



## Association between diabetes mellitus and periodontal health

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### ABSTRACT

Periodontitis is a chronic inflammatory disease, highly prevalent almost around 10-15% of adults. Periodontitis is a group of chronic, progressive bacterial infections causing inflammation and destruction of supporting structures of teeth and has multiple factors affecting the quality of an individual's life. Diabetes is also a chronic inflammatory disease. Both diseases share a common platform in disease pathogenesis, a periodontal abscess is the sixth complication of diabetes, and there is clear evidence showing the relationship between periodontitis and diabetes. Overall no clear evidence and studies which correlate diabetes and periodontal parameters. This study aims to compare blood sugar levels with demographic data age, gender and to assess the association between periodontal severity with diabetic status. Results: Periodontal severity was found to be greater in both male and female with diabetic Mellitus. 39 out of 52 subjects have generalized chronic periodontitis, and 13 was found to have localized chronic periodontitis. The age group of (50-70) years had high severity of clinical attachment loss. No significant difference between male and female on periodontal severity was found. Conclusion: This study concludes the age group of 50-60 years more prevalent among diabetes with periodontitis. The male is more affected by diabetes and periodontitis. The association between periodontal severity (CAL, PD) increases with an increase in blood sugar level was statistically significant.



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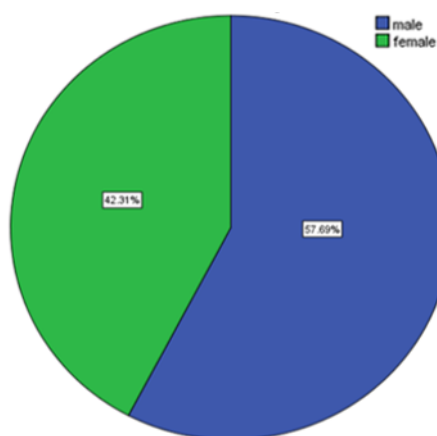
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### INTRODUCTION

The term "diabetes mellitus" is used to identify a group of disorders characterized by elevated levels

of glucose in the blood. Diabetes is a highly prevalent worldwide disorder (Amos *et al.*, 1997). Diabetes mellitus is known to be the most commonly found medical disorder that will be seen today by every practicing dentist. Awareness of the dentist about the general and oral signs of undiagnosed or less controlled diabetes mellitus is necessary. Diabetic patients with periodontitis and severe alveolar bone loss will undergo full mouth extraction while performing such extensive procedure full mouth series of CBCT should be taken to assess the course of the posterior inferior alveolar nerve (Kavarthapu and Thamaraiselvan, 2018). With improvements in treatment, more people are likely to survive for longer periods after diagnosis, thereby, further increasing the prevalence. This may consequently lead to increases in complications, and

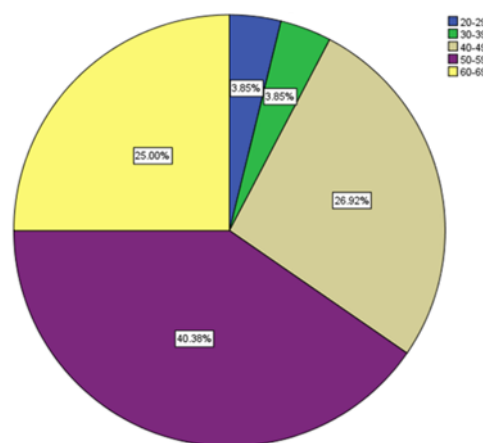
it is found that ET-1 plays a role in the pathogenesis of various systemic diseases and it is a potent vasoconstrictor (Khalid, 2017). It has been considered that diabetes is one of the most challenging health problems prevailing in the 21st century (Pradeepa and Mohan, 2002). Changes in human behavior and lifestyle have resulted in a spike in cases of diabetes mellitus all over the world (Cockram, 2000). India leads the world today with the largest number of diabetic cases in any given country all over the world (Bačić *et al.*, 1988). Diabetes in India is found to have a multi factorial aetiology and includes genetic factors together with environmental factors such as obesity-associated with increasing standards of living, steady urban migration, and lifestyle changes. Ascertaining underlying systemic diseases from oral symptoms is an important value of a tool in discovering underlying systemic diseases. The correlation between oral manifestation and systemic diseases provides a means for early diagnosis of such conditions. Oral candidiasis and other opportunistic fungal diseases are some of the early, non-specific signs of uncontrolled diabetes. Some previous studies suggest that periodontal regeneration through plasma rich protein will be helpful in treating both patients with chronic periodontitis and diabetes (Ravi *et al.*, 2017).



