

Periodontal Abscess as a Clinical Oral Sign in Patients with Diabetes Mellitus - An Original Study

P S Samyuktha¹, Shilpa Syam^{2*}

¹Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, India.

²Department of Oral Medicine and Radiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, India.

Abstract

Diabetes mellitus is an endocrine-related systemic metabolic disorder that is characterized by increased blood glucose levels and abnormalities in carbohydrate, protein, and lipid metabolism. Many studies show a high prevalence rate of periodontal diseases as well as increased severity in diabetic patients than in non-diabetic patients, including greater attachment loss, increased alveolar bone loss, marked bleeding on probing, and increased mobility of teeth. The current study aims to evaluate the periodontal abscess as a possible oral sign in patients with diabetes mellitus. A sample size of 500 diabetic patients from the Dental OP visiting a private dental college was included in the study. The patient's periodontal status, oral hygiene and presence of any abscesses were recorded. The patients' RBS levels were recorded and subjected to statistical analysis. The Chi-Square test was used for the comparison of groups. Out of the 500 patients, 425 (85%) presented with no periodontal abscess in the oral cavity, while 75 patients (15%) presented with periodontal abscess in the oral cavity. The cross-tabulation between the RBS value and the presence of periodontal abscess was done and it was found to be statistically significant (p value = $0.024 < 0.05$). The present study shows that Periodontal abscess can be considered as a possible oral sign in patients with Diabetes Mellitus. Periodontal abscess can be considered as possible oral clinical diagnostic criteria for the diagnosis of diabetes mellitus. Multiple or recurring periodontal abscesses can signify uncontrolled diabetes mellitus.

Keywords: Periodontal abscess, Diabetes mellitus, Oral sign of diabetes, Periodontitis, Innovative treatment

Corresponding author: Shilpa Syam
E-mail ✉ shilpaskottoor@gmail.com

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Introduction

Diabetes mellitus is a systemic metabolic disorder that is characterized by increased blood glucose levels and abnormalities in carbohydrate, protein and lipid metabolism [1, 2]. It is an endocrine disorder caused by decreased insulin production or increased insulin tolerance [3]. It can be categorized into 2 types: Type I, which is known as insulin-dependent diabetes mellitus, and Type II which is known as non-insulin-dependent diabetes mellitus [4, 5]. Autoimmune destruction of β - cells of the

pancreas is the cause of type I diabetes, and type II develops as a result of improper insulin function [6, 7]. Polyuria, polydipsia, and polyphagia, as well as lethargy and weariness accompanying pruritus, are the most frequent systemic illnesses afflicting the Indian population [8]. Diabetes mellitus causes periodontitis, which is the sixth most common consequence. Diabetics have a higher prevalence of severe periodontitis than non-diabetics, with a ratio of 59.6% to 39% [9]. Many studies show a higher prevalence rate of periodontal diseases as well as a marked increase in severity in diabetic patients than in nondiabetic

patients, including greater attachment loss, increased alveolar bone loss, marked bleeding on probing, and increased mobility of teeth [10].

The periodontal flora is affected by diabetes. *Capnocytophaga*, anaerobic *vibrios*, and *Actinomyces* species have been found in the subgingival flora of insulin-dependent diabetic individuals with periodontitis [11]. Another potential method for decreasing the severity of periodontal disease is a decrease in cAMP levels [12]. Diabetes is also linked to a faulty host response. Diabetics with impaired neutrophils are more susceptible to periodontitis [13]. In diabetics, hyperglycemia causes reduced chemotaxis, phagocytosis, and increased intracellular bacterial activity [14]. Chemotaxis dysfunction can be caused by a variety of biochemical changes in the body [15]. Diabetes has been linked to faulty phagocytosis. In poorly managed diabetes, neutrophil phagocytosis is compromised [16]. In diabetics, defects in PMN function have been suggested as a possible source of bacterial infection [17]. Patients with diabetes and periodontal diseases show a marked rise in prostaglandin E2 synthesis, secreted by peripheral blood monocytes [18]. Insulin defects are associated with collagen defects. Osteoblasts produced fewer bone matrix components, gingiva and periodontal ligament fibroblasts produced less collagen, and collagenase activity increased in experimentally created diabetics [19]. Collagen from diabetic patients is more insoluble and resistant to digestion, affecting breakdown and remodeling directly [20]. Insulin prevents the start of the disease and corrects the abnormal collagen production. Genetic propensity, lengthy duration, and poor control of hyperglycemia have all been linked to vascular alterations [21]. Poor wound healing is a typical occurrence in diabetics, and it is marked by a decrease in wound collagen content and tensile strength. Impaired growth factor secretion could play a major role in diabetic wound healing.

