ulcers. It may attack the tongue, causing a painful, burning sensation. It also can cause difficulty in swallowing and compromise your ability to taste.

## Burning mouth syndrome

Diabetics are more susceptible to oral infections (including oral thrush) that produce burning mouth sensations. Additionally, diabetics are prone to vascular changes that affect the small blood vessels in the mouth, creating a lower threshold for pain.<sup>20</sup>

## Lichen planus

Type I diabetes and Oral Lichen Planus(OLP) are characterized by autoimmune phenomena and T cell immune responses respectively, suggest that the immune system may play a critical role in the appearance of OLP in patients with type I DM. Grinspan's syndrome is a triad comprising of oral lichen planus, diabetes mellitus and hypertension.<sup>21</sup>

## Conclusion

Blood glucose control is the most important factor in maintaining diabetics' oral health. Rigorous dental hygiene is also imperative for those with diabetes, for without it oral health problems can multiply exponentially. Regular dental checkups and periodontal screenings are important for evaluating overall dental health and for treating dental problems in their initial stages.

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#### **Marijuana: recreation as medicine?**

Its psychoactive properties have ensured its extensive use for recreational purposes for the last 5000 years. United Nations has declared it to be the most commonly used illicit drug. But recently the evidence is mounting that Cannabis (marijuana, hashish, bhang) may have medicinal properties. The most recent one comes from Israel. Zach Klein (He has made a documentary "Prescribed Grass" on Cannabis) and his associates of Tel Aviv University treated 19 patients with a variety of chronic disorders including terminal cancer, ALS, PTSD etc., with medicinal cannabis. The results were spectacular. Cannabis improved the appetite, relieved the pain and cured insomnia where all other conventional medicines failed. Besides, almost all the patients gained weight and were able to reduce their conventional drug intake. Klein believes the healing powers of Cannabis is nothing short of miraculous. He has urged the governments to change the policy regarding its use.

(<http://www.sciencedaily.com/releases/2013/01/130124123453.htm>)

**- Dr. K. Ramesh Rao**