Int J Clinicopathol Correl. 2024; 8(2):29-34.

Original Research

Prevalence and Recurrence of Multiple Periapical Cysts in Uncontrolled Diabetic Patients: A Retrospective Observational Study

Shankar Srinivasan[1*]

Affiliation

[1] Private Practitioner, Chintadripet, Chennai, Tamil Nadu, India.

***Corresponding Author**

Shankar Srinivasan, Private Practitioner, Chintadripet, Chennai, Tamil Nadu, India.
E-mail: 55829@tma.edu.ge

Submitted: 19-Nov-2024
Revised: 03-Dec- 2024
Accepted: 07-Dec-2024
Published: 12-Dec-2024

Abstract

Objective: This study aims to examine the prevalence and clinical characteristics of multiple periapical cysts in patients with uncontrolled diabetes, and to assess the association between poor glycemic control, oral hygiene, and cyst recurrence.

Methods: A retrospective observational survey was conducted on 5000 diabetic patient records, identifying 2759 individuals with uncontrolled diabetes (HbA1c > 7%). Data were collected on patient demographics, oral hygiene status, presence and recurrence of periapical cysts, and relevant medical history. Oral hygiene was evaluated using DMFT and plaque index scores.

Results: Among the 2759 uncontrolled diabetic patients, 2183 (79.1%) demonstrated poor oral hygiene, as indicated by low DMFT and high plaque index scores. Periapical cysts were identified in 983 patients (35.6%), with many exhibiting multiple cysts, particularly in posterior mandibular and maxillary regions. Additionally, 649 patients had a history of periapical cyst surgery, with 45.8% experiencing cyst recurrence, likely due to impaired healing associated with hyperglycemia. Patients also reported high rates of pain, swelling, and tooth mobility linked to cysts.

Conclusion: Uncontrolled diabetes is strongly associated with poor oral hygiene, a higher prevalence of multiple periapical cysts, and an elevated rate of cyst recurrence post-surgery. These findings suggest that diabetic patients with poor glycemic control require targeted oral health interventions and close monitoring to prevent complications and improve outcomes. Further research on interventions to enhance wound healing and reduce recurrence in diabetic patients is warranted.

Keywords: Uncontrolled Diabetes, Periapical Cysts, Oral Hygiene, Cyst Recurrence, Diabetic Complications

How to cite this article: Shankar Srinivasan, Prevalence and Recurrence of Multiple Periapical Cysts in Uncontrolled Diabetic Patients: A Retrospective Observational Study, Int J Clinicopathol Correl. 2024; 8(2):29-34. 10.56501/intjclinicopatholcorrel.v8i2.1183. Copyright © 2024 Shankar

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia due to either insufficient insulin production or ineffective insulin utilization. This condition is classified into Type 1 and Type 2 diabetes, with Type 2 diabetes accounting for approximately 90-95% of all cases worldwide. In addition to systemic complications like cardiovascular disease, neuropathy, and retinopathy, diabetes significantly impacts oral health. [1,2] Uncontrolled diabetes is known to contribute to periodontal diseases, which encompass a range of inflammatory conditions affecting the supporting structures of teeth, including the gums, periodontal ligament, and alveolar bone. [3]

Periodontal cysts are inflammatory odontogenic cysts that arise from periodontal tissues in response to chronic inflammation or infection, commonly affecting the surrounding soft and hard tissues. [4] Although periodontal cysts, especially multiple occurrences, are relatively rare in the general population, evidence suggests a potential increase in their prevalence among individuals with poorly managed diabetes. [5] The immunosuppressive effects of hyperglycemia, coupled with increased susceptibility to infections, make diabetics more prone to such oral complications. [6] However, specific data on the prevalence of multiple periodontal cysts in uncontrolled diabetic populations are limited, and existing studies often lack focused investigation on this condition.

