



Research article

The Role of Type-2 Diabetes Mellitus in the Progressivity of Periodontitis Stage IV Grade C: A Case Report

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Abstract.

Background: According to the American Academy of Periodontology (AAP)'s classification of periodontal disease in 2017, diabetes mellitus is one of the grade modifiers of the progressivity of the disease, which is determined by the HbA1c level of a patient. Systemic condition is often considered as a risk factor that aggravates periodontal tissue breakdown. However, the progressivity of periodontal disease can also be found in healthy (nondiabetic) patients.

Objective: To identify the role of type-2 diabetes mellitus and its effect on the severity of periodontal breakdown in periodontitis stage 4 grade C patients.

Case Report: This case report describes the condition of female patients, aged 30–40 years, who presented to the periodontology clinic in RSKGM FKG UI, with the chief complaint of severe tooth mobility. The patients reported were healthy and diabetic (type-2 diabetes mellitus) patients diagnosed with periodontitis stage 4 grade C. Initial therapies were carried out, such as, such as scaling, occlusal adjustment and dental splint.

Results: Clinical outcomes after one week showed no inflammation, no oedematous, no redness on gingiva and less mobility on several teeth. Both groups showed extended and aggressive progress of the disease, however, the systemic conditions also played a critical role in the overall periodontal tissue breakdown.

Conclusion: Management of systemic disease is crucial in order to prevent periodontal breakdown or complications that could happen in periodontal therapies.

Keywords: periodontitis, systemic disease, diabetes mellitus, case report

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1. Introduction

Diabetes is a metabolic disorder of multiple etiology that is characterised by chronic hyperglycaemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both [1]. This disorder has a profound impact on health in affected individuals, causing high morbidity and mortality rates,

and constitute an economic burden on health systems [2,3]. According to periodontal disease classification by American Academy of Periodontology (AAP) in 2017, diabetes mellitus is one of the grade modifiers of the progressivity of periodontal disease, which is determined by the level of HbA1c [4]. Clinical evidence suggests that type 2 diabetes mellitus increases the risk of developing inflammatory diseases including periodontitis [5].

Periodontitis caused by a dysbiosis of the oral microbiota and associated with a dysregulated immune inflammatory response [6]. Epidemiological and clinical studies indicate a higher incidence and intensity of periodontal diseases in patients afflicted with diabetes mellitus. The occurrence of significant alveolar bone loss and periodontitis is 4.2-fold and 2.8-fold higher in type 2 diabetes mellitus in comparison to healthy individuals [7]. Clinical evidence has been presented in the literature supporting direct, indirect, or no association between DM and clinical periodontal status [8].

Taylor and co-workers recently provided a detailed review on the relationship between glycaemic control and periodontal inflammation at molecular and cellular levels [9]. Increased HbA1c levels, in turn, contribute to increased risk of diabetes complications (including periodontitis), creating a two-way, bidirectional relationship between the diseases [10]. Hyperglycaemia alters the host's response, favouring bacterial infection and an exacerbated inflammatory process [11], meanwhile, periodontitis contributes to systemic dissemination of bacteria and bacterial products and may induce a systemic inflammatory process that can cause insulin resistance [12]. The pathogenic processes that link the two diseases are the focus of much research, and it is likely that upregulated inflammation arising from each condition adversely affects the other [8].

Patients with poorly controlled diabetes suffer more from gingival bleeding than those with good or moderate control [13]. However, other studies have found no correlation between diabetic parameters and periodontal disease, thus resulting in conflicting conclusions [14]. The systemic condition often being considered as one of the risk factors that aggravates periodontal tissue breakdown. But, the progressivity of periodontal disease also can be found in healthy patient. Periodontitis patients, with or without diabetes mellitus could have different clinical appearances and radiographs despite of having the same diagnosis of staging and grading. This case report aims to identify the role of Diabetes Mellitus type 2 and its effect on the severity of periodontal breakdown in Periodontitis stage 4 grade C.

2. Case 1

A 37-year-old woman came to Periodontology Clinic, *Rumah Sakit Khusus Gigi dan Mulut (RSKGM)* Faculty of Dentistry Universitas Indonesia, because of severe mobility and pain on upper and lower teeth since 2018. The chief complaint was pain and discomfort due to mobility on several teeth. The patient was diagnosed with Diabetes Mellitus while taking a thorough medical check-up in 2017 and had family history of diabetes melitus. When the patient came in, she was instructed to check her level of HbA1c and the result was 10.1%. The patient had lost several teeth caused by mobility and never visit the dentist regularly. She brushes her teeth twice a day without flossing. Consent was given by the patient to use the dental medical record.

