Clinical Periodontal Parameters Associated with Diabetes Mellitus in Patients Attending a Private Dental Hospital in Chennai

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ABSTRACT

Chronic periodontitis is an inflammatory condition that affects oral tissues surrounding the teeth, guided mainly by host immune inflammatory reaction. It is widely accepted that chronic periodontitis is one of the classical complications of diabetes. Therefore, the aim of the study was to assess the clinical periodontal parameters associated with diabetes mellitus. A hospital setting based study where case record data of total 80 study participants, 40 diabetics and 40 healthy participants were examined using Russell's Periodontal Index and CPITN Index and Descriptive statistics, Chi-square were used to analyse the data. The mean age of the study population was 56.1 ± 13.4 years. No statistical significance found between Russell's periodontal index scores and diabetes, CPITN scores and diabetes in our study population. From the results of the study, it can be concluded that, clinical periodontal parameters though slightly severe among diabetic patients, no statistical significance was found when compared with the healthy patients. The periodontal parameters showed a moderate severity among diabetic patients compared to non-diabetic patients, even though no statistical difference was observed. As dental health professionals, our focus should be on improvising the oral hygiene of the diabetic patients to limit the progression of the disease.

KEY WORDS: BLEEDING ON PROBING; BONE LOSS; DIABETES; PERIODONTAL POCKET; RUSSELL'S PERIODONTAL INDEX.

INTRODUCTION

Periodontal disease is a chronic inflammatory disease of periodontium and is characterized by periodontal ligament loss and destruction of surrounding alveolar bone. It is the main cause of tooth loss among adults and is responsible for the global burden of disease. According to the National Oral Health Survey, the prevalence of periodontitis in India was 57%, 67.7%, 89.6%, 79.9%, in the age groups 12, 15, 35 - 44, 65 - 74 years respectively. Periodontitis leads to negative impacts and poor oral health related quality of life. Among various risk factors, diabetes has been confirmed as a major risk factor. Many studies have demonstrated the influence of diabetes on oral health conditions. Prevalence of severe

periodontitis in diabetics as compared to non-diabetics has been found to be 59.6% and 39%. The explanation for this was stated as, chronic hyperglycemia increases the expression of toll like receptors and pro inflammatory cytokines in periodontal tissue, thus augmenting periodontal inflammation (Kinane, 2001; Esa et al., 2001; Mathur et al., 2004; Al-Harthi et al., 2013; Huang et al., 2016; Nazir, 2017; Pavithra and Jayashri, 2019; Samuel et al., 2020).

Periodontal disease other than being the sixth complication of diabetes, also leads to an array of other oral health related problems such as heavy plaque accumulation leading to increased microbial concentration causing gingival diseases and dental caries, salivary gland dysfunction, may give rise to lesions in oral cavity which may cause nutritional problems (Saini et al., Saini and Sugandha, 2011; Prabakar et al., 2018b; Mebin et al., 2020; Neralla et al., 2019; Prabakar et al., 2016; Prabakar et al., 2018a; Prabakar et al., 2018; Mohapatra et al., 2019; Pratha and Prabakar, 2019; Pavithra and Jayashri, 2019; Samuel et al., 2020).

Another main factor influencing the severity of periodontitis is smoking where studies have shown moderate smokers

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have a 1.32 times higher risk of periodontal disease and heavy smokers have a 2.33 times higher risk. Also, there have been studies showing association of fluorosis with periodontal diseases which states fluoride could play a role as an environmental factor in causing periodontitis through its effect on hard and soft tissues of the periodontium. Therefore, it can be concluded that periodontal disease also depends on a number of factors (Vandana, 2014; Jang et al., 2016; Kumar and Preethi, 2017; Kumar and Vijayalakshmi, 2017; Khatri et al., 2019; Leelavathi and Others, 2019; Sathish and Karthick, 2020).

There are studies that report abnormal collagen metabolism, abnormal polymorphonuclear cell (PMN) function and altered microbial flora are found in close association with severity of periodontitis in diabetic patients, whereas other studies suggest there is no relationship between diabetes and periodontal disease there is no relationship between diabetes and periodontal disease and when these two conditions exist together, it is a coincidence rather than a specific cause and effect relationship. There is a difference of opinion regarding the relationship between periodontitis and diabetes, this study was conducted to assess clinical periodontal parameters associated with diabetes mellitus among the adult population visiting a private dental college in Chennai (Bernick et al., 1975; Ervasti et al., 1985; Hayden and Buckley, 1989; Grossi et al., 1996; Pavithra and Jayashri, 2019; Samuel et al., 2020).

