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# PERIODONTAL STATUS IN PATIENTS WITH DIABETES MELLITUS AND HYPERTENSION: A CASE REPORT

**Citra Nur Shabrina Putri Winda[1], Dian Yosi Arinawati[2]**
**[1]School of Dentistry, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta**
**[2]Department of Oral Biology, Faculty of Dentistry, Universitas Muhammadiyah Yogyakarta**

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**Abstract**

**Introduction:** Periodontal disease includes all diseases that affect the periodontium, namely the gingiva, periodontal ligament, cementum, and alveolar bone. Environmental factors and genetic factors influence the severity of the occurrence of periodontal disease. **Case report:** A 58 year old female patient came to RSGM UMY with complaints of pain in the upper right tooth. The patient has a history of Diabetes Mellitus. The patient regularly consumes drugs in the form of metformin, amlodihypnoe, fonylin, and lansoprazole. Examination of the teeth showed carious lesions, non-carious lesions, residual roots, and edentulus. The patient's Oral Hygiene was 6.3 (poor). **Discussion:** Type 2 DM affects the initiation and development of periodontitis by causing a hyperinflammatory response while repairing damaged bone and producing a continued end product. Amlodipine belongs to a class of anti-hypertensive calcium channel blockers which can cause gingival enlargement due to abnormal fibroblasts. **Conclusion:** Diabetes Mellitus is a predisposing factor for periodontitis to become more severe and has a two-way relationship related to blood sugar conditions and periodontal conditions. In addition, anti-hypertensive drugs also have a role in the occurrence of oral manifestations.

***Corresponding author:***
*Dian Yosi Arinawati*
*Jl. Brawijaya, Geblagan, Tamantirto, Bantul, Daerah Istimewa Yogyakarta, Indonesia*
*Email: **dianyosi@umy.ac.id***

## Introduction

Periodontal diseases are pathological conditions that impact the periodontium, an anatomical structure encompassing the supportive tissues surrounding the tooth, including the gingival tissue, alveolar bone, cementum, and periodontal ligament (Kinane et al., 2017). Periodontal disease is a common condition that affects many people. It is a gum disease that can cause inflammation, bleeding, and even tooth loss if left untreated. Based on epidemiological data, 10% of developed countries experience chronic periodontal disease and around 44-57% experience mild periodontal disease. Periodontal disease is caused by plaque bacteria found on the surface of the teeth, plaque is a soft deposit containing a collection of pathogenic microorganisms such as *Prophyomonas gingivitis, actinobacillus actinomycetemcomitans, Prevotela intermedia, Fusobacterium nucleatum*and*tannerella forsythia* (Ermawati et al., 2015).

Periodontal disease includes all diseases that affect the periodontium, namely the gingiva, periodontal ligament, cementum, and alveolar bone (Kumar et al., 2019). Periodontitis is an inflammatory disease of periodontal tissue Periodontal tissue itself is a complex system with high sensitivity to pressure. This disease can be caused by plaque, tartar, age, genetic factors, and systemic disease. Inflammation of periodontal tissue is of two types, periodontitis and gingivitis. Periodontitis is an inflammatory disease that damages the supporting tissues of teeth caused by specific microorganisms, resulting in further

damage to the periodontal ligament and alveolar bone, accompanied by pocket formation, gingival recession, or both. Gingivitis is inflammation of the soft tissue around the teeth, such as the gums, with or without attachment loss (Suratri, 2020).

Diabetes Mellitus (DM) is a disease characterized by blood glucose levels exceeding normal, where the instant blood sugar level is ≥ 200 mg/dl and the fasting blood sugar level is ≥ 126 mg/dl. DM is often not realized by sufferers and be aware when complications have occurred (Petersmann et al., 2019). Long-term damage, dysfunction, and failure of various organs are the long-term effects of DM, which include retinopathy, nephropathy, autonomic neuropathy, peripheral neuropathy, and cardiovascular disease (Kaur et al., 2015).