Glycemic control plays a critical role in determining the severity and progression of oral diseases. Poor glycemic control, often observed in patients with uncontrolled diabetes, exacerbates the inflammatory response in periodontal tissues. [7] This leads to a heightened risk of infections, which can subsequently cause or worsen odontogenic cyst formation. Research indicates that hyperglycemia can impair neutrophil function, reduce tissue repair capacity, and increase the oral microbial load, thereby creating an environment conducive to the development of periodontal cysts. [8]

Despite these insights, there remains a knowledge gap concerning the specific prevalence and characteristics of periodontal cysts in uncontrolled diabetic patients. Understanding the correlation between uncontrolled diabetes and periodontal cyst formation could offer valuable insights into targeted preventative and therapeutic strategies for this high-risk population. By conducting an observational survey focused on this relationship, we aim to fill this knowledge gap and provide a foundation for more personalized periodontal management in diabetic care.

This study aims to investigate the prevalence of multiple periodontal cysts in patients with uncontrolled diabetes through an observational survey. By examining this population, we seek to determine whether a correlation exists between the lack of glycemic control and an increased prevalence of periodontal cysts. Ultimately, this research could aid clinicians in identifying diabetic patients at higher risk of oral complications, supporting early intervention and improved management strategies.

Materials and Methods

Study Design and Population

This observational survey was conducted to assess the prevalence of multiple periodontal cysts in patients with uncontrolled diabetes. The study involved a comprehensive review of clinical records from approximately 5000 diabetic patients treated at [insert hospital/clinic name] between [insert start and end dates]. After thorough screening, a total of 2759 patients were identified as having uncontrolled diabetes, defined by a hemoglobin A1c (HbA1c) level greater than 7%.

Inclusion Criteria

1. Diagnosed Type 1 or Type 2 diabetes (clinical guidelines).
2. HbA1c > 7% (uncontrolled diabetes).
3. Aged 18 years or older.
4. Complete medical and dental records.
5. Informed consent for research data usage.

Exclusion Criteria

1. HbA1c ≤ 7% (controlled diabetes).
2. Incomplete medical records.

3. Significant dental procedures within the last 6 months.
4. Systemic conditions affecting oral health (e.g., autoimmune diseases, malignancies).
5. Pregnancy.

Data Collection

Data were collected using a standardized questionnaire that included information on demographics, diabetes management (medications, duration of diabetes), general health status, and oral health assessments (including clinical examinations and radiographic evaluations). The presence of multiple periapical cysts was confirmed through clinical and radiographic findings, as documented in the patients' dental records.

Statistical Analysis

Descriptive statistics were employed to summarize patient demographics and clinical characteristics. The prevalence of multiple periodontal cysts among patients with uncontrolled diabetes was calculated. Comparisons between subgroups were performed using chi-square tests, with a significance level set at $p < 0.05$. Data were analysed using SPSS software to ensure rigorous statistical evaluation of the results.

Results

Patient Demographics

A total of 5000 diabetic patient records were screened, and 2759 patients (55.2%) (Figure 1) were identified as having uncontrolled diabetes (HbA1c > 7%). Among these patients, the age range was 30–80 years, with a mean age of 56.2 ± 12.5 years. The gender distribution included 1563 males (56.7%) and 1196 females (43.3%).

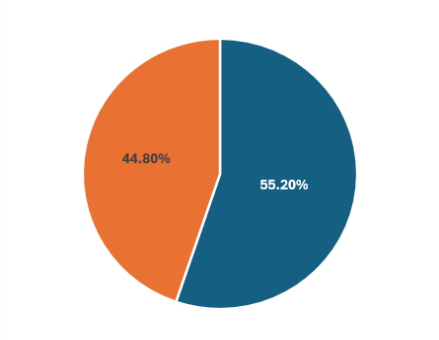

Figure 1: Shows the distribution of cases where the orange (44.80%) denotes the controlled diabetic group, and the Blue (55.20%) denotes the number of uncontrolled diabetic group.

Oral Hygiene Assessment

The oral hygiene status of patients was assessed using the Decayed, Missing, and Filled Teeth (DMFT) index and the plaque index score. Of the 2759 patients with uncontrolled diabetes, 2183 (79.1%) had poor oral hygiene (figure 2) , characterized by low DMFT scores (indicating untreated decay and missing teeth) and high plaque index values. The average DMFT score for this group was 5.7 ± 1.3, while the mean plaque index score was 2.8 ± 0.6, indicating suboptimal oral health and a high burden of dental plaque and caries.