**Figure 1: Pie chart represents gender-wise distribution among the subjects.**

Systemic adverse manifestations of diabetes mellitus include increased fragility to bacterial infections, such as periodontal disease and delayed wound healing. Diabetics express more periodontal problems than non-diabetics. Interleukin-21 (IL-21) inflammatory mediator has a definitive role in the pathogenesis of various systemic diseases with an inflammatory component, and a study shows an increase in IL-21 levels in periodontitis (Sandberg *et al.*, 2000; Mootha *et al.*, 2016). Periodontitis is one of the most common inflammatory diseases of the oral cavity. It causes gradual destruction of connec-

tive tissue surrounding the teeth, ultimately leading to loss of teeth. Changes in oral soft tissues, in addition to periodontal tissues, can be helpful in the diagnosis of diabetes in undiagnosed patients and may serve as aids in monitoring the care of patients with known diabetes. Sometimes the destruction can be more severe, leading up to intrabony defects which can be treated by platelet-rich fibrin (Mealey, 2008; Panda *et al.*, 2014).

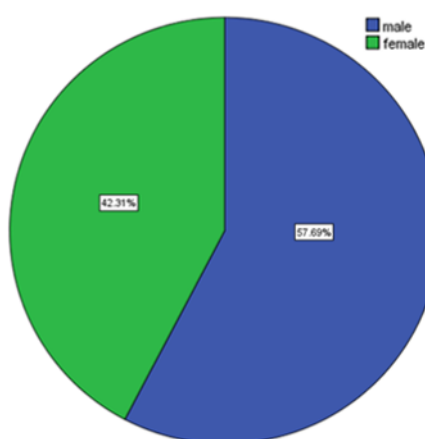


**Figure 2: Pie chart shows the age-wise distribution of the study subjects.**

The periodontal tissues are the most affected tissues in the oral cavity by diabetes. This can appear as redness and swelling of the gingiva, bleeding from the gingiva with minor provocation, looseness and spacing of teeth, and exposed root surfaces (at risk for caries) that may or may not carry plaque and mineralized deposits (calculus), depending on the oral hygiene of the individual. (Lamster *et al.*, 2008; Avinash *et al.*, 2017) this study suggests that Stem cells are uncommitted entities capable of both self-renewal and differentiation into cementoblasts, osteoblasts, fibroblasts, endothelial cells, nerve cells and epithelial cells which can be used in treating diabetic patients with periodontitis.

Multivariate risk analysis showed that subjects with type 2 diabetes had approximately threefold increased odds of having periodontitis compared with subjects without diabetes and this study found that there is an increase in TNF in patients with chronic periodontitis (Varghese *et al.*, 2015). Periodontal disease includes mainly gingivitis (in which the disease is only limited within gingiva and mostly reversible in nature) and periodontitis (in which the destruction is also extended to the surrounding tissues and alveolar bone) and when two inflammatory diseases having same pathogenesis needed to be treated in a holistic way (Ramesh *et al.*, 2016). Periodontitis mostly occurs in the adult population, and the level of destruction increases with increase in

age. In younger patients visiting clinics for esthetic treatment like the lip, positioning would be a valuable treatment option (Ramesh *et al.*, 2019). Multiple studies have demonstrated that diabetes mellitus (type 1 and type 2) is an established risk factor for periodontitis and microbial plaque accumulation consists of both bacterial and viral origin (Priyanka *et al.*, 2017). Both diabetes mellitus and periodontitis are chronic diseases affecting a larger group of people (Cockram, 2000). The fact that diabetes mellitus is commonly associated with periodontal diseases has been demonstrated in several studies (Emrich *et al.*, 1991; Cerda, 1994). There is evidence for a bidirectional relationship between diabetes mellitus and periodontal diseases.