The periodontal abscess is a localized infection in the periodontium that is characterized by the aggregation of necrotic debris and bacterial products [22]. Periodontal abscesses can cause rapid loss of the periodontal tissues, periodontal ligament, and alveolar bone, negatively impacting the tooth's prognosis [23]. Periodontal abscesses are the third most prevalent dental emergency that people bring to the dentist's office. A periodontal abscess's microbiology is strikingly similar to that of periodontal disease, with gram-negative anaerobic bacteria predominating. Periodontal abscess can be used as an oral clinical diagnostic criterion for diabetes mellitus diagnosis [24].

The current study aimed to evaluate the periodontal abscess as a possible oral sign in patients with diabetes mellitus.

Materials and Methods

This retrospective study examined the records of patients from June 1, 2019 to March 31, 2021 who visited Saveetha Dental College and Hospitals. Ethical approval was obtained from the institutional review board. The study population included adult patients with Diabetes mellitus. The study sample included both male and female genders, predominantly South Indians. The sample size was 500 adult diabetic patients. The inclusion criteria for the study included patients with diabetes mellitus with records of their Rbs value, a proper clinical photograph, and periodontal status. Exclusion criteria included Patients with other systemic illnesses, patients with periapical abscesses, pericoronal abscesses, etc.

The necessary data, such as age, gender, chief complaint, past medical history, dental status, periodontal status, etc., was recorded. The periodontal status data was analyzed along with the dental status of the patient to look for the presence of a periodontal abscess. The patients' RBS values were analyzed. The incomplete patient data was excluded.

Data was recorded in Microsoft Excel, exported to the statistical package of Social Science for Windows (SPSS), and subjected to statistical analysis. The chi-square test was used for the comparison of groups, and their significance was recorded. Pie charts and bar graphs were used to graphically represent the data obtained.

Results and Discussion

Out of the 500 samples chosen, 449 (89.8%) were males and 51 (10.2%) were females (**Figure 1**). 15 patients (3%) were in the age group 20-30 years, 70 patients (14%) were in the age group 30-40 years, 130 patients (26%) were in the age group 40-50 years, 170 patients (34%) were in the age group 50-60 years, 60 patients (12%) were in the age group 60-70 years, 40 patients (8%) were in the age group 70-80 years, and 15 patients (3%) were above 80 years of age (**Figure 2**).

Out of the 500 patients, 425 (85%) presented with no periodontal abscess in the oral cavity, while 75 patients (15%) presented with periodontal abscess in the oral cavity (**Figure 3**).

Out of the 500 patients, 158 (31.6%) patients showed RBS value between 300-400 mg/dl, 127 (25.4%) showed RBS value of less than 200 mg/dl, 117 (23.4%) patients showed RBS value of 300-400 mg/dl and 98 patients (19.6%) showed RBS value of more than 400 mg/dl (**Figure 4**).

The cross-tabulation (Chi-Square test) between the RBS value and the presence of periodontal abscess was done and it was found to be statistically significant (p value= $0.024 < 0.05$) (**Figure 5**).

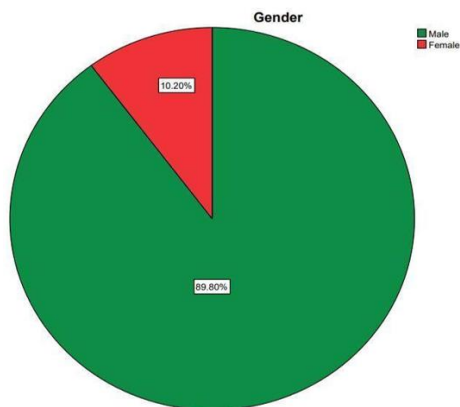


Figure 1. Pie chart depicting the percentages of the gender of the diabetic patients in the sample size. 89.8% (green) were males, while 10.2% (red) were females.

