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# **Periodontitis and its association with anti-diabetes mellitus drugs**

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## **Abstract**

Diabetes mellitus (DM) is characterized by a high blood sugar level over a prolonged period of time. Diabetes causes changes to blood vessels. This affects the flow of nutrients. It also affects how waste is removed from body tissues and can cause bacterial growth and infection, also. Poor blood sugar control makes it harder for the immune system to fight infections. Uncontrolled gum disease may also make it harder to control the diabetes.

Diabetes has been unequivocally confirmed as a major risk factor for periodontitis. People with diabetes are more likely to have periodontal disease than people without diabetes, probably because people with diabetes are more susceptible to contracting infections. In fact, periodontal disease is often considered a complication of diabetes. Those people who don't have their diabetes under control are especially at risk.

A number of studies found a higher prevalence of periodontal disease among diabetic patients than among healthy controls. In large studies, it showed that diabetic patients were twice as likely as nondiabetic subjects to have attachment loss, one study has shown that diabetic patients are 5 times more likely to be partially edentulous than nondiabetic subjects.

**DEFINITIONS:** Periodontal disease, which includes gingivitis and periodontitis, is classified according to the presence or absence of periodontal ligament and/or alveolar bone involvement:

● **Gingivitis** – Gingivitis involves only the gums it is an inflammatory process characterized by gingival redness, swelling, and bleeding that is provoked by routine brushing or flossing or by a use of a periodontal probe. Healthy gingival tissues are pink, stippled (similar to an orange peel), and firm. Noninflamed gingival tissue should not bleed or suppurate during routine flossing and brushing, or when professionally probed.

● **Periodontitis** – is a chronic infectious disease caused by periodontal bacterial infection. Periodontitis is characterized by gingival inflammation accompanied by the loss of supportive connective tissues including the periodontal ligament and alveolar bone. Bone loss is seen on radiographs. Progression of periodontitis will cause accelerated tooth mobility and eventual tooth loss (1, 2, 3).

**CLINICAL PRESENTATION:** In the majority of cases, primary care providers are alerted to the presence of periodontitis or gingivitis in their patients after a diagnosis is made by a dental professional. Alternatively, primary care providers may notice the presence of periodontitis or gingivitis (i.e., gum swelling and/or bleeding, bad breath) on routine physical exam, at which point the patient should be directed to seek care from a dental professional for further evaluation and management (2,3).

**Symptoms:**

✚ Healthy gums are firm and pale pink and fit snugly around teeth.  
Signs and symptoms of periodontitis can include:

✚ Swollen or puffy gums


✚ Bright red, dusky red or purplish gums

- ✚ Gums that feel tender when touched
- ✚ Gums that bleed easily
- ✚ Pink-tinged toothbrush after brushing
- ✚ Spitting out blood when brushing or flossing teeth
- ✚ Bad breath
- ✚ Pus between teeth and gums
- ✚ Loose teeth or loss of teeth
- ✚ Painful chewing
- ✚ New spaces developing between teeth
- ✚ Gums that pull away from teeth (recede), making teeth look longer than normal
- ✚ A change in the way teeth fit together when bite(4,5)


## Causes

In most cases, the development of periodontitis starts with plaque a sticky film composed mainly of bacteria. If left untreated, here's how plaque can eventually advance to periodontitis:

- ✚ **Plaque forms on teeth** when starches and sugars in food interact with bacteria normally found in mouth. Brushing teeth twice a day and flossing once a day removes plaque, but plaque re-forms quickly.
- ✚ **Plaque can harden under gum line into tartar (calculus)** if it stays on teeth. Tartar is more difficult to remove and it's filled with bacteria. The longer plaque and tartar remain on teeth, the more damage they can do. Can't get rid of tartar by brushing and flossing — need a professional dental cleaning to remove it.

 **Plaque can cause gingivitis**, the mildest form of gum disease.

Gingivitis is irritation and inflammation of the part of gum tissue around the base of teeth (gingiva). Gingivitis can be reversed with professional treatment and good home oral care.

 **Ongoing gum inflammation can cause periodontitis**, eventually causing pockets to develop between gums and teeth that fill with plaque, tartar and bacteria. In time, these pockets become deeper, filling with more bacteria. If not treated, these deep infections cause a loss of tissue and bone, and ultimately may lose one or more teeth. Also, ongoing chronic inflammation can put a strain on immune system. (4,5)

## **Diagnosis**

Periodontal disease is diagnosed by dentist or dental hygienist during a periodontal examination. This type of exam should always be part of regular dental check-up.