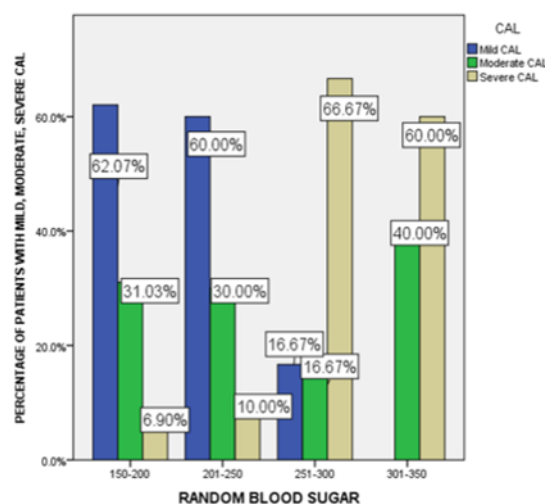


**Figure 3: The periodontal status of the subjects included in this study.**

8 out of 9 follow up studies reported poorer periodontal health in subjects with poorer glycemic control and treatment of aggressive periodontitis with diabetes can also be done with the help of dental implants (Davenport *et al.*, 1998; Ramesh *et al.*, 2017). Several other studies reported that treating periodontal disease in patients having diabetic Mellitus provided evidence that the periodontal infection has direct adverse but modifiable effect over glycemic control. Patients having periodontitis and diabetes in the view of maintaining their oral health mouthwash like chlorhexidine can be used in addition to herbal mouth wash (Ramamurthy and Mg, 2018).

Periodontal problem with diabetes when treated regularly showed better prognosis both in maintaining oral health and regulating glycemic control. As said earlier, endothelial cells play a major role in the pathogenesis of periodontitis which can be used as a marker to assess the severity of the disease (Khalid *et al.*, 2016). The study aims to compare blood sugar levels with demographic data age, gender and to assess the association between periodontal severity

and diabetes.



**Figure 4: Bar graph represents the association between blood sugar level and patients with mild, moderate and severe CAL.**

## MATERIALS AND METHODS

The case records of all 8600 patients visiting Saveetha Dental College from June 2019 to March 2020 were analyzed, and the data of 52 patients with diabetics were retrieved retrospectively. Data such as clinical attachment loss (CAL), probing depth (PD), and periodontal status of the individual. Ethical clearance: Ethical clearance was obtained from the research ethical board of saveetha dental college prior to the study. In case of doubts or discordance of Data, the patients were contacted over the phone or asked to report back to the College to confirm the findings. Sample size determination: Sample size was estimated to be fifty-two patients who visited saveetha dental college between June 2019 to April 2020 were selected for review. All patients had a history of diabetes mellitus. Their periodontal diagnosis was recorded.

### Eligibility criteria

#### Inclusion criteria

- Patients with a history of a diabetic.
- Patients with periodontitis.
- Those who gave informed consent were included.
- Patients with upper posterior teeth.

