

Periodontitis and Diabetes Mellitus – A Bidirectional Relationship

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Key points

- Diabetes mellitus characteristic features
- Periodontitis prevalence in diabetes mellitus
- Severe periodontitis is linked to an increased risk of developing diabetes

A collection of disorders known as "diabetes mellitus" is characterized by increased blood glucose levels as well as abnormalities in carbohydrate, lipid, and protein metabolism. Numerous oral diseases and disorders have been linked to diabetes mellitus. One of those disorders has been identified as periodontitis. Periodontitis has been indicated as a potential risk factor in diabetic patients because of their insufficient metabolic control.¹ Periodontitis is an inflammatory condition that ultimately causes tissue damage and alveolar bone resorption. This tissue damage causes the collagen fibers of the periodontal ligament to break down, resulting in the formation of a periodontal pocket between the gingiva and the tooth. Periodontitis is a slow-progressing disease usually leading to irreversible tissue damage. The condition is often asymptomatic in the early stages. The pockets deepen because of additional breakdown of periodontal ligament fibers and alveolar bone resorption, which occurs in tandem with the progression of attachment loss. When left untreated, periodontitis will result in tooth loss.²

The first relationship

Periodontitis is more prevalent in individuals with diabetes mellitus, i.e. diabetic patients are at an increased risk (up to two to three times) of having periodontitis than individuals without diabetes mellitus.

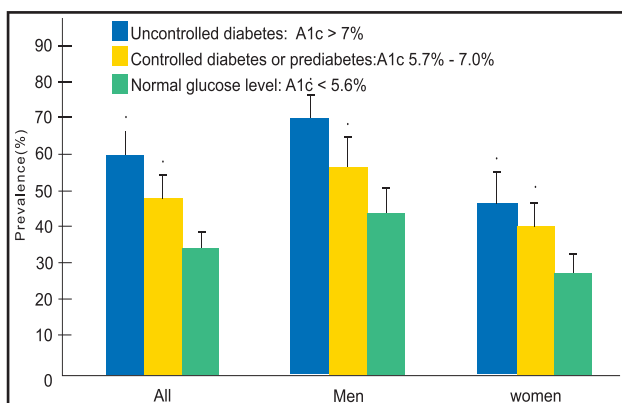


Figure 1; Prevalence of periodontitis in controlled diabetes, uncontrolled diabetes, and normal glucose level patients.

The degree of glycemic control in an individual is a critical factor in determining the risk of acquiring periodontitis. In individuals without diabetes mellitus, periodontitis is linked to higher glycated hemoglobin (HbA1c) and fasting blood glucose levels. In individuals with diabetes mellitus, an even higher level of HbA1c is found.³

Two processes may explain the common origin of both diseases and their influence on an individual. Both processes use the effects of advanced glycosylation end products (AGEs) where diabetes mellitus i.e., hyperglycemia, triggers an increased inflammatory phenotype in cells. Studies show that chronic hyperglycemia produces AGEs that can bind to specific receptors (RAGE) on various cells such as fibroblasts,

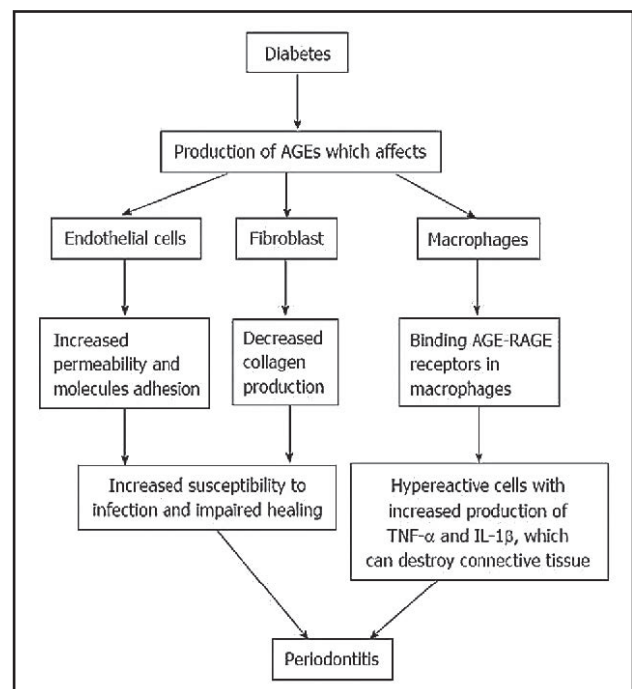


Figure 2; how diabetes mellitus can contribute to the development of periodontal disease.

TNF: Tumor necrosis factor; IL-1β: Interleukins 1β;
 AGE: Advanced glycosylation end product;
 RAGE: Receptors AGE.5

endothelial cells, and macrophages. As a result, macrophages become hyperactive, producing pro-inflammatory cytokines such as interleukins 1 β and 6 (IL-1 β , IL-6) and TNF- α . AGEs also cause endothelial cells to become hyper permeable and hyper expressive for adhesion molecules, while fibroblasts produce less collagen. As a result, AGEs produced by chronic hyperglycemia can cause hyper inflammatory reactions, vascular modifications, impaired healing, and an increased susceptibility to infections. Increased AGE buildup and interaction with RAGE in diabetic gingiva leads to increased proinflammatory cytokine production, vascular dysfunction, and loss of effective tissue integrity and barrier function.

The second relationship

On the contrary, looking at the bidirectional relationship of periodontitis and diabetes mellitus, we can also see that severe periodontitis is linked to an increased risk of developing diabetes. 3 Periodontitis is a chronic low-grade infection caused by numerous pathogens that can disrupt insulin function. Chronic gram-negative periodontal infection is likely to induce insulin resistance, which contributes to metabolic imbalance. 6 Periodontitis has also been linked to a long-term HbA1c increase in adults without diabetes, indicating that periodontal inflammation could impact the risk of acquiring diabetes. 7

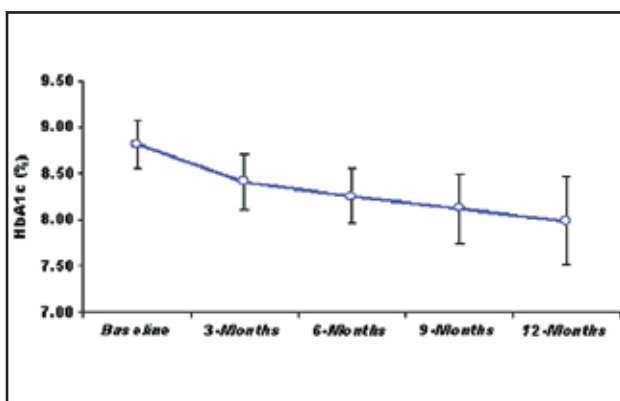


Figure 3; Periodontal treatment on HbA1c (%) (≤ 8.8).
For all groups.

Treatment

In reference to treating periodontitis in a diabetic patient, mechanical removal of supra- and subgingival bacterial plaque with scalers, curettes, or ultrasonic devices, as well as extensive oral hygiene instructions for the patient are used. Only a near-ideal oral hygiene program can prevent the production of new dental plaque deposits and re-infection of the sub-gingival tissues. In terms of improving clinical periodontal conditions, the routine use of local antibiotics as supplemental therapy is still debatable. Surgery is required on a regular basis to minimize or remove deep persistent periodontal lesions. 8 Incidentally,

when compared to no treatment or standard care, periodontal treatment with sub gingival instrumentation improves glycemic control in people with both periodontitis and diabetes by a clinically significant amount. 9

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