A periodontal probe (small dental instrument) is gently used to measure the sulcus (pocket or space) between the tooth and the gums. The depth of a healthy sulcus measures three millimeters or less and does not bleed. The periodontal probe helps indicate if pockets are deeper than three millimeters. As periodontal disease progresses, the pockets usually get deeper. dentist or hygienist will use pocket depths, amount of bleeding, inflammation, tooth mobility, etc. to make a diagnosis. (19, 20)

## **Treatment**

Treatment may be performed by a periodontist, a dentist or a dental hygienist. The goal of periodontitis treatment is to thoroughly clean the pockets around teeth and prevent damage to surrounding bone. The best

chance for successful treatment when also adopt a daily routine of good oral care, manage health conditions that may impact dental health and stop tobacco use.

### **Medical treatment**

If periodontitis isn't advanced, treatment may involve less invasive procedures, including:

- ✚ **Scaling:** removes tartar and bacteria from tooth surfaces and beneath gums. It may be performed using instruments, a laser or an ultrasonic device.
- ✚ **Root planning:** smooths the root surfaces, discouraging further buildup of tartar and bacteria, and removes bacterial byproducts that contribute to inflammation and delay healing or reattachment of the gum to the tooth surfaces.
- ✚ **Antibiotics:** Topical or oral antibiotics can help control bacterial infection. Topical antibiotics can include antibiotic mouth rinses or insertion of gels containing antibiotics in the space between teeth and gums or into pockets after deep cleaning. However, oral antibiotics may be necessary to completely eliminate infection-causing bacteria.

### **Surgical treatments**

Advanced periodontitis, treatment may require dental surgery, such as:

- ✚ **Flap surgery (pocket reduction surgery):** periodontist makes tiny incisions in gum so that a section of gum tissue can be lifted back, exposing the roots for more effective scaling and root planning. Because periodontitis often causes bone loss, the underlying bone may be recontoured before the gum tissue is sutured back in place. After heal, it's easier to clean these areas and maintain healthy gum tissue.
- ✚ **Soft tissue grafts:** When lose gum tissue, gumline recedes. May need to have some of the damaged soft tissue reinforced. This is usually done by removing a small amount of tissue from the roof of mouth (palate) or using tissue from another donor source and attaching it to the affected site. This can help reduce further gum recession, cover exposed roots and give teeth a more pleasing appearance.

**+ Bone grafting:** This procedure is performed when periodontitis has destroyed the bone surrounding tooth root. The graft may be composed of small fragments of bone, or the bone may be synthetic or donated. The bone graft helps prevent tooth loss by holding tooth in place. It also serves as a platform for the regrowth of natural bone.(17,18)

## **Prevention**

**+ Brush teeth.** Brushing after meals helps remove food debris and plaque trapped between teeth and gums. Don't forget to include tongue, bacteria love to hide there.

**+ Floss.** Flossing at least once a day helps remove food particles and plaque between teeth and along the gum line that toothbrush can't quite reach.

**+ Swish with mouthwash.** Using a mouthwash can help reduce plaque and can remove remaining food particles that brushing and flossing missed.

**+ Known risk.** Age, smoking, diet and genetics can all increase risk for periodontal disease. If are at increased risk, be sure to talk with dental professional. (6)

## **Associations between diabetes and periodontitis**

Diabetes mellitus is one of the world's major diseases. Antidiabetic drugs are medicines developed to stabilize and control blood glucose levels amongst people with diabetes, mostly anti-diabetic drugs are administered orally except the insulin. There are different types of anti-diabetic drugs, and their selection depends on the nature of the diabetes, age and situation of the person, and many other factors. Treatments include the agents which increase the amount of insulin secreted by the pancreas, or increase the

sensitivity of target organs to insulin, and agents which decrease the rate at which glucose is absorbed from the gastrointestinal tract. People are mainly focused on insulin, insulin analogues, oral hypoglycemic agents and various other complementary and alternate medicines to control the blood glucose levels in diabetes.

Research has suggested that the relationship between diabetes and periodontal disease goes both ways - periodontal disease may make it more difficult for people who have diabetes to control their blood sugar.