Intra-oral examination showed heavy plaque and calculus accumulation. The gingiva was intensely inflamed and oedematous, and profuse sulcular bleeding occurred upon gentle probing. Pus was oozing from around several teeth. Despite the poor oral hygiene, no dental caries was found. Most of the remaining teeth were extremely mobile, showing °2 and °3 mobility. Periodontal probing depths ranges from 3 to 10 mm and recession ranges from 2 to 12 mm. Tooth 13, 25, 26, 31, 32, 42, 44 were missing (Figures 1 & 2). Panoramic radiograph showed severe alveolar bone loss and horizontal bone defect (Figure 3). Generally, patient had poor prognosis due to uncontrolled Diabetes Melitus with high level of HbA1c although patient was eager for dental treatment. Locally, several teeth had fair to poor prognosis due to severe alveolar bone loss with horizontal bone defect and severe mobility, exacerbated with the uncontrolled Diabetes Melitus.

Patient was given education on diabetes mellitus and its effect to periodontal disease, and instruction for home care oral hygiene (tooth brushing and daily flossing). Patient was also instructed to check her diabetes with her previous doctor to be able to maintain the optimal HbA1c level. Medications (Amoxycillin 500mg and Metronidazole 500mg t.i.d for 1 week) was given following scaling and root planing. Further periodontal treatment plan was outlined and explained to the patient. Subsequent to phase I therapy, patient was planned to have monthly periodontal evaluation and maintenance. Patient will also need intra-coronal splint and prosthodontic rehabilitation.

Patient was called back after 1 week of the first visit, with no more pain and discomfort. Intra-oral examination showed no inflammation, no redness, and swelling on the gingiva and less mobility on several teeth. However, there was found plaque and calculus on the lower anterior and upper posterior teeth. Patient was once again instructed to maintain oral hygiene using toothbrush and daily flossing. Patient was also informed that surgical treatment will not be made unless the glycaemic level is controlled. Patient



Figure 1: Intra-Oral views before periodontal treatment. Occlusal view of maxilla (A); Lateral view of right side (B) and left side (D); Frontal view (C); and Occlusal view of mandibular (E).



Figure 2: Intra-Oral views after scaling and root planing. Occlusal view of maxilla (A); Lateral view of right side (B) and left side (D); Frontal view (C); and Occlusal view of mandibular (E).

was instructed to consult with internist and check periodically to the dentist every 2 weeks.



Figure 3: Panoramic radiograph shows extreme alveolar bone loss prominently at the upper and lower anterior teeth and all remaining posterior teeth.

3. Case 2

A 40-year-old woman came to Periodontology Clinic, *RSKGM* Faculty of Dentistry Universitas Indonesia, with severe mobility and pain on almost of all the teeth particularly on lower teeth since last year. There is no history of systemic disease and the result of HbA1C level was 5.6%. Patient had loss posterior teeth caused by untreated dental caries. Several dental caries was also found on upper and lower remaining posterior teeth. Patient never visit the dentist routinely, brushes the teeth twice daily but never brushes before going to sleep, and never done daily flossing. Consent was given by the patient to use the dental medical record.

Clinical examination revealed poor oral hygiene, heavy calculus and plaque accumulation. The gingiva was intensely inflamed and oedematous, and profuse sulcular bleeding occurred upon gentle probing. Teeth 12, 14, 15, 16, 24, 36, 37, 46 were missing. Most of the remaining teeth were mobile, with °2 and °1 of mobility. Pocket probing depths was 2 to 8 mm and recession were 1 to 5 mm (Figure 4). Radiographic examination showed total alveolar bone loss on several teeth and horizontal bone defect was also found on upper and lower posterior teeth (Figure 5). Patient had fair prognosis generally, as patient had poor oral hygiene although patient was healthy with no systemic disease and had good compliance with instructions given by the dentist. Several teeth had fair to poor prognosis due to severe alveolar bone loss with horizontal bone defect and severe mobility and malocclusion.

Patient was also given education and instruction for home care oral hygiene (tooth brushing and daily flossing). Periodontal phase I therapy, such as scaling, root planing, wire-splint and occlusal adjustment was done during the first visit. Further periodontal



Figure 4: Intra-Oral views after scaling and root planing. Occlusal view of maxilla (A); Lateral view of right side (B) and left side (D); Frontal view (C); and Occlusal view of mandibular (E).