Hypertension, also known as high blood pressure, is an increase in blood pressure above the standard limit, namely 120/80 mmHg. According to the World *Health Organization* (WHO), the average blood pressure limit is<130/85 mmHg (Widyawati et al., 2022). According to the Joint National Committee on Prevention Detection, Evaluation, and Treatment of High-Pressure *VII* (JNC-VII), hypertension is divided into 3 groups, namely pre-hypertension if the systolic pressure is 120-129 mmHg and diastolic< 80mmHg. Stage one hypertension occurs when systolic pressure is 130-139 mmHg, and diastolic pressure is 130-139 mmHg. Stage two hypertension occurs when systolic pressure > 140 mmHg and diastolic > 90 mmHg (Aji et al., 2020).

In periodontal disease, pathogenic bacteria that accumulate in the subgingival sulcus are environmental factors that influence the inflammatory response of periodontal tissue (Kinane et al., 2017). Meanwhile, genetic factors play an important role in increasing the risk of periodontal disease. In addition, various risk factors for periodontal disease include heredity, smoking, bad oral hygiene, diabetes, and certain medications such ascalcium chanel blockers, dilantin, and cyclosporine. Risk assessment is important because the more risk factors a patient has, the greater the chance of disease severity (Kaur et al., 2015).

Periodontal disease has garnered significant attention recently due to its potential association with cardiovascular disease, being recognized as a chronic inflammatory condition correlated with systemic markers of inflammation and endothelial dysfunction. Numerous research studies have indicated a possible connection between chronic inflammation and hypertension (Rivas-Tumanyan et al., 2013). Patients with periodontal disease are at an elevated risk of developing hypertension in comparison to individuals possessing a healthy periodontium (Zhao et al., 2019). The correlation between periodontitis and hypertension holds significant importance due to the substantial influence of blood pressure control on the progression of cardiovascular disease in individuals with hypertension (Rosa et al., 2023).

Diabetes significantly enhances the prevalence of periodontitis and the extent of the disease, including the number of affected teeth and its overall severity. Reports indicate that patients diagnosed with diabetes may frequently present to dental professionals with multiple recurring periodontal abscesses; however, while this occurrence may arise, it is not considered typical (Casanova et al., 2014). The poorer the control and the longer the duration of diabetes, the greater the prevalence and severity of periodontal disease. Evidence from human studies has demonstrated that the treatment of periodontal disease can reduce glycated hemoglobin levels in diabetic patients (Morita et al., 2009). The prevalence of periodontal disease among individuals with diabetes is reported to be 86.8%, encompassing 27.3% for gingivitis and 59.5% for periodontitis (Rajhans et al., 2011).

**Case Report**

An aged female patient, 58 years old, came to RSGM UMY with complaints of pain in his upper right tooth. This complaint has been felt since 10 days ago with a VAS scale of 7 out of 10. This complaint has been reported to the dentist and treated with cataflam. However, the patient still feels pain when the prescribed medication has run out.

The patient brushes his teeth twice a day when showering in the morning and evening. He

sometimes uses mouthwash but has never used dental floss. The patient last came to the dentist one week ago to have his complaints checked, and a tooth filling was carried out.

The patient has had a history of Diabetes Mellitus since she was pregnant with her 4th child in 2003 and around 18 years ago. The patient regularly consumes drugs such as metformin, amlodihypnone, fonylin, and lanzoprazole. Patients routinely check their blood sugar with a specialist in internal medicine and routinely check their blood pressure conditions at home. The patient has never been hospitalized in the last 3 years. The patient admitted that he had no allergies to drugs or food. The last patient underwent a fasting blood sugar examination with results of 274 mg/dl.

| PEMERIKSAAN | HASIL | NILAI RUJUKAN | METODE |
|---|---|---|---|
| | | Tinggi : 200 - 499 mg/dL | |
| | | Sangat Tinggi : ≥ 500 mg/dL | |
| Kolesterol HDL | 49 | > 50 mg/dL | Kolorimetri Enzimatik Homogen |
| Kolesterol LDL | 170 | Optimal : < 100 mg/dL | Kolorimetri Enzimatik Homogen |
| | | Batas tinggi : 130 - 159 mg/dL | |
| | | Tinggi : 160 - 189 mg/dL | |
| | | Sangat Tinggi : ≥ 190 mg/dL | |
| Rasio LDL/HDL Kol | 3,5 | Resiko rendah : < 3 | |
| | | Resiko sedang : 3 - 6 | |
| | | Resiko tinggi : > 6 | |
| Glukosa Puasa | 274 | < 100 mg/dL | Hexokinase |
| | | Indikasi DM : ≥ 126 mg/dL | |
| BUN | 11,5 | 6 - 20 mg/dL | |

**Figure 1.** Lab examination results

The patient's father was not suspected of having a history of systemic disease. The patient's mother has a history of Asthma and Diabetes Mellitus.

