CASE STUDY

Prevalence and Severity of Periodontal Disease in Type II Diabetes Mellitus (Noninsulin-dependent Diabetes Mellitus) Patients in Gulbarga, Karnataka, India: An Epidemiological Study

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ABSTRACT

Background/objectives: The objective was to study the prevalence and severity of periodontal disease in type II DM patients in Gulbarga, Karnataka, India.

Materials and methods: A total of 100 type II DM patients and 100 nondiabetic patients with age group of 35 to 75 years were examined. The study group was divided into well, moderate and poorly controlled diabetes based on glycated hemoglobin (HbA_{1C}) levels. Information regarding age, oral hygiene habits, personal habits, diabetic status and mode of diabetic therapy was obtained. Community periodontal index of treatment needs (CPITN) was used to assess the periodontal status. The results were statistically evaluated.

Results: The mean CPITN score and the number of missing teeth was higher in diabetics compared to nondiabetics and was statistically significant ($p = 0.05$). The prevalence of periodontal disease was found to be more frequent and severe in diabetic patients as compared to nondiabetics. The risk factors like glycated hemoglobin HbA_{1C}, duration of diabetes, personal habits and oral hygiene habits showed a positive correlation with periodontal destruction, whereas mode of diabetic therapy showed negative correlation with the periodontal status.

Conclusion: Diabetic patients showed higher prevalence and severity of periodontal disease compared to nondiabetics.

Keywords: DM, Glycated hemoglobin, Periodontal disease, Community periodontal index of treatment needs.

INTRODUCTION

Diabetes Mellitus (DM) is a systemic disease with several major complications affecting both the quality and length of life.[1] Diabetes is certain to be one of the most challenging health problems in the 21st century. It is now one of the most common noncommunicable diseases globally. Diabetes is the fourth leading cause of death in most developed countries and there is substantial evidence that it is epidemic in many developing and newly industrialized nations.[2]

India leads the world today with the largest number of diabetics in any given country. In the 1970s, the prevalence of diabetes among urban Indians was reported to be 2.1% and this has now risen to 12.1%. According to WHO projections, the present 30 to 33 million diabetics in India will go up to 40 million by 2010 and 74 million by 2025. WHO has issued a warning that India will be the 'Diabetes Capital of the World'.[3]

DM is a systemic disease commonly associated with periodontal diseases. This close relationship has been demonstrated in a number of clinical and epidemiological studies.[4] The relationship between these two diseases is not totally clear. This may be due to complex nature of both the diseases. Several investigators have reported a higher incidence and severity of periodontal disease in type II noninsulin-dependent (NIDDM) diabetic patients as compared to nondiabetic controls. Evidence also suggests that periodontal infection and periodontal treatment have the potential to alter glycemic control in diabetic patients.[5]

A cross-sectional study by Emrich et al[6] was conducted to determine the relationship between DM and oral health status in Pima Indians from the Gila river Indian community in Arizona. The findings of this study demonstrated that diabetes increases the risk of developing destructive periodontal disease about threefold. In a study by Cerda et al,[7] the association of periodontal disease with diabetes was studied in NIDDM patients and it was concluded that years since diagnosis of diabetes is made were more significant than age, for severity of periodontal disease in.

In a study done by Novanes Jr et al,[8] it was concluded that glycated hemoglobin test was more reliable than the fasting glucose analysis. It has been also observed that the severity of periodontal disease increased with the increase in the blood glucose levels.[9]

There are very limited studies done comparing the periodontal status of poorly, moderately and well controlled diabetics. The literature reveals relative scarcity of studies from India in this perspective.

The aim was to study the prevalence and severity of periodontal disease in type II DM (NIDDM) patients in Gulbarga city and to investigate other factors, such as age,

sex, oral hygiene habits, personal habits, duration of diabetes, mode of diabetic therapy, glycated hemoglobin as contributory risk elements for periodontal disease.

MATERIALS AND METHODS

A cross-sectional case controlled study was designed. Patients were divided in to two groups—diabetics (NIDDM) and nondiabetics. Hundred (43 females and 57 males) type II DM (NIDDM) patients, aged between 35 and 75 years, visiting Dr Rudrawadi's Hospital, Gulbarga, Karnataka, India, formed the study group. Control group consisted of 100 (54 females and 46 males) patients, age and sex matched nondiabetic patients from the same hospital.