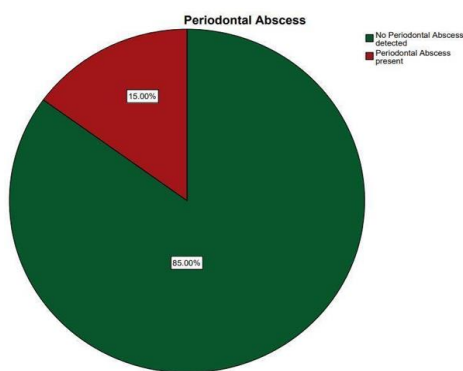


Figure 2. Pie chart depicting the age groups of the patients in the sample size. 3% of the patients (Dark blue) were in the age group 20-30 years, 14% of the patients (Green) were in the age group 30-40 years, 26% of the patients (Beige) were in the age group 40-50 years, 34% of the patients (Purple) were in the age group 50-60 years, 12% of the patients (Yellow) were in the age group 60-70 years, 8% of the patients (Red) were in the age group 70-80 years and 3% of the patients (Light blue) were above 80 years of age.

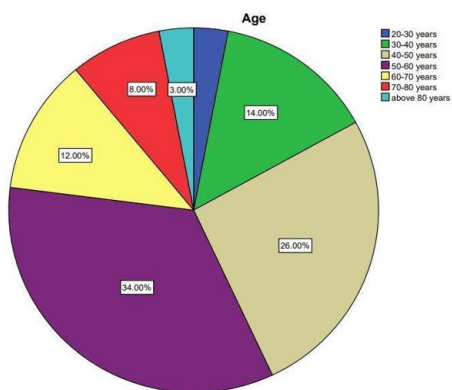


Figure 3. Pie chart depicting the presence of Periodontal abscess in the sample size. 85% (Green) presented with no periodontal abscess in the oral cavity, and 15% (Red) presented with periodontal abscess in the oral cavity.

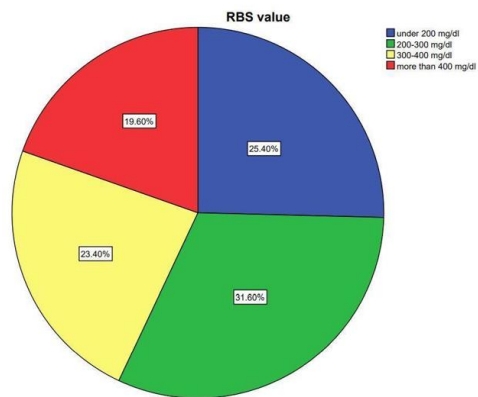


Figure 4. Pie chart depicting the RBS values of the patients. 31.6% (Green) had RBS value between 200-300 mg/dl, 25.4% (Blue) had RBS value under 200 mg/dl, 23.4% (Yellow) had RBS value between 300-400 mg/dl and 19.6% (Red) had RBS value of more than 400 mg/dl.

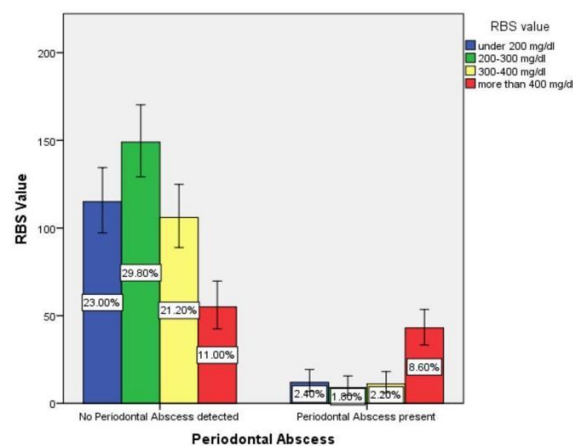


Figure 5. Bar chart showing the association between the RBS values of the patients and the presence of periodontal abscess. The x-axis represents the presence of periodontal abscess and the y-axis represents the RBS values of the patients. Blue denotes an RBS value of less than 200 mg/dl, Green denotes an RBS value between 200-300 mg/dl, Yellow denotes an RBS value between 300-400 mg/dl and Red denotes an RBS value of more than 400 mg/dl. Patients with higher RBS values have been found to have a higher occurrence of Periodontal abscesses, while patients with slightly elevated RBS values are found to not have periodontal abscesses. The difference was found to be statistically significant (chi-square value: 8.687, df: 3, p-value: 0.024: significant). Hence, statistically significant results show that patients with higher RBS values -more than 400 mg (8.6%)— have a higher chance of developing periodontal abscesses.