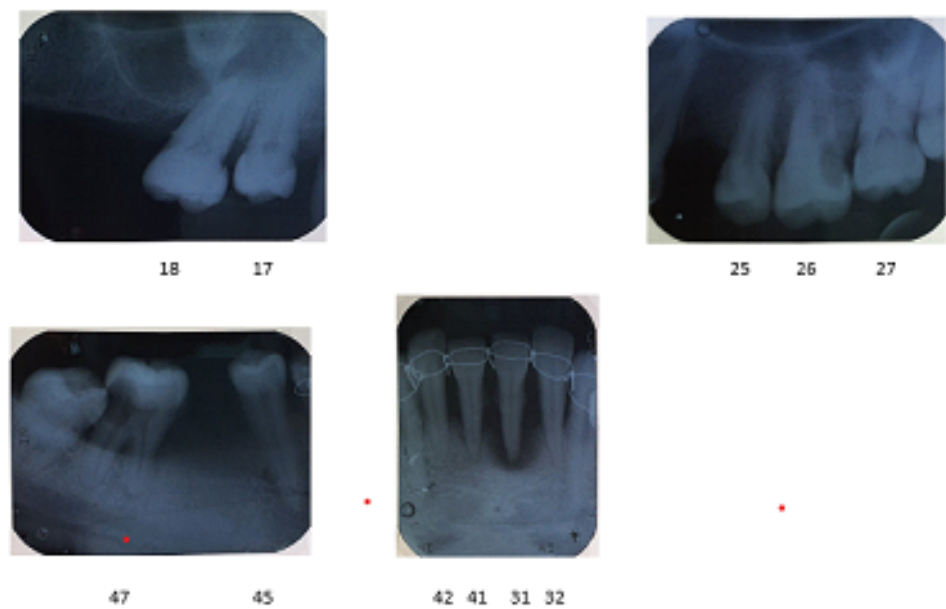


Figure 5: Periapical radiographs were taken at the first visit, showed extreme bone loss at the lower left central incisor with floating-tooth appearance. Advanced alveolar bone loss was also found at the lower right and left lateral incisor.

treatment plan was outlined and explained to the patient. Periodontal evaluation and maintenance will be done monthly to check the splint and teeth mobility. Periodontal phase II therapy (surgical) may be needed if there was no significant improvement on

pocket probing depths in the future. Orthodontic treatment will be needed to correct the malocclusion and prosthodontic for rehabilitation.

After 1 week of the first visit, patient showed improvement on the gingiva and no more pain. Inflammation, oedematous, and swelling were not found. Instructions for home care oral hygiene was given due to plaque and calculus which were found on the upper posterior teeth and lower anterior teeth prior to scaling and root planing. Patient was instructed to check periodically every 1-3 months to observe the mobility and bone loss.

4. Discussion

The teeth condition in case 1 showed a change in the occlusion due to the loss of teeth due to bone damage. The pressure received by the teeth not to match the long axis of the teeth, so that the periodontal damage was heavier in addition to the influence of uncontrolled diabetes conditions. In case 2, the periodontal damage caused by bacterial dysbiosis, which is aggravated by local factors, namely cross-bite in anterior teeth. The pattern of damage seen also shows differences where case 1 has severe damage to all teeth, while case 2 has severe damage to several teeth according to local factors that affect the damage that occurs.

There were no differences found in the result of initial periodontal therapy (phase I) in periodontitis stage 4 grade C patients with and without diabetes mellitus. Following initial periodontal therapy, both cases shown good responses of reduced gingival bleeding and inflammation. Clinical appearances showed improvement after scaling and root planing within 1 week. Probing depth, clinical attachments loss and bleeding on probing values would also decreased significantly at 3 to 6 months post-therapy [15].

Although probing depth were similar between patient with and without diabetes mellitus, the severity degree of the disease differs. Patient with diabetes mellitus showed more severe bone loss and had more CAL compared to patient without diabetes. Smoking also aggravated the severity of the disease. Patient periodontitis who smoke showed higher probing depths and displayed more loss of CAL [14].

Different management was done in medication administration. Patient with diabetes mellitus needed to be given antibiotics while going through the periodontal initial therapy, as they were more prone to infection and risks of complications. Antibiotics administration might confound the result of the initial periodontal therapy between both cases wherefore it could control pathogen infiltration and reduced inflammation. Non-surgical periodontal treatment with adjunctive antibiotic for patients with diabetes

mellitus would show significant improvement in clinical appearances and reduced mobility. Patients with diabetes mellitus were given adjunctive antibiotic for 14 days and presented gain of clinical attachment after non-surgical therapy [16].

