Diabetes and Periodontal Disease - Exploring the Connection

Both diabetes and periodontal disease are common chronic diseases in many parts of the world. This article describes the current evidence supporting a bi-directional relationship between diabetes and periodontal infections.

**Diabetes:**

Diabetes mellitus is a heterogeneous group of disorders with different causes but all characterized by hyperglycemia. Type 1 diabetes mellitus is due to destruction of the insulin-producing cells. Type 2 diabetes mellitus is the result of insulin resistance coupled with relative beta-cell failure (1). It is recently reported that type 2 diabetes comprises; 90% of all cases of diabetes mellitus in the population of several countries (2,3).

Diabetes is now one of the most common non-communicable diseases globally. It is the fourth or fifth leading cause of death in most high-income countries and there is substantial evidence that it is epidemic in many low- and middle-income countries.

Diabetes mellitus is the most common chronic endocrine disorder, affecting an estimated 5% to 10% of the adult population in industrialized Western countries, Asia, Africa, Central America and South America, and it has a large impact on society (4-6).
The International Diabetes Federation (IDF) has estimated the numbers of people with diabetes for 2011 of 366 million and forecasts for 2030 of 552 million (7). Saudi Arabia has one of the highest percentages of Diabetes in the world. The overall prevalence of DM in adults in Saudi Arabia is 23.7% (5). Five of the 10 countries where diabetes is most prevalent are located in the six-nation Gulf Cooperation Council, according to the International Diabetes Federation (IDF) (7). Kuwait is No. 3 while Qatar is sixth, Saudi Arabia seventh, Bahrain eighth and the United Arab Emirates No. 10. The rest of the top 10 are Pacific island nations with much smaller populations, apart from Lebanon which comes in fifth (Table1).

Diabetes is characterized by an increased susceptibility to infection, poor wound healing, and increased morbidity and mortality associated with disease progression.

Table 1: Top 10 countries/territories for prevalence* (%) of diabetes (20-79 years), 2011 and 2030

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<td>Qatar</td>
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<td>United Arab Emirates</td>
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*comparative prevalence (7)

Periodontal Disease as a Complication of Diabetes

Diabetes is recognized as an important risk factor for more severe and progressive periodontitis, infection or lesions resulting in the destruction of tissues and supporting bone that form the attachment around the tooth (see Figure 1). Periodontal disease has
been reported as the sixth complication of diabetes, along with neuropathy, nephropathy, retinopathy, and micro- and macrovascular diseases (8).

A number of studies found a higher prevalence of periodontal disease among diabetic patients than among healthy controls (9). In a large cross-sectional study, Grossi and others (10) showed that diabetic patients were twice as likely as non-diabetic subjects to have attachment loss. Firatli (9) followed type 1 diabetic patients and healthy controls for 5 years. The people with diabetes had significantly more clinical attachment loss than controls. In another cross-sectional study, Bridges and others (11) found that diabetes affected all periodontal parameters, including bleeding scores, probing depths, loss of attachment and missing teeth. In fact, one study has shown that diabetic patients are 5 times more likely to be partially edentulous than non-diabetic subjects (12).

**PERIODONTAL DISEASE AND ITS EFFECTS ON GLYCEMIC CONTROL**

The chronic challenge of the periodontal pathogens may provide a constant source of proinflammatory cytokines that may be associated with tissue insulin resistance and poor glycemic control in subjects with diabetes (13,14). In inflamed periodontal tissues, there are increased levels of inflammatory mediators associated with tissue destruction, including tumor necrosis factor alpha (TNF-α), interleukin 6 (IL-6), interleukin 1- β (IL-1β), prostaglandin E2, and matrix metalloproteinases (14). In addition to the local
destruction, this inflammation involves increased permeability of the capillaries leading to potential portals to the systemic circulation for the inflammatory mediators as well as the products of the bacterial infection (see Figure 2).

These mediators have been reported to be important in pathways for the pathogenesis of insulin resistance, coronary heart disease, and, more recently, diabetes (15). Based on this theory, it was hypothesized that the successful control of periodontal infection could improve the clinical signs of periodontitis as well as the metabolic control of DM (13). Various investigations (16-21) demonstrated that scaling and root planing (SRP), associated or not with antibiotics, yielded clinical benefits in subjects with diabetes, including a reduction in probing depth (PD), bleeding on probing (BOP), and suppuration and a gain in clinical attachment level (CAL). Simultaneously, these interventional studies (16-24) assessed the potential effects of different types of periodontal therapy on glycemic control in subjects with diabetes, as measured by glycosylated hemoglobin (HbA1c) levels. Some investigations (13,16,21-23) suggested that improvements in periodontal condition positively affect metabolic control, whereas other studies (17,24,25) did not find this beneficial effect. Al-Mubarak and colleagues (21) recently conducted a study to evaluate the effectiveness of scaling and root planing (SRP) and adjunctive chemotherapy (doxycycline hyclate, 20 mg) on gingival health and glycemic control in diabetic subjects with chronic periodontitis. Three hundred and forty-six type 1 and 2 diabetic subjects with chronic periodontitis were randomized into four test groups: Group 1 received one session of SRP at the baseline visit and placebo tablets twice/day, started at the baseline visit, for 3 months, Group 2 received one
session of SRP at the baseline visit, and doxycycline hyclate (20 mg, twice/day) started at the baseline visit for 3 months, Group 3 received two sessions of SRP, first at the baseline visit and second at the 6 months, with placebo tablets twice/day started at the baseline visit and 6-month visit, for 3 months at each visit, and Group 4 received two sessions of SRP, first at the baseline visit and the second at the 6-month visit, and doxycycline hyclate 20 mg twice/day, started at the baseline visit and the 6-month visit, for 3 months at each visit. Venous blood samples were obtained to evaluate glycated hemoglobin (HbA1c); dental measurements were also included. We found that HbA1c showed significant improvement (P < 0.05) only for subjects with glycated hemoglobin ≤8.8% within each group, as well as when subjects were combined together. All groups achieved statistically significant improvements for most of the dental parameters at follow-up visits (P < 0.05) compared to the baseline. We concluded that that SRP and adjunctive therapy may significantly reduce glycated hemoglobin levels for subjects with HbA1c ≤8.8%.

Finally, more systematic studies in diverse populations is warranted to support existing evidence that treating periodontal infections can contribute to glycemic control management and possibly to the reduction of the burden of complications of diabetes.

**Recommendations**

1. Health care providers should understand the effects of diabetes on periodontal tissues, the possible impact of periodontal disease in patients with diabetes and should discuss with their diabetic patients the increased risk for periodontal diseases.

2. Dentists should facilitate the identification and referral of un-recognized cases of diabetes in dental offices. They should also control oral infection in all patients with diabetes especially those with severe periodontitis so as to reduce the inflammatory burden experienced and may improve glycemic control.

3. Physicians should recognize the clinical presentations of periodontitis and consider oral inspection so that patients with diabetes who developed oral complications could be promptly referred to dentists for treatment.
4. Medical and dental professions should collaborate in arranging proper management of patients with diabetes in particular those with periodontitis.

References:


