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Most Recurrent Periodontitis Diagnosis in Patients with Diabetes Mellitus

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Abstract

Periodontitis is considered the most common complication of Diabetes Mellitus. An increase in the frequency of periodontal diseases associated with a longer duration of the disease has been reported. In Mexico, 12 million 400 thousand people live with DM2 according to data from Ensanut (2021). A cross-sectional, mixed, observational, risk-free study was conducted. Twenty-four patients diagnosed with type 2 diabetes mellitus who attended the periodontal clinic at the Centro Mexicano en Estomatologia, Morelia Campus, during the period February 2024 to July 2025 were selected. The most common periodontal diagnosis in these patients was determinated. The inclusion criteria for patients were men and women, aged 18 to 70 years old, and those with periodontal disease. As part of the patient survey, the time since diabetic onset, disease control, and serum glucose levels were investigated. The results show that the most frequently recurring diagnosis was stage II generalized grade B periodontitis, with 7 (29.1%) reported cases, followed by stage IV generalized grade C periodontitis, with 5 (20.83%) diagnosed patients. While the number of

dental organ losses was minimal, with 6 (25%) of cases not presenting any loss. The highest number of dental organs lost was 1 (4.16%) patient with 13 teeth, followed by 3 (12.5%) patients with 9 lost teeth. In conclusion, we can say that the periodontal diagnosis stage and grade increases with the patient's glycemic imbalance. Control of periodontal disease is important because it can improve DM2 control, just as better DM2 control can contribute to improving periodontal disease control.

Keywords: Periodontics; Type 2 Diabetes Mellitus; Periodontitis

Introduction

The WHO defines diabetes as a chronic disease that occurs when the pancreas does not secrete enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose levels. A common effect of uncontrolled diabetes is hyperglycemia, which over time severely damages many organs and systems in the body, especially the nerves and blood vessels. In Mexico, the 2021 National Health and Nutrition Survey (ENSANUT) indicates that 12.4 million people suffer from diabetes. According to data from the latter, 10.3% of the population aged 20 years and older in Mexico had a previous diagnosis of diabetes. In 2021, 13% of deaths in Mexico were due to diabetes (140,729), according to the Statistics of Registered Deaths [1-3]. In Type 2 Diabetes Mellitus (T2DM), two fundamental mechanisms contribute to its development: Insulin Resistance (IR) and subsequent progressive beta cell dysfunction. These mechanisms involve multiple signaling pathways in different organs, which are altered by both external and internal factors. IR is a condition in which insulin target cells fail to respond adequately to insulin, which reduces glucose uptake in muscle and adipose tissue [4]. The most common causes of IR are a decrease in the number of insulin receptors and their catalytic activity. Reticulum stress and mitochondrial dysfunction have also been associated. In obese patients, adipose tissue releases much greater quantities of adipokines such as TNF-alpha, IL-6 and resistin, which are involved in insulin resistance. It is important to remember that adipose tissue not only contains adipocytes, but also preadipocytes/macrophages, leukocytes and other cells. In the adipose tissue of obese patients, there is an overpopulation of these cell types that are responsible for the exacerbated and sustained inflammatory response [5,6]. The increase in glucose entry via GLUT-2 into pancreatic beta cells produces an increase in the glycosylation of ER proteins and the production of free radicals, generating an autoxidation effect of glucose that damages the pancreatic beta cell. The increase in fatty acids produces lipotoxicity through the formation of ceramides, which are responsible for activating cell death mechanisms in these cells by releasing cytochrome C from the mitochondria, which activates the caspases responsible for apoptosis of β cells. The increase in leptin has the ability to induce apoptosis in β cells since it increases inflammatory reactions and generates oxidative stress. In turn, the adiponectin-resistin imbalance produces an increase in the expression of inflammatory factors via NFkβ, ultimately triggering the cell death process [6]. The increase in glucose entry via GLUT-2 into pancreatic beta cells produces an increase in the glycosylation of ER proteins and the production of free radicals, generating an autoxidation effect of glucose that damages the pancreatic beta cell. The increase in fatty acids produces lipotoxicity through the formation of

ceramides, which are responsible for activating cell death mechanisms in these cells by releasing cytochrome C from the mitochondria, which activates the caspases responsible for apoptosis of β cells. The increase in leptin has the ability to induce apoptosis in β cells since it increases inflammatory reactions and generates oxidative stress. In turn, the adiponectin-resistin imbalance produces an increase in the expression of inflammatory factors via NFkβ, ultimately triggering the cell death process [7].

Table 1: Classification of periodontitis by stage, according to the severity of the initial diagnosis and the complexity of treatment, based on local factors. Workshop periodontitis classification, 2019 update.

Stage of periodontitis		Stage I	Stage II	Stage III	Stage IV
	Interdental insertion loss	1 – 2 mm	3-4 mm	>= greater than or equal to 5 mm	>= greater than or equal to 5 mm
Severity	Radiographic insertion loss	Coronal 1/3 (<15%)	Coronal 1/3 (15 - 30%)	Extension to the middle or apical 1/3 of the root	Extension to the middle or apical 1/3 of the root
	Tooth loss	There is no tooth loss due to periodontitis.		Tooth loss due to periodontitis of ≤ 4	Tooth loss due to periodontitis of ≥ 5

Complexity	Local	Maximum probing depth ≤ 4 mm Bone loss Mostly horizontal	Maximum probing depth ≤ 5 mm Bone loss Mostly horizontal	In addition to state II complexity: Probing depth ≥ 6mm Vertical bone loss ≥ 3 mm Furcation involvement class II or III Moderate ridge defect	In addition to state III complexity: Need for complex rehabilitation due to: Masticatory dysfunction Secondary occlusal trauma (>- grade 2) Severe ridge defect Bite collapse, drifting, flaring Less than 20 remaining teeth

Table 2: Classification of Periodontitis by Grade. Workshop periodontitis classification, 2019 update.

			GRADE A Slow rate	GRADE B Moderate rate	GRADE C Rapid rate
Primary criteria	Direct evidence of progression	Radiographic bone loss or CAL	No loss over 5 years	< 2 mm over 5 years	≥ 2 mm over 5 years
	I Indirect evidence of progression	% bone loss – aged	<0,25	0,25-1.0	>1.0

					Destruction exceeded expectations given biofilm deposits; specific clinical patterns suggestive of periods of rapid progressive and/or early onset disease.
		Case fenotype	Heavy biofilm deposits with low levels of destruction	Destruction commensurate with biofilm deposits	
Grade modifiers	Risk factors	Smoking	Non-smoker	<10 cig/day	≥ 10 cig/day
		Diabetes	Normoglycemic/no diagnosis of diabetes	HbA1c <7.0% in a patient with diabetes	HbA1c ≥ 7.0 % in a patient with diabetes

Periodontitis is considered the most common complication of type 2 diabetes. An increased frequency of periodontal disease has been reported in association with a longer history of type 2 diabetes. The risk of periodontitis increases in people with this diagnosis. Periodontal disease has been valued as a predictor of clinically established diabetic nephropathy and end-stage renal disease. Adequate treatment of periodontal disease significantly influences the improvement of metabolic control, as expressed by HbA1c levels. Furthermore, maintained metabolic control in people with diabetes mellitus and periodontal disease translates into an improvement in signs of gingival inflammation [8].

The most important factors that can cause periodontal disease include biochemical, immunological, genetic, connective tissue, and microvascular alterations. Some researchers consider it an infectious disease, closely related in origin, just as caries is to biofilm. The biofilm deposited on teeth is the main cause of periodontal disease. Between 300 and 500 species of microorganisms have been found, of which 30 and 40 are periodontogenic and are predominantly anaerobic and gram-negative microorganisms [9]. The presence of microangiopathy and autonomic neuropathy in the gums may play a role, as microcirculation is altered. Furthermore, in people with diabetes mellitus, the immune response is altered due to alterations in

polymorphonuclear leukocyte function caused by hyperglycemia. Added to these alterations is the presence of diabetic microangiopathy, which contributes to decreased oxygen diffusion and waste elimination, favoring the establishment and multiplication of microorganisms, particularly anaerobes and the presence of monocytes that react to liposaccharides by releasing various inflammatory mediators. In people with type 2 diabetes mellitus and poorly maintained metabolic control, there is an accumulation of non-enzymatic Advanced Glycation Products (AGPs), which affects the migration and phagocytosis of both polymorphonuclear and mononuclear cells. This favors the establishment of a subgingival flora that, through maturation, will gradually transform into predominantly anaerobic gram-negative flora. The aforementioned determines the increase in the secretion of inflammatory mediators already mentioned, which will mediate the destruction of connective tissue, bone resorption, and the development of insulin resistance in the tissue. Simultaneously, the infection per se is capable of developing changes in insulin homeostasis, which contributes to hyperglycemia and an increase in AGPs **[10-12]**.

Materials and methods

Cross-sectional, mixed, observational, risk-free study. Twenty-four patients who attended the Periodontics Clinic at the Mexican Center for Stomatology, Morelia Campus, from February 2024 to July 2025, diagnosed with type 2 diabetes mellitus, were selected. The inclusion criteria for patients were patients of both sexes, aged 18 to 70 years, and those with periodontal disease. Patients under 18 years of age, patients over 70 years of age, and patients not diagnosed with type 2 diabetes mellitus were excluded.