Patients within the age of 35 to 75 years (mean age: 53.012 ± 9.70) with at least 20 teeth present were included in the study. Patients with type I insulin-dependent DM (IDDM), history of rheumatic heart problems requiring prophylactic antibiotics, pregnant and lactating females were excluded from the study.

Diabetic patients based on the glycated hemoglobin (HbA_{1C}) values were divided as follows:[10]
1. $>7.0\%$ → Well controlled diabetics (35 patients)
2. $7.0-8.0\%$ → Moderately controlled diabetics (35 patients)
3. $>8.0\%$ → Poorly or uncontrolled diabetics (30 patients)

Informed written consent was obtained from all the participants. All relevant information regarding the age, oral hygiene aids used, frequency of tooth brushing and personal habits were obtained from the patients. The HbA_{1C} values, duration of diabetes (<5 years, 6-10 years, >10 years) and the mode of diabetic therapy (oral hypoglycemic drugs, combination of oral hypoglycemic drug and insulin, diet restriction, combination of oral hypoglycemic drugs and physical exercise) were obtained from the hospital records. Type II DM (NIDDM) patients were selected in the study,

as it is the most common form of diabetes observed in any population (85-90%), when compared to type I diabtese mellitus (IDDM) which accounts for 10 to 15% of all diabetic cases.[11]

Clinical examination was done with CPITN probe (Hu-Friedy, Chicago, IL, USA). Community periodontal index for treatment needs (CPITN) was recorded for the study and control group. The teeth examined were 17, 16, 11, 26, 27, 37, 36, 31, 46, 47 (FDI notation). Although 10 index teeth were examined, one relating to each sextant was made. When both or one of the designated molar teeth was present, the worst finding from these tooth surfaces was recorded for the sextant. If no index teeth were present in a sextant qualifying for examination, all the remaining teeth in that sextant were examined. If no, teeth were present in the sextant then it was coded as M.[12]

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS 10.0 statistical software. Statistical test employed for the obtained data in our study were Student's t-test, ANOVA, tukey's test, Kruskal-Wallis nonparametric test, odds ratio and multiple regression analysis.

RESULTS

Periodontal examination was carried out using CPITN probe and sextant was compared as this would avoid under emphasis/over emphasis (Graphs 1 and 2). Periodontal status of upper right sextant in nondiabetic and diabetic males was 1.609 ± 0.954 and 2.919 ± 0.788 respectively and in nondiabetic and diabetic females was 1.444 ± 1.076 and 2.755 ± 0.735 respectively. Periodontal status of upper anterior teeth in nondiabetic and diabetic males was 1.283 ± 0.779 and 2.793 ± 0.786 respectively and in
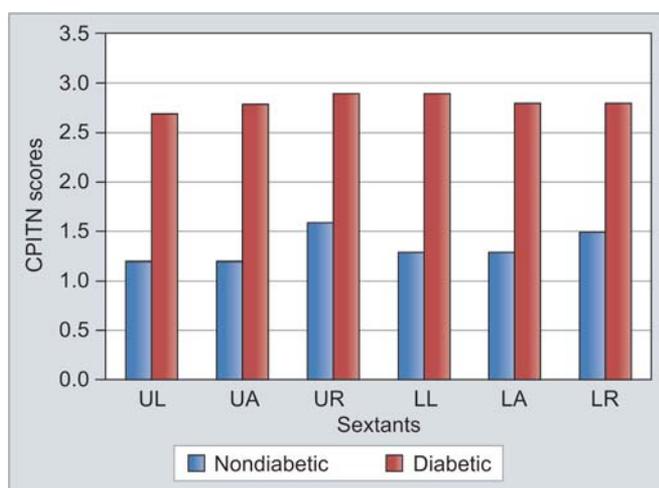
Graph 1: Mean CPITN scores of diabetic and nondiabetic males (UL: Upper left; UA: Upper anterior; UR: Upper right; LL: Lower left, LA: Lower anterior; LR: Lower right
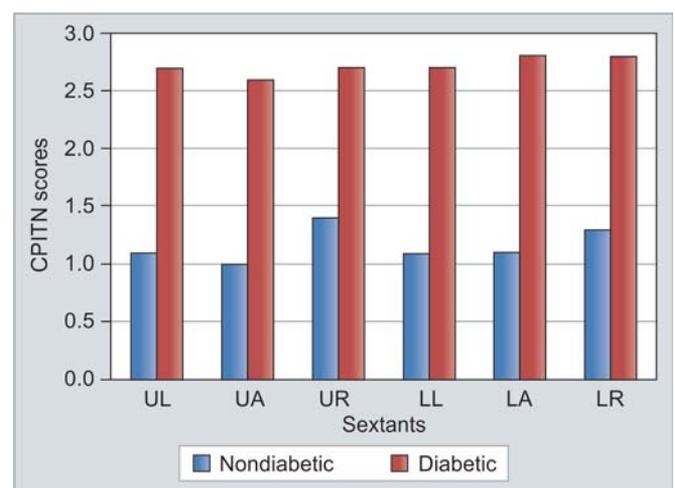
Graph 2: Mean CPITN scores of diabetic and nondiabetic females (UL: Upper left; UA: Upper anterior; UR: Upper right; LL: Lower left; LR: Lower anterior; LR: Lower right)