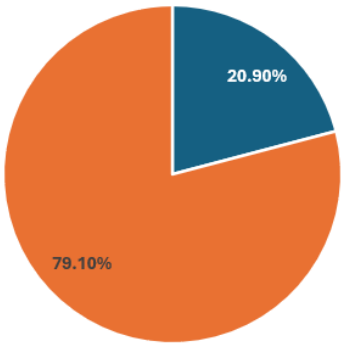

Figure 2: Shows the participants with poor oral hygiene where the orange (79.10%) denotes the percentage of participants having poor oral hygiene, and the Blue (20.90%) denotes the percentage of participants having better oral hygiene according to their DMFT scores.

Prevalence and Distribution of Periapical Cysts

Radiographic and clinical examinations revealed that 983 patients (35.6%) with uncontrolled diabetes had more than two periapical cysts, often located in the posterior mandibular and maxillary regions. The cysts ranged in size from 0.5 to 2.5 cm in diameter, with most patients presenting with multiple cysts bilaterally. The high prevalence of periapical cysts in this population suggests a correlation between poor glycemic control and cyst formation in periodontal tissues.

Clinical Features of Periapical Cysts
The clinical presentation of periapical cysts in patients with uncontrolled diabetes commonly included chronic or recurrent pain, mild to moderate swelling, and discomfort during chewing. Radiographically, the cysts presented as well-defined radiolucent areas at the apex of the affected teeth, with sclerotic borders in some cases. In addition, many patients reported tooth mobility and tenderness in the cystic regions. These findings suggest that periapical cysts in uncontrolled diabetic patients are often symptomatic and may interfere with daily activities.

History of Periapical Cysts and Surgical Outcomes
Among the 983 patients with periapical cysts, 649 (23.5% of the total uncontrolled diabetic population) had a documented history of previous cyst formation and surgical intervention. These patients often experienced postoperative complications, including delayed healing, infection, and recurrence of cysts. The recurrence rate in this subset was approximately 45.8%, likely due to impaired wound healing and a reduced immune response associated with hyperglycemia.

Medications and General Health
Data on medications revealed that most patients were prescribed oral hypoglycemic agents (56.2%) or insulin (43.8%) to manage diabetes, although glycemic control remained suboptimal in these patients. Additionally, a significant number of patients (67.4%) were diagnosed with comorbid conditions such as hypertension, cardiovascular disease, or renal dysfunction, which may further influence their susceptibility to infections and periodontal complications.

The analysis highlights a strong correlation between uncontrolled diabetes and poor oral health outcomes, including increased prevalence and recurrence of periapical cysts. Uncontrolled diabetic patients not only showed higher instances of poor oral hygiene but also demonstrated a significant tendency toward multiple and recurrent periapical cysts, indicating the need for enhanced oral health management and monitoring within this high-risk group.

Discussion

The findings of this study underscore the significant impact of uncontrolled diabetes on oral health, specifically in relation to the prevalence of multiple periapical cysts. Our data indicate that patients with poorly controlled diabetes exhibit notably poor oral hygiene, as reflected by low DMFT and high plaque index scores in 79.1% of the study population. This aligns with previous studies that have shown an association between hyperglycemia and diminished oral health, suggesting that elevated blood glucose levels can alter the oral microbiome, reduce salivary flow, and lead to increased plaque accumulation and dental caries. [9-11] Diabetic patients are also more prone to periodontal inflammation, with vascular changes and reduced infection resistance that contribute to a greater risk of oral diseases. [12-14] These factors highlight the need for oral health interventions specifically tailored to diabetic patients to address these systemic and local challenges.