Due to the pandemic situation, patient could not continue the surgical treatment needed.

5. Conclusion

Initial therapy is the most importance phase in periodontal therapy. With adequate initial therapy, severe periodontitis could show excellent outcomes. Good home care oral hygiene also needed to support the outcome. The similarity of the results of these cases was because case 1 was given antibiotics for 14 days while case 2 was purely due to the response to the initial therapy.

Further study with more cases is needed to identify the role of Diabetes Mellitus type 2 and periodontal disease.

References

- [1] World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications: Report of a WHO consultation. Part 1, Diagnosis and classification of diabetes mellitus. World Health Organization; Geneva 1999. Available from: <https://apps.who.int/iris/handle/10665/66040>
- [2] Cowie CC, Rust KF, Byrd-Holt DD, et al. Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population: National Health and Nutrition Examination Survey 1999–2002. *Diabetes Care*. 2008;29(6):1263–1268.
- [3] Kathiresan TS, Masthan KMK, Sarangarajan R, et al. A study of diabetes associated oral manifestations. *Journal of Pharmacy & Bioallied Science*. 2017;9(1):21–26.
- [4] Caton JG, Armitage G, Berglundh T, et al. A new classification scheme for periodontal and peri-implant diseases and conditions – Introduction and key changes from the 1999 classification. *Journal of Clinical Periodontology*. 2018;45(20):1–8. <https://doi.org/10.1111/jcpe.12935>
- [5] Preshaw PM, Alba AL, Herrera D, et al. Periodontitis and diabetes: A two-way relationship. *Diabetologia*. 2012;55:21–31.
- [6] Bartold PM, van Dyke TE. Periodontitis: A hostmediated disruption of microbial homeostasis. *Unlearning learned concepts. Periodontol 2000*. 2013;62:203–17.

- [7] Gumus P, Buduneli N. Diabetes mellitus and periodontitis: Signs of a bidirectional relationship. *European Medical Journal*. 2013;1:30–36.
- [8] Ervasti T, Knuutila M, Pohjamo L, et al. Relation between control of diabetes and gingival bleeding. *J Periodontol*. 1985;56:154.
- [9] Taylor JJ, Preshaw PM, Lalla E. A review of the evidence for pathogenic mechanisms that may link periodontitis and diabetes. *Journal of Clinical Periodontology*. 2013;40(140):113.
- [10] Ishikawa M, Yoshida K, Okamura et al. Oral Porphyromonas gingivalis translocates to the liver and regulates hepatic glycogen synthesis through the Akt/ GSK-3 β signaling pathway. *Biochimica et Biophysica Acta*. 2013;1832:2035–2043.
- [11] Cha'varry NGM, Vettore MV, Sansone C, et al. The relationship between diabetes mellitus and destructive periodontal disease: A meta-analysis. *Oral Health & Preventive Dentistry*. 2009;7:107–127.
- [12] Lalla E, Lamster B, Stern DM, et al. Receptor for advanced glycation end products, inflammation, and accelerated periodontal disease in diabetes: Mechanisms and insights into therapeutic modalities. *Annals of Periodontology*. 2001;6:113–118.
- [13] Polak D, Shapira L. An update on the evidence for pathogenic mechanisms that may link periodontitis and diabetes. *Journal of Clinical Periodontology*. 2018;45:150–166.
- [14] Botero JE, Yepes FL, Roldan N, et al. Tooth and periodontal clinical attachment loss are associated with hyperglycaemia in patients with diabetes. *Journal of Periodontology*. 2012;83: 1245-1250. <https://doi.org/10.1902/jop.2012.110681>
- [15] Quintero AJ, Chaparro A, Qurynen M, et al. Effect of two periodontal treatment modalities in patients with uncontrolled type 2 diabetes mellitus: A randomized clinical trial. *Journal of Clinical Periodontology*. 2018;45:1098–1106. <https://doi.org/10.1111/jcpe.12991>
- [16] Duarte PM, Feres M, Yassine LLS, et al. Clinical and microbiological effects of scaling and root planing, metronidazole and amoxicillin in the treatment of diabetic and non- diabetic subjects with periodontitis: A cohort study. *Journal of Clinical Periodontology*. 2018;45:1326–1335. <https://doi.org/10.1111/jcpe.12994>