non-diabetic and diabetic females was 1.000 ± 0.869 and 2.612 ± 0.762 respectively. Periodontal status of upper left sextant in nondiabetic and diabetic males was 1.261 ± 0.953 and 2.794 ± 0.788 respectively and in nondiabetic and diabetic females was 1.185 ± 0.779 and 2.761 ± 0.742 respectively. Periodontal status of lower right sextant in non-diabetic and diabetic males was 1.543 ± 1.005 and 2.843 ± 0.763 respectively and in nondiabetic and diabetic females was 1.241 ± 0.823 and 2.786 ± 0.798 respectively. Periodontal status of lower anterior teeth in nondiabetic and diabetic males was 1.356 ± 0.957 and 2.820 ± 0.769 respectively and in nondiabetic and diabetic females was 1.130 ± 0.933 and 2.855 ± 0.777 respectively. Periodontal status of lower left sextant in nondiabetic and diabetic males was 1.356 ± 0.933 and 2.861 ± 0.753 respectively and in nondiabetic and diabetic females was 1.185 ± 0.826 and 2.771 ± 0.767 respectively. It was found that periodontal status was statistically significant among nondiabetic and diabetic males and females ($p = 0.05$).

Well-controlled diabetics had missing teeth in 33 sextants (4.03%) moderately controlled had missing teeth in 57 sextants (7.1%) and poorly controlled diabetics had missing teeth in 69 sextants (8.3%). The nondiabetics showed only 2 (0.3%) sextants with missing teeth.

Most of the patients, i.e. 51 had diabetes duration of <5 years and their CPITN score was 2.658 ± 0.635.[12] patients had diabetes duration of 6 to 10 years and their CPITN score was 2.940 ± 0.562. Thirty-seven patients had diabetes duration of >10 years and their CPITN score was 3.000 ± 0.576. It was also observed that the duration of diabetes increased, the severity of periodontal disease increased (Graph 3). As the HbA_{1C} increases, the severity of periodontal disease increases (Graph 4).

According to the multiple regression analysis, the risk factors like HbA_{1C}, duration of diabetes, personal habits and oral hygiene habits showed a positive correlation with periodontal destruction, whereas mode of diabetic therapy showed negative correlation.

The odds ratio of a diabetic showing periodontal destruction as compared to nondiabetics was 1.97, 2.10 and 2.42 in well, moderate and poorly controlled diabetics respectively. When males and females were analyzed separately, the odds ratio was 1.86, 1.92 and 2.29 in well, moderate and poorly controlled diabetic males, and 2.11, 2.31 and 2.56 in well, moderate and poorly controlled diabetic females respectively.

DISCUSSION

Relationship of diabetes and oral tissues is very complex and is intriguing. In the last few decades, epidemiological studies have been conducted to understand the association between diabetes and oral tissues. Periodontitis has been referred to as the sixth complication of diabetes.[13]

Extensive review of literature reveals that the earliest study on type II DM (NIDDM) was done in by Cohen et al[14] on the association between diabetes and periodontal disease in females. Later on, many studies were conducted which showed varying results.

The CPITN index was used for the assessment of periodontal health status in accordance with various studies by Bacic et al and Bakhshandeh et al.[15] The risk elements like age, oral hygiene aids used, frequency of brushing, HbA_{1C} and duration of diabetes were assessed in our study similar to those used by various authors.[16,17]

In our study, 88.88% of the diabetic patients brushed only once a day, only 10.87% brushed twice a day, when compared to 22% nondiabetics who brushed twice a day and majority of the patients in both groups used toothbrush and toothpaste.

The mode of diabetic therapy included in the study was oral hypoglycemic drugs, combination of oral hypoglycemic