Our study also reveals a high prevalence of multiple periapical cysts in patients with uncontrolled diabetes, with 35.6% of this population exhibiting more than two cysts. This elevated rate is consistent with the literature suggesting that hyperglycaemia can weaken immune defences, increasing susceptibility to odontogenic infections and subsequent cyst formation. [15,16] The presence of elevated glucose in gingival crevicular fluid and saliva in diabetic patients creates an environment that facilitates microbial growth, further predisposing these individuals to infections in the periodontal and periapical tissues. [17] This phenomenon suggests that diabetic patients, particularly those with poorly controlled glucose levels, may be at greater risk of developing these oral cysts due to a complex interplay of compromised immune function, chronic inflammation, and heightened microbial activity. [18]

A notable observation from our analysis is the high rate of recurrence in periapical cysts following surgical intervention, with 23.5% of patients having a documented history of recurrent cyst formation. In this subset, nearly 45.8% of cases showed evidence of cyst recurrence post-surgery, which is likely attributable to impaired healing associated with diabetes. Chronic hyperglycaemia is known to

disrupt the normal wound-healing cascade by delaying cell migration, reducing angiogenesis, and impairing collagen formation, which can contribute to poor postoperative outcomes and cyst recurrence in diabetic individuals. [18,19] These findings support the need for more rigorous postoperative care protocols and follow-up strategies in diabetic patients undergoing oral surgeries, to mitigate the risk of recurrent infections and improve healing outcomes.

Additionally, the data from this study illustrate the complex relationship between diabetes-related comorbidities and oral health outcomes. Most of our study participants were also managing other chronic conditions such as hypertension, cardiovascular disease, and renal dysfunction, all of which can complicate glycaemic control and heighten susceptibility to periodontal and periapical pathologies. These comorbidities likely compound the oral health challenges faced by diabetic patients, suggesting that a multidisciplinary approach involving both dental and medical practitioners is essential to ensure holistic management of these patients. Addressing not only oral health but also systemic health factors in diabetic patients may lead to better overall outcomes and reduce the incidence of complications such as periapical cysts.

In summary, our study emphasizes the need for heightened awareness and proactive management of oral health in diabetic patients, particularly those with uncontrolled glucose levels. The high prevalence of multiple periapical cysts and the notable rate of recurrence in this population suggest that tailored preventive and treatment strategies are critical. Future research could explore the specific molecular mechanisms linking hyperglycaemia to cyst formation and recurrence, as well as interventions to enhance immune function and wound healing in diabetic patients. The findings presented here contribute to a growing body of evidence underscoring the importance of comprehensive oral care in the management of diabetes, with potential benefits extending beyond oral health to impact overall quality of life and systemic disease outcomes.

Conclusion

This study highlights a significant association between uncontrolled diabetes and an increased prevalence of multiple periapical cysts, alongside poor oral hygiene and a high recurrence rate of cysts post-surgery. Our findings underscore the impact of hyperglycemia on oral health, suggesting that poor glycemic control not only exacerbates periodontal inflammation and infection susceptibility but also impairs wound healing, leading to recurrent periapical pathologies. These results emphasize the critical need for integrated care approaches that address both glycemic management and oral health maintenance in diabetic patients to prevent complications and improve clinical outcomes. Future research should explore targeted strategies to enhance oral health and surgical recovery in this vulnerable population.

Acknowledgement: Nil

Conflict of interest: Nil

Source of funding: Nil

References

1. Banday MZ, Sameer AS, Nissar S. Pathophysiology of diabetes: An overview. Avicenna journal of medicine. 2020 Oct;10(04):174-88. DOI: [10.4103/ajm.ajm_53_20]
2. S.Ragul Prasath, Dr. Palati Sinduja, Dr. Priyadharshini (2022). Knowledge And Awareness on Various Treatment Modalities of Diabetes Mellitus -A Observational Survey Journal for Educators, Teachers and Trainers,Vol. 13(6). 190-198. DOI: [10.47750/jett.2022.13.06.017]
3. Păunică I, Giurgiu M, Dumitriu AS, Păunică S, Pantea Stoian AM, Martu MA, Serafinceanu C. The bidirectional relationship between periodontal disease and diabetes mellitus—A review. Diagnostics. 2023 Feb 11;13(4):681. DOI: [10.3390/diagnostics13040681]
4. Dias GJ, Prasad K, Santos AL. Pathogenesis of apical periodontal cysts: guidelines for diagnosis in palaeopathology. International Journal of Osteoarchaeology. 2007 Nov;17(6):619-26.DOI: [10.1002/oa.902]
5. Mealey BL, Ocampo GL. Diabetes mellitus and periodontal disease. Periodontology 2000. 2007 Jun