The patient is a housewife. She regularly consumes fruit and vegetables, drinks enough water, and almost never exercises.

From the results of objective examinations related to vital signs, the following data were obtained:

**Table 1.** Vital sign examination results

| | |
|---|---|
| Blood Pressure | 161/87 mmHg |
| Pulse | 80 times per minutes (Normal) |
| Breathing | 19 times per minute (Normal) |
| Temperature | 36,5$^{o}$ (Afebris) |
| Body Weight | 56 kg |
| Height | 150 cm |
| IMT | 24,9 (Normal) |

Examination of vital signs showed that the patient's blood pressure was in the Hypertension Stage 2 category.

The results of the extra oral examination revealed an abnormality in the form of clicking in the left TMJ. When the patient opens and closes the mouth on the left jaw there is a "click" sound without pain. On examination of the mucosa and soft tissue, several normal variations were found in the form of :

A. Linea Alba: There is a slightly prominent linear lesion on the right and left buccal mucosa (bilateral), the color of the mucosa is slightly whitish with irregular edges and a soft consistency.
B. Gingivitis: There are reddish gingiva with rounded interdental edges, unstippling texture, shiny surface, consistent soft on the buccal and labial sides of the upper and lower jaw
C. Fissure Tongue: There is a linear fissure or groove on the dorsal median of the tongue that is the same color as the surrounding mucosa with a depth of approximately 1 mm along the anterior 2.3 of the tongue.
D. Coated Tongue: There is white plaque on the dorsal of the tongue, it can be scraped off and does not leave a reddish area.

Dental examination showed carious lesions on teeth 16, 14, 12, 21, 22, 23, 24, 25, 26, 27, 37, 36, 34, 45, 47 and remaining tooth roots 48, as well as non-carious lesions in the form of attrition on teeth 31, 32, 33, 41, 42, and 43. There are edentulous areas on teeth 18, 17, 15, 11 and 46. Apart from that, there are tooth-colored deposits on teeth 14 and 44. For oral hygiene, the patient showed 6.3 (poor).

**Figure 2**. Intraoral photo

**Figure 3.** Intraoral photo of the upper jaw

**Figure 4.** Intraoral photo of the lower jaw

Based on subjective and objective examination, the patient's diagnosis was chronic periodontitis. The treatment plan that will be carried out on patients is to communicate, inform, and educate patients regarding the conditions experienced by patients, their causes, ways to prevent them, and their treatment. Then, a medical referral to an internal medicine doctor to check the patient's blood sugar levels is made. After that, scaling treatment is carried out, followed by tooth extraction treatment, restoration, making dentures, and control and evaluation.

**Discussion**

Periodontitis is a multifactorial disease. Environmental and genetic factors play a role in the process of inflammation in the tissues supporting the teeth. Oral bacteria play an essential role in the pathology of periodontitis (Isola, 2020). Chronic periodontitis can lead to gingivitis, periodontal attachment loss, alveolar bone resorption, and ultimately tooth loss. Periodontitis is the sixth most common chronic disease. It is commonly experienced by populations worldwide and affects a person's chewing ability, nutritional status, and quality of life (Wu et al., 2020).

Diabetes Mellitus (DM) is a chronic disease that occurs when the pancreas does not produce enough insulin (a hormone that regulates blood sugar) or vice versa when the body cannot use the insulin it produces effectively (Mekala & Bertoni, 2020). DM is a metabolic disorder with multiple etiologies characterized by chronic hyperglycemia with impaired metabolism of carbohydrates, fats, and proteins due to defects in insulin secretion, insulin action, or both (Kaur et al., 2015). Common symptoms in DM sufferers are polyuria, polyphagia, polydipsia, and weight loss. Based on the classification, DM is divided into two, DM type 1 or Insulin Dependent Diabetes Mellitus (IDDM) and type 2 DM or non-insulin Dependent Diabetes Mellitus (NIDDM) (Ermawati et al., 2015).