Previously our team has a rich experience in working on various research projects across multiple disciplines (Gheena and Ezhilarasan, 2019; Ke et al., 2019; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Samuel et al., 2019; Sharma et al., 2019; Varghese et al., 2019; Venu et al., 2019; Vignesh et al., 2019; Jain et al., 2019; Jose et al., 2020; Krishnaswamy et al., 2020; Muthukrishnan et al., 2020; Samuel et al., 2020; Sathish and Karthick, 2020). Now the growing trend in this area motivated us to pursue this project.

MATERIAL AND METHODS

A retrospective study was conducted among patients reporting to the OPD of Saveetha Dental College with periodontal problems. The study was conducted between August 2019 - January 2020. Simple Random Sampling was carried out to select a total case record of 80 patients, out of which 40 were diabetic and 40 were healthy patients. Prior to the start of the study, ethical approval (SDC/SIHEC/2020/DIASDATA/0619-0320) was obtained from Scientific Review Board, Saveetha Dental College, SIMATS University. Data consisting of age, disease status, periodontal health status was retrieved from records of patients who visited the dental college. The periodontal status was quantified using Russell's Periodontal Index and CPITN Index. The oral examination was done using a mouth mirror, William's probe and WHO probe under bright light and dental chair by trained examiners. To measure CPITN Index, the WHO probe with working tip of 0.5mm in diameter and markings at 3.5 mm, 5.5 mm, 8.5 mm and 11.5 mm was used as it reduces the chances of false measurement of the pocket depth.

The index teeth 17/16, 11, 26/27, 37/36, 21, 46/47 were examined and a code was given to each sextant, but only the highest code was recorded among the examined teeth in individual sextant. After evaluating the periodontal status, Treatment Needs (TN) for each subject was categorized on the basis of highest code recorded during the examination of all sextants in the subject. While recording Russell's Periodontal Index, all teeth present were subjected to examination. Scoring values of 1, 2, 4, 6, 8 were given and cumulative score was obtained to elucidate the final periodontal status score and patients were categorized based on that. The findings were recorded according to the criteria's provided by the author and entered into the digital system.

Statistical Analysis: Data was analyzed using SPSS Version 23.0. Descriptive statistics, Chi square were used to analyse the parameters among the two groups. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

The study consists of case records of 80 participants out of which 52.50% were males and 47.50% were females as seen in Figure 1. The mean age of the participants was 56.1 ± 13.4 overall, for diabetics it was 61.4 ± 8.2 and for healthy patients, 50.8 ± 15.4 (Table 1) Figure 2 shows the distribution of participants based on Russell's Periodontal Score, 48.75% had "Established Destructive Periodontal Tissue", followed by 32.50% experiencing "Beginning of Destructive Periodontal Tissue", out of the total study population, 10.0% has "Terminal Disease", 7.50% has "Simple Gingivitis" and 1.25% has "Clinically Normal Supportive Tissue".

Figure 1: The pie chart represents the distribution of study population based on gender, where 67.69% were males (denoted by colour blue) and 32.31% were females (denoted by colour red), thus showing a male predilection in the study population.

The participants were also categorised based on their CPITN Score, which revealed 61.25% had Supra/Subgingival calculus, indicating need for professional cleaning of teeth and removal of plaque retentive factors, 27.50% had periodontal pockets with 4-5 mm depth indicating treatment need for scaling and root planing, 6.25% of the participants had gingival bleeding on probing, indicating a need for improving their personal hygiene, whereas the 5.0% of

participants who had periodontal pocket depth more than 6 mm depth needed to undergo complex procedures involving deep scaling, root planing and further surgical treatments (Figure 3). The comparison of Russell's Periodontal score among diabetics and non-diabetics did not produce a statistically significant value ($p=0.3$) even though the severity of periodontal disease was higher in diabetic patients as shown in Figure 4. Similarly, no statistical significance was seen among the two groups in terms of CPITN score ($p=0.6$) as given in Figure 5.