Severe periodontal disease can increase blood sugar, contributing to increased periods of time when the body functions with a high blood sugar. This puts people with diabetes at increased risk for diabetic complications. (8, 9)

The risk of periodontitis is increased by approximately threefold in diabetic individuals compared with non-diabetic individuals. The level of glycemic control is of key importance in determining increased risk. For example, in the US National Health and Nutrition Examination Survey (NHANES) III, adults with an HbA<sub>1c</sub> level of >9% had a significantly higher prevalence of severe periodontitis than those without diabetes (OR 2.90; 95% CI 1.40, 6.03) after controlling for age, ethnicity, education, sex and smoking. The importance of diabetes as a major risk factor for periodontitis became apparent in the 1990s in a number of cross-sectional and longitudinal studies investigating the Pima Indian population. The prevalence and incidence of periodontitis were greater in Pima Indians who had type 2 diabetes mellitus compared with those who did not, with an approximately threefold increased risk for periodontitis. The majority of research has focused on type 2 diabetes mellitus as a risk factor for periodontitis, probably because both diseases have historically tended to develop in



patients in their 40s and 50s. However, type 1 diabetes mellitus also increases the risk of periodontitis, and all patients with diabetes (including children and young adults) should be considered to be at increased risk of periodontitis. One early study identified that around 10% of children (<18 years) with type 1 diabetes mellitus had increased attachment loss and bone loss compared with controls, despite comparable plaque scores]. More recently, in a study of 350 diabetic children (6–18 years old) vs 350 non-diabetic controls, the proportion of periodontal sites with evidence of periodontitis was greater in the children with diabetes (>20% vs 8% of sites, respectively) (9,10,11).

### **Hypoglycemic drug effect on periodontitis**

**Metformin (MF):** a second-generation biguanide, is a commonly used oral antidiabetic drug that has been shown recently to stimulate osteoblasts and reduce alveolar bone loss. There is a study that aims to explore the efficacy of 0.5%, 1%, and 1.5% MF gel as a local drug delivery system in adjunct to scaling and root planing (SRP) for treatment of intrabony defects (IBDs) in patients with chronic periodontitis.

**They are found Mean PD reduction and mean CAL gain** was found to be greater in MF groups than the placebo group at both 3 and 6 months. Furthermore, significantly greater reduction of IBD depth was found in the MF groups compared to the placebo group, with greatest reduction in 1% MF.

**So,** the results of the study show that local delivery of MF into the periodontal pocket stimulated significant increase in the PD reduction, CAL gain, and improved IBD depth reduction compared to placebo in adjunct to SRP. This can provide a new direction in the field of periodontal healing. (12)

**Insulin:** is a peptide hormone secreted in the body by beta cells of islets of Langerhans of the pancreas and regulates blood glucose levels. Medical treatment with insulin is indicated when there is inadequate production or increased demands of insulin in the body.

Insulin used in the treatment and management of diabetes mellitus type-1 and sometimes diabetes mellitus type-2

**So** Patients diagnosed with type 2 diabetes were more likely to have severe periodontitis (CPI 4) compared with patients with normal glucose tolerance or impaired fasting glucose ( $P < .001$ ). Subjects with severe periodontitis had significantly higher prevalence of abdominal obesity, serum triglycerides, and insulin resistance ( $P$  values of .012,  $<.001$ , and .003, respectively). The odds ratios (ORs) for prevalence of severe periodontitis were significantly increased from normal glucose tolerance and impaired fasting glucose (OR = 1.32; 95% confidence interval, 1.06–1.64) to type 2 diabetes (OR = 1.5; 95% CI, 1.11–2.02), after adjusting for potential confounders ( $P$  for trend = .003). The prevalence of severe periodontitis increased significantly with increasing insulin resistance ( $P$  for trend = .04) in nondiabetic individuals. Furthermore, insulin-resistant individuals with normal waist circumference showed significantly higher odds of severe periodontitis (OR = 1.47; 95% CI, 1.16–1.87) than did insulin-sensitive individuals with normal waist circumference.

So Non-abdominally obese subjects with insulin resistance were more likely to have severe periodontitis. Insulin resistance can be considered an independent risk factor of periodontal disease in normal weight population defined by abdominal obesity. (13, 14, 15, 16)

## **Conclusions :**

Diabetes mellitus and periodontitis are closely related. Diabetes mellitus that is not controlled well leads to higher blood sugar (glucose) levels in the mouth fluids. This promotes the growth of bacteria that can cause gum disease. On the other hand, infections from untreated periodontal disease can cause the blood sugar to rise and make it harder to control diabetes.