Results

The results were obtained from a population of 24 patients seen between February 2024 and July 2025 at the periodontics clinic of the Centro Mexicano en Estomatologia campus Morelia. Of these, 14 (58.33%) were female and 10 (41.66%) were male. The age range was 27 to 60 years, with a bimodal trend of 34 and 39 years. As part of the survey conducted with the patients, the time they were diagnosed as type 2 diabetics was investigated. 13 (54.16%) were unaware of this information, 2 (8.33%) mentioned that they were diagnosed 15 years ago, and 2 (8.33%) reported 7 years ago. The data reported on the control of their pathology was that 21 (87.5%) of the patients are not controlled and 3 (12.5%) are controlled. However, it should be noted that 9 (37.5%) of the patients do take some type of medication to control their diabetes, despite not doing so frequently. Meanwhile, 15 (62.5%) are not receiving pharmacological or homeopathic treatment. As part of the standardized diagnostic and care protocol established at the Centro Mexicano en Estomatologia campus Morelia, laboratory tests were requested, which reported serum glucose levels ranging from 105 mg/dL to 240 mg/dL.

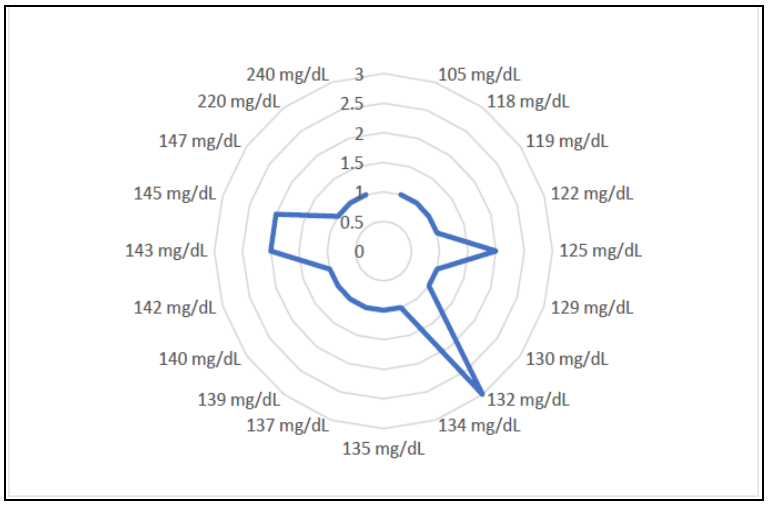

Chart 1: Serum glucose count in blood chemistry.

It was established that the diagnosis with the highest incidence was generalized Grade B stage II periodontitis with 7 (29.1%) reported cases, followed by generalized Grade C stage IV periodontitis with 5 (20.83%) of diagnosed patients. Showing that the worse the patient's glycemic control, the greater the tooth loss, while the number of dental organ losses was minimal, with 6 (25%) of cases not presenting any loss. The highest number of dental organs lost was 1 (4.16%) patient with 13 teeth, followed by 3 (12.5%) patients with 9 lost teeth.

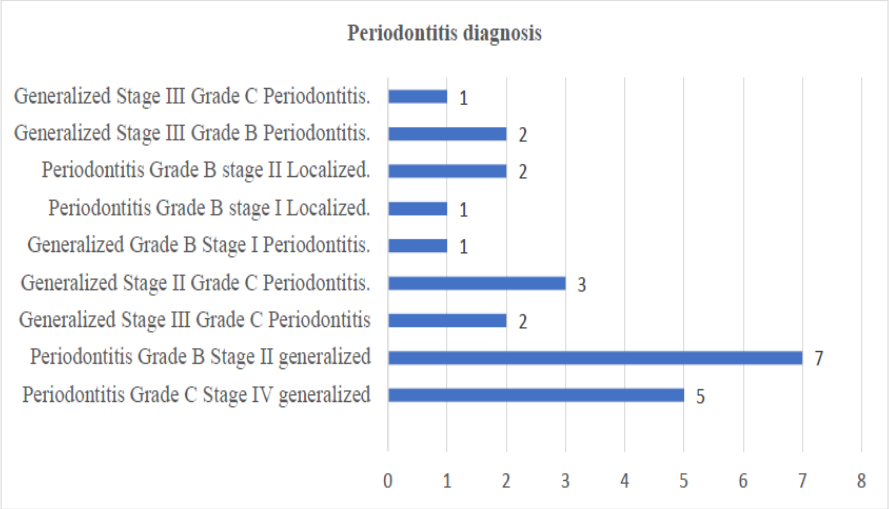

Chart 2: Diagnosis that occurred most frequently in patients treated at the periodontics clinic of the Centro Mexicano en Estomatología, campus Morelia.