Hypertension is a condition where blood pressure is above the normal threshold. Hypertension is divided into two types, namely essential (primary) hypertension and secondary hypertension. Essential hypertension is also called idiopathic, where the cause of hypertension cannot be precisely determined. Meanwhile, secondary hypertension is advanced hypertension. Where a person can be said to be hypertensive if the systolic blood pressure is $\geq$ 140 mmHg and/or diastolic blood pressure is $\geq$ 90 mmHg on repeated examinations (Aji et al., 2020).

Type 2 Diabetes Mellitus occurs due to the failure of insulin function to convert glucose into energy due to insulin molecule damage or interference in insulin receptors. The amount of insulin in type 2 DM sufferers can be said to be expected or even increased. However, the number of insulin receptors on the cell surface is reduced, resulting in less glucose entering. This results in a shortage of glucose and causes glucose levels to become high in the blood vessels (Ermawati et al., 2015). Type 2 DM influences the initiation and development of periodontitis by causing a hyperinflammatory response while repairing damaged bone and producing advanced end products. Local infection can cause increased levels of IL-6, TNF-a, and CRP in the system and increase systemic inflammation, contributing to insulin resistance (Wu et al., 2020). So, DM sufferers have a reduced ability to fight infection and slow healing. Infection can cause blood sugar levels to increase and be challenging to control (Kaur et al., 2015).

Bacterial endotoxins, antigens and other virulence factors stimulate the host immunoinflammatory response. Neutrophils respond to inflammation to fight pathogenic microbes, which triggers an antibody response. In resistant individuals, the development of local reversible inflammation leads to gingivitis. Meanwhile, in susceptible individuals, proinflammatory mediators (cytokines, prostanoids and matrix metalloproteinase) increase and cause connective tissue damage and changes in bone metabolism known as periodontitis (Kaur et al., 2015). In addition, the distribution of nutrients and oxygen in periodontal tissue is disrupted due to narrowed blood vessels, so gram-negative anaerobic bacteria in periodontal pockets become more pathogenic and cause periodontal tissue to be disrupted and tissue toxicity occurs (Aji et al., 2020).

Hypertension is a chronic disease that often occurs in the world. The prevalence of hypertension in Indonesia in 2018 reached 34.1%. This prevalence increases with age and is a significant factor in the occurrence of heart failure, stroke, and chronic kidney disease (Suratri, 2020). Treatment for hypertension is preventing cardiovascular complications. The most widely used anti-hypertension drugs are *Beta Bloker, Diuretic, Angiotensin- converting enzyme* (ACE) *inhibitor* and *Kalsium antagonis* (Aji et al., 2020). However, these are types of drugs that have side effects on oral manifestation: calcium chanel blocker have side effects on gingival enlargement, diuretic drugs are used to treat hypertension affect xerostomia, ACE inhibitor a andrenergic blockers, central simpatolitik beta blocker diuretic have a side effect on likenoid however, a rare reaction like rashes and angioedema are effect from ACE inhibitor angiotensin (Glick, 2020; Teoh et al., 2019).

Gingival enlargement is an oral manifestation that most often occurs in hypertensive patients who take various types of anti-hypertensive drugs *calcium chanel blockers*, one of which is amlodipine (Silva et al., 2019). The response to medication affects the gingival tissue, resulting in inflammation and gingival enlargement. Fibroblasts experience abnormalities due to increased levels of protein synthesis, which contains collagen. Proinflammatory cytokines increase interleukin-1β (IL-1β) and IL-6. Pharmacological agents have a negative effect on the entry of calcium ions.

## Conclusion

Diabetes Mellitus is a predisposing factor for periodontitis to become more severe and has a two-way relationship related to blood sugar conditions and periodontal conditions. In addition, anti-hypertensive drugs also have a role in the occurrence of oral manifestations. So, as a dentist, you must be able to know the appropriate medical management for diabetes mellitus and hypertension patients to maintain a person's quality of life.

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