#### Exclusion criteria

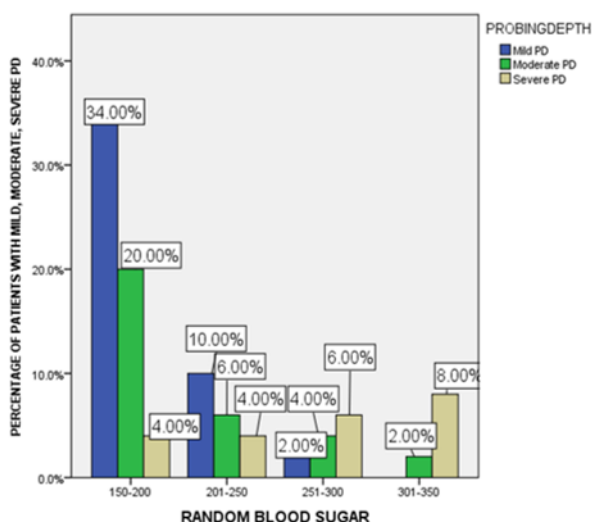
- Patient with coexisting systemic diseases.

- Severe oral inflammation is unrelated to periodontal conditions.

Probing depth and clinical attachment loss: Probing depth was recorded from gingival margin to the total depth while clinical attachment loss was recorded from cementoenamel junction using Williams probe. Out of six surfaces, the surface with the highest scoring was taken into consideration. The upper posterior tooth is recorded. Statistics: All the statistics and analysis were done using SPSS software (version 2019). All the descriptive analysis were used to present the number of male and female subjects and demographic variables of the study participants. Chi-square test was used to establish a correlation between categorical variables. P (<0.05) was set to be statistically significant.

## RESULTS AND DISCUSSION

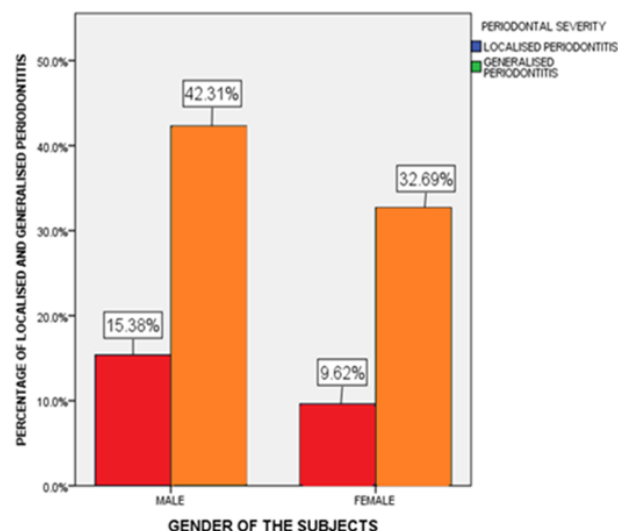
Fifty-two study participants who were qualified under inclusion criteria were analyzed. Out of 52 subjects male (n=30) and female (n=22) Figure 1 and age group of subjects was ranging from 20 to 70 years of age Figure 2 and the age group from 50 to 60 years of age had increased numbers of periodontitis which accounts for about more than 70 per cent, but in age groups like 20-40 years had fewer numbers which account for only about seven percent of cases.



**Figure 5: Bar graph represents the comparison between blood sugar level and subjects with mild, moderate and severe PD.**

Periodontal severity: 75 % out of 52 subjects have generalized chronic periodontitis, and 25% was found to have localized chronic periodontitis Figure 3. Association between blood sugar level and clinical attachment loss: subjects with low blood

sugar had less severe clinical attachment loss, severity increases with an increase in blood sugar level. (p<0.05) as evaluated by the chi-square test Figure 4. Association between blood sugar level and probing depth: subjects with low blood sugar had both less and high severe probing depth, severity increases with an increase in blood sugar level. (p<0.05) as determined by chi-square test Figure 5. Association between gender and periodontal severity: No significant difference is between male and female on periodontal severity. Both the genders are equally affected. This has been evaluated by (p>0.05) chi-square test Figure 6.