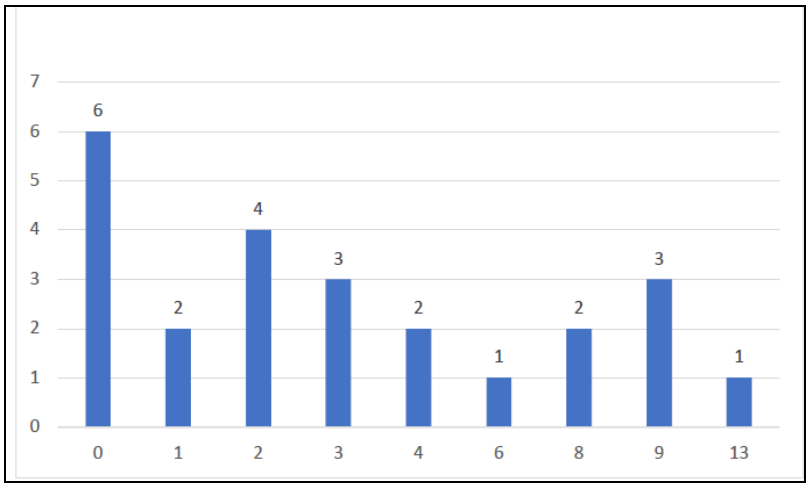

Chart 3: Number of dental organs lost since diagnosis of type 2 diabetes mellitus.

Discussion

Although there are reported cases of C, Hb1cA testing to confirm the diagnosis has not been performed. Therefore, there is a bias in the results obtained, and it is suggested that the study be repeated, instructing patients to undergo this test. Moron-Araujo M in 2021 conducted a search in the following databases: Pubmed, Cochrane, Google Scholar, and Medline, where only the literature review of the last 10 years was included with the keywords: Periodontitis and Diabetes, relation periodontitis and diabetes, diabetes and the relationship with periodontitis. A total of 832 articles were obtained from all databases. The results showed that the prevalent periodontal disease in diabetic patients is periodontitis, because, by presenting an inefficient inflammatory response, the inflammation will persist for a period of time, causing the loss of structures such as ligament and bone fibers, which causes the loss of insertion, a fundamental characteristic of periodontitis **[13]**. Ortega S, Kremer SS, De La Cruz M in 2021 to establish the relationship between the degree of periodontal disease and metabolic control of glycemia in patients suffering from type 2 diabetes conducted an observational, descriptive, cross-sectional study. 42 patients diagnosed with type 2 diabetes mellitus of both sexes, between 25 and 75 years of age, were selected. An odontogram was performed and the degree of periodontal disease was evaluated. To determine the degree of metabolic compensation in the patients, venous blood samples were taken and glycosylated hemoglobin values were measured. 23.55% of the patients did not present periodontal disease and the rest were divided into mild, moderate and severe, with mild disease presenting first. Patients with a higher degree of periodontal disease had a greater number of missing teeth (p 0.0334). Periodontal disease was distributed equally in both glycemic control groups (p=0.1211). In the study group, the degree of periodontal disease was independent of the patients' glycemic control. If attachment loss is not treated promptly, it will eventually progress to the loss of affected teeth due to inflammation **[14]**. Utami S et al. conducted an observational, cross-sectional study evaluating 263 patients who were classified according to diagnosis and severity using the criteria scale of the European Federation of Periodontology, the American Academy of Periodontology, and the Centers for

Disease Control and Prevention, using the clinical parameters of clinical attachment loss and probing depth. The diagnosis of DM was established by measuring HbA1c. Descriptive statistics were used to describe the distribution of periodontitis severity. The results of this study indicated that severe periodontitis was the most common category in patients with type 2 DM. Severe periodontitis is the most common type of periodontitis across all age, occupation, and education levels. Mild periodontitis occurred in 4.5% of the study population, moderate periodontitis in 21.3%, and severe periodontitis in 74.2% **[15]**. De la Cruz GD in 2023 conducted a prospective and observational study. In 50 diabetic patients who underwent serum and capillary glycemic control and glycated hemoglobin (HbA1C) where he evaluated the quality of oral hygiene, the degree of gingival inflammation, as well as the need for periodontal treatment. According to the results obtained, we can infer that patients with poor DM control, (23/50) 46%, present more severe periodontal conditions than controlled patients (27/50) 54% **[16]**.

Conclusions

The results show that the periodontal diagnosis of stage and grade increases with the greater the patient's glycemic imbalance. The majority of the study population was diagnosed with generalized stage II grade B periodontitis, followed by stage IV grade C periodontitis. Most patients with periodontal disease do not take any medication to control T2DM, and some others do but do not maintain good control of their medication. Two, three, and nine teeth are the dental organs that the majority of the evaluated population has lost since being diagnosed with T2DM. Controlling periodontal disease can improve the control of DM, just as better control of DM can contribute to improving the control of periodontal disease. Therefore, it is important for the physician and dentist to communicate well in order to treat both diseases simultaneously and achieve control in a more timely manner.

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