Table 1. Mean Age of study participants

Variable	N	Mean	Standard Deviation
Overall	80	56.1 years	13.4
Diabetic	40	50.8 years	15.4
Non-diabetic	40	61.4 years	8.2

Figure 2: The bar graph represents the distribution of the study population based on Russell's periodontal score. X axis represents Russell's periodontal score and Y axis represents the distribution of study participants based on Russell's periodontal score. Among the study population, 48.8% of all participants had established destructive periodontal tissue.

The current study was based on the alternate hypothesis that periodontal parameters are worse in diabetic patients than in non-diabetic patients. The results of this study support the hypothesis, however no statistically significant difference was observed in Russell's periodontal scoring and CPITN scoring when periodontal health of diabetic patients was compared to periodontal health of non-diabetic patients. One possible explanation for this could be that risk factors for periodontitis includes genetic, ethnicity, advancing age, smoking and not just presence or absence of systemic disease. There are reports of statistically significant relationship between the duration of hyperglycemia and severity of periodontal inflammation. In the current study, the duration of diabetes among the diabetic patients was approximately 3-4 years, therefore it could have resulted in the limited effect of hyperglycemia. Similar findings were reported in studies conducted by Shammari et al., Mohammed et al (Goldin et al., 2006; Al-Shammari et al.,

2006; Javed et al., 2014; Alasqah et al., 2018; Vijayashree, 2019; Mathew et al., 2020).

Figure 3: represents the distribution of CPITN scores among the study population. X axis represents the CPITN score and Y axis represents the distribution of the study population based on CPITN score. Among the study population, the majority of the participants (61.3%) had supra/subgingival calculus.

Figure 4: Represents the association between the diabetics, non-diabetics and Russell's Periodontal score. X axis represents the disease status, i.e diabetics and non-diabetics and Y axis represents the distribution of study population based on Russell's periodontal score. Chi square test was used and prevalence of destructive periodontal tissue was more in diabetics (26.2%) than in non-diabetics (22.5%), however no statistical significance was observed. $\chi^2 = 4.051$, $df = 4$, p value = 0.3; hence, statistically not significant.

However, studies have also reported statistical significance between Russell's periodontal score and duration of diabetes. The present study shows majority of the participants (61.2%) had supra/subgingival calculus, which coincides with the findings of other studies where removal of calculus was intended for majority of the study population, in a study conducted by Dan et al among patients of Rheumatoid arthritis, a study done among Intellectually Disabled patients contrasting results were found in other studies. The distribution of participants with pocket depth

more than 6 mm was around 5%, similar to other study by Dan et al., which could be explained by the fact that the less severity of periodontitis among this set of study participants could be attributed to the age group of the participants as, the present study had participants below 60 years of age, the studies with opposing results had participants over 65 years of age (Bretz et al., 2005; Kim et al., 2013; Piperea-Sianu et al., 2013; Piperea-Sianu et al., 2013; Diab et al., 2017; Vijayashree, 2019; Mathew et al., 2020).

Figure 5: Represents the association between diabetics, non-diabetics and CPITN score. X axis represents disease status and Y axis represents the distribution of study population based on CPITN score. Chi square test was used, and periodontal pocket depths were more severe in diabetics (15.0%) than in non-diabetics (12.5%), however no statistical significance was observed. χ^2 value = 1.565, df = 3, p value = 0.6; hence, statistically not significant

Periodontal conditions begin to undergo a faster destruction among diabetic patients aged 35 years and above as reported by Bacic et al. The odds of having severe periodontitis according to Russell's Periodontal scoring was slightly more in diabetic patients as to non-diabetics, as also seen in previous studies. As clinicians and public health professionals, it is necessary to evaluate the progression of periodontal disease among diabetic patients' early diagnosis and treatment could result in a better oral health related quality of life and decrease the burden of disease (Bacić et al., 1988; Brown et al., 1990; Torrungruang et al., 2005; Kannan et al., 2017).

Limitations: The study was conducted in a hospital setting, so patients seeking treatment have only been included, also the sample size being small, the results cannot be generalised. Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc et al., 2018; Ramesh et al., 2018; Ezhilarasan et al., 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree, 2019; Mathew et al., 2020). We hope this study adds to this rich legacy.

CONCLUSION

The periodontal parameters showed a moderate severity among diabetic patients compared to non-diabetic patients,

even though no statistical difference was observed. As dental health professionals, our focus should be on improvising the oral hygiene of the diabetic patients to limit the progression of the disease.

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