The present study shows that periodontal abscess can be considered a possible oral sign in patients with diabetes

mellitus. It was found that patients with higher RBS values were more prone to developing periodontal abscesses. It can be noted that while undiagnosed diabetes mellitus can be detected in a small percentage of patients with the presence of periodontal abscess as a diagnostic criteria, periodontal abscess can also be considered a complication due to diabetes mellitus. The various factors at play include poor wound healing, suppressed immunity, defective collagen deposition, etc. [25]. Other factors that can be considered while associating periodontal pathology with diabetes mellitus might include socio-economic factors, accessibility to proper dental care, oral hygiene, race, ethnicity, etc. [26].

Previous studies have tried linking periodontal abscess with diabetes mellitus and have yielded success. A study conducted by Alagl *et al.* found that 0.05% of undiagnosed diabetes was noted among the 1,43,212 patients [25]. In their retrospective study involving 1352 patients, it was found that almost 59% of the patients had elevated HbA1c levels, with 12% of the patients with high levels of HbA1c showing multiple recurrent periodontal abscesses. This is in correlation with the present study. Periodontal abscess can be used as an oral clinical diagnostic criterion for diabetes mellitus diagnosis. Elderly patients visiting dental clinics should be given special attention to determine whether they have this systemic ailment [27].

Reduced defense mechanisms and greater susceptibility to infection, which leads to devastating periodontal disease, are the most noticeable alterations in uncontrolled diabetes. Periodontal disease in diabetics, according to many physicians, does not follow a predictable pattern [28]. Diabetic patients with poor oral hygiene are more likely to experience severe gingival inflammation, deep periodontal pockets, fast bone loss, and frequent periodontal abscesses. Periodontal disease is more common and more severe in Type I diabetics, according to numerous studies. The study conducted by Bjelland *et al.* had 834 men and 742 women in their study, while the present study consisted of 449 males and 51 females [26]. This gave rise to a higher male population in the study, leading to probable inconsistencies.

Willett *et al.*'s investigation of long-term risk treatments among type 2 diabetes patients found that several of them are linked to low daily activity, depression, and cognitive impairment [29]. Such consequences, while evident, may be connected to other systemic illnesses, leaving the disease's original cause undiagnosed. Multiple periodontal abscesses, or recurrent periodontal abscesses, are symptoms of diabetes mellitus [30]. The occurrence of acute infections in senior people, such as repeated recurring periodontal abscesses, might be used as a clinical indicator for diabetes mellitus diagnosis. The mean age of the patients in the study by Walter *et al.* was ± 14.2 years. This is in correlation with the present study as the most common age group was found to be 50-60 years.

A two-way interaction between diabetes and periodontal disorders should be given significant emphasis in the current era of periodontal medicine. Periodontal disease treatment returns blood sugar levels to normal. Similarly, diabetes mellitus treatment leads to a reduction in periodontal disease [31]. Patients with multiple periodontal abscesses should be referred for laboratory testing, and if diabetic, should be sent to a physician for diabetes care. Similarly, diabetic patients should have a periodontal check as part of their physical examination for diabetes monitoring. Patients should be referred to a periodontist for treatment if symptoms of gingival irritation or abscesses are discovered [32]. Since the study was retrospective and relied on the data already collected, it was limited by its interventions and investigations.

The study can be further expanded by holding clinical trials of patients with diabetes mellitus with periodontal problems and associating various RBS levels with various periodontal pathologies. It can be further expanded by performing cohort studies of diabetic patients with multiple periodontal abscesses.

Conclusion

Periodontal abscesses can be considered as possible oral clinical diagnostic criteria for the diagnosis of uncontrolled diabetes mellitus. Dentists must be aware of all the clinical oral signs. Systemic illnesses can manifest and should aid the patients in the proper diagnosis and treatment of the same. Multiple or recurring periodontal abscesses can signify uncontrolled diabetes mellitus.

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Ethics statement: The study was approved by the Ethical Committee of the institution and the study was done with adherence to the principles of Declaration of Helsinki.

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