Diabetes mellitus is considered one of the major risk factors for periodontitis, and, vice versa, periodontitis is considered to increase the risk of developing diabetes mellitus.

Effective glycemic control improves lesions in diabetic patients with periodontitis through ameliorating inflammation at the gingival sites of periodontal tissue.

A huge number of reports has addressed the effect of periodontal intervention therapy on glycemic control, but few reports have addressed the effect of glycemic drug on periodontal disease diabetic patients. I recommend that in the future there should be research on the effect of each anti-diabetic drug, its effect on gingivitis, and how each drug contributes to prognosis of periodontitis.

## Reference

- 1-Burt B, Research, Science and Therapy Committee of the American Academy of Periodontology. Position paper: epidemiology of periodontal diseases. *J Periodontol* 2005; 76:1406.
- 2\_Hein C. Scottsdale revisited: the role of dental practitioners in screening for undiagnosed diabetes and the medical co-management of patients with diabetes or those at risk for diabetes. *Compend Contin Educ Dent* 2008; 29:538.
- 3-Teshome A, Yitayeh A. The effect of periodontal therapy on glycemic control and fasting plasma glucose level in type 2 diabetic patients: systematic review and meta-analysis. *BMC Oral Health* 2016; 17:31.
- 4- Jamestown.ubertali,DMD, hingham,MA ,jul2019/ merck manuals
- 5-Periodontitis - Symptoms and Causes" Litin, Scott C, and Sanjeev Nanda. *Mayo Clinic Family Health Book*, 2018, 5Th Edition. 2018.
- 6 Periodontology, American. "PREVENTING PERIODONTAL DISEASE | Perio.Org". *Perio.Org*, 2021
- 7-Salvi GE, Carollo-Bittel B, Lang NP. Effects of diabetes mellitus on periodontal and peri-implant conditions: update on associations and risks. *J Clin Periodontol*. 2008;35:398–409.
- 8-Khader YS, Dauod AS, El-Qaderi SS, Alkafajei A, Batayha WQ. Periodontal status of diabetics compared with nondiabetics: a meta-analysis. *J Diabetes Complicat*. 2006
- 9- Mealey BL, Ocampo GL. Diabetes mellitus and periodontal disease. *Periodontol* 2000. 2007

10- Tsai C, Hayes C, Taylor GW. Glycemic control of type 2 diabetes and severe periodontal disease in the US adult population. *Community Dent Oral Epidemiol.* 2002

11-Lalla E, Cheng B, Lal S, et al. Diabetes mellitus promotes periodontal destruction in children. *J Clin Periodontol.* 2007

12-Pradeep, A.R. et al. "Efficacy Of Varying Concentrations Of Subgingivally Delivered Metformin In The Treatment Of Chronic Periodontitis: A Randomized Controlled Clinical Trial". *Journal of Periodontology*, vol 84, no. 2, 2013, pp. 212-220. Wiley, doi:10.1902/jop.2012.120025.

13- Chapple IL, GencoR. Diabetes and periodontal diseases: Consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. *J Clin Periodontol.* 2013; 40Suppl 14:S106–S112.

14-HimsworthHP. Diabetes mellitus: Its differentiation into insulin-sensitive and insulin-insensitive types. 1936. *Int J Epidemiol.* 2013; 42:1594–1598.

15-IslamSK, SeoM, LeeYS, MoonSS. Association of periodontitis with insulin resistance,  $\beta$ -cell function, and impaired fasting glucose before onset of diabetes. *EndocrJ.* 2015; 62:981–989.

16-LimSG, HanK, KimHA, et al. Association between insulin resistance and periodontitis in Korean adults. *J Clin Periodontol.* 2014; 41:121-130.

17-Hill RW, Ramfjord SP, Morrison EC, et al. Four types of periodontal treatment compared over two years. *J Periodontol.* 2011

18-Isidor F, Karring T. Long-term effect of surgical and non-surgical periodontal treatment. A 5-year clinical study. *J Periodontal Res.* 2014; 21:462–472

19- "Periodontal Diagnosis". Vol 59, no. 2, 2014, pp. e41-e42. Elsevier BV, doi:10.1016/j.denabs.2013.01.039.

20- Highfield, J. "Diagnosis and Classification Of Periodontal Disease". Australian Dental Journal, vol 54, 2009, pp. S11-S26. Wiley, doi:10.1111/j.1834-7819.2009.01140.x.