**Figure 6: A correlation between gender and periodontal severity.**

Periodontitis and diabetes are common, complex, chronic diseases with an established bidirectional relationship. Good periodontal regeneration achieved by the addition of platelet-rich fibrin along with coronally advanced flap improved prognosis as suggested by [Thamaraiselvan et al. \(2015\)](#). The diabetics with poor glycaemic control are associated with an increased prevalence and severity of periodontitis, then with good glycaemic control. Various herbal extracts with antioxidant, antibacterial properties are an effective adjunct plaque reduction, in treating diabetes with periodontitis ([Ramesh et al., 2016](#)). All Non-surgical periodontal treatment has been associated with improvements in glycaemic control in diabetic patients, with reductions in HbA1c of approximately 0.4% following periodontal therapy. For these reasons, management of periodontitis in people with diabetes are particularly important. The dental team, therefore, has an important role to play in the management of people with diabetes.

In this study, we had increased male subjects (n=30)

and female (n=22) but however no gender predominance on periodontal severity as we determined by chi-square test, no significance was found, this was in accordance with previous studies this shows male are more prone to diabetes than females. Periodontal severity increases as age increases in the patients with diabetes mellitus, as we found that the age group of 50-59 accounts to more than 40.38 percent of periodontitis when compared to the age group of other years of age. These results were in concurrence with the study of [Engbretson \(2002\)](#). In some previous study, the authors found that the type 2 diabetes mellitus shows association between diabetes disease and females ([Ervasti et al., 1985](#)). But later on, some studies interpreted results which were in contrast to the results found in the study above.

This study was undertaken to compare diabetic (both poorly controlled and well-controlled) with periodontal parameters, which were not done in previous studies ([Emrich et al., 1991](#); [Almas et al., 2001](#)). And we found that the patients with diabetes showed the aggressive and generalized form of periodontitis than less severe form/localized periodontitis ([Campus et al., 2005](#)) we analyzed that 75% of subjects had generalized periodontitis and only 25 % of cases had localized periodontitis. Previous studies also found that diabetes can increase the development of aggressive forms of periodontitis. In this also found that aged patients with high blood sugar level had severe clinical attachment loss, patients with blood sugar ranging from 150-200 had mild CAL whereas subjects with blood sugar ranging from 300-250 had no mild CAL but accounted to 60 % severe CAL. which is in accordance with a cross-sectional study which suggested that the clinical attachment loss is more prevalent in diabetic patients high blood sugar. And sometimes, young patients with diabetes can also have severe clinical attachment loss ([Lalla et al., 2006](#)).

There is progressive destruction of alveolar bone in adults with diabetes. Patients with poor glycemic control and poor oral hygiene have the risk of developing severe periodontitis ([Taylor et al., 1998](#)). It is found that as the duration of diabetes mellitus increases, the severity of periodontal disease also increases ([Andersen et al., 2007](#)). A study suggested that diabetes mellitus increases the gingival inflammatory response to plaque bio film ([Offenbacher et al., 2007](#)). Glycemic control without proper periodontal treatment will have a poor outcome on clinical attachment loss ([Ainamo et al., 1982](#); [Kata-giri, 2013](#)). Chronic periodontitis is asymptomatic in early stages ([Tervonen and Oliver, 1993](#); [Tsai et al., 2002](#); [D'Avila et al., 2005](#)) which can be easily

ignored by patients and assessed only by dentists. Studies show that well-controlled diabetes patients have a good and healthy periodontal status, and hence glycemic control should be seen as a regimen for periodontal health ([Mealey, 2006](#); [Goncalves, 2008](#)). Within the limitations of the study smaller sample size, so further studies with larger sample size and involving people from different ethnicities are mandatory. Furthermore, more prospective studies comparing the types of diabetes and their effect on glycemic control are essential.

## CONCLUSION

Periodontal disease and diabetes are strongly inter-related and have common pathology. The age group most prevalent diabetic with periodontitis is 50-59 years. The males are more affected than females. Association between periodontal severity (CAL, PD) increases with an increase in blood sugar level was statistically significant. The improvement in periodontal health would have a positive impact on glycemic control.

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The authors declare that they have no funding support for this study.

## Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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