1;44(1). DOI: [10.1111/j.1600-0757.2006.00193.x]
6. Chávez-Reyes J, Escárcega-González CE, Chavira-Suárez E, León-Buitimea A, Vázquez-León P, Morones-Ramírez JR, Villalón CM, Quintanar-Stephano A, Marichal-Cancino BA. Susceptibility for some infectious diseases in patients with diabetes: the key role of glycemia. Frontiers in public health. 2021 Feb 16;9:559595. DOI: [10.3389/fpubh.2021.559595]
7. Sonnenschein SK, Meyle J. Local inflammatory reactions in patients with diabetes and periodontitis. Periodontology 2000. 2015 Oct;69(1):221-54. DOI: [10.1111/prd.12089]
8. Palaskar SJ, Pawar RB, Shah DR. Oral Health Challenges during Chronic Diseases: Prevention and Treatment Using Functional Foods and Nutraceuticals. InApplications of Functional Foods and Nutraceuticals for Chronic Diseases 2023 Feb 9 (pp. 293-316). CRC Press. DOI: [1201/9781003220053-13]
9. Ahmad R, Haque M. Oral health messiers: diabetes mellitus relevance. Diabetes, Metabolic Syndrome and Obesity. 2021 Jul 1:3001-15. DOI: [10.2147/DMSO.S318972]
10. Hoseini A, Mirzapour A, Bijani A, Shirzad A. Salivary flow rate and xerostomia in patients with type I and II diabetes mellitus. Electronic physician. 2017 Sep;9(9):5244. DOI: [10.19082/5244]
11. Matsumoto N, Omagari D, Ushikoshi-Nakayama R, Yamazaki T, Inoue H, Saito I. Hyperglycemia induces generation of reactive oxygen species and accelerates apoptotic cell death in salivary gland cells. Pathobiology. 2021 May 17;88(3):234-41. DOI: [10.1159/000512639]
12. Sneka S, Sinduja P. A comparative study on salivary ph in diabetic patients with periodontitis and without periodontitis. Journal of Pharmaceutical Negative Results. 2022 Oct 4:1253-8. DOI: [10.47750/pnr.2022.13.S04.148]
13. Iacopino AM. Periodontitis and diabetes interrelationships: role of inflammation. Annals of periodontology. 2001 Dec;6(1):125-37. DOI: [10.1902/annals.2001.6.1.125]
14. Graves DT, Ding Z, Yang Y. The impact of diabetes on periodontal diseases. Periodontology 2000. 2020 Feb;82(1):214-24. DOI: [10.1111/prd.12318]
15. Jafar N, Edriss H, Nugent K. The effect of short-term hyperglycemia on the innate immune system. The American journal of the medical sciences. 2016 Feb 1;351(2):201-11. DOI: [10.1016/j.amjms.2015.11.011]
16. Graves DT, Kayal RA. Diabetic complications and dysregulated innate immunity. Frontiers in bioscience: a journal and virtual library. 2008 Jan 1;13:1227. DOI: [10.2741/2757]
17. Barros SP, Williams R, Offenbacher S, Morelli T. Gingival crevicular fluid as a source of biomarkers for periodontitis. Periodontology 2000. 2016 Feb;70(1):53-64. DOI: [10.1111/prd.12107]
18. Negrini TD, Carlos IZ, Duque C, Caiaffa KS, Arthur RA. Interplay among the oral microbiome, oral cavity conditions, the host immune response, diabetes mellitus, and its associated-risk factors—An overview. Frontiers in oral health. 2021 Sep 9;2:697428. DOI: [10.3389/froh.2021.697428]
19. Pastar I, Balukoff NC, Sawaya AP, Vecin NM, Tomic-Canic M. Physiology and pathophysiology of wound healing in diabetes. InThe Diabetic Foot: Medical and Surgical Management 2024 May 31 (pp. 109-134). Cham: Springer International Publishing. DOI: [10.1007/978-3-031-55715-6_7]
20. Tahergorabi Z, Khazaei M. Imbalance of angiogenesis in diabetic complications: the mechanisms. International journal of preventive medicine. 2012 Dec;3(12):827. DOI: [10.4103/2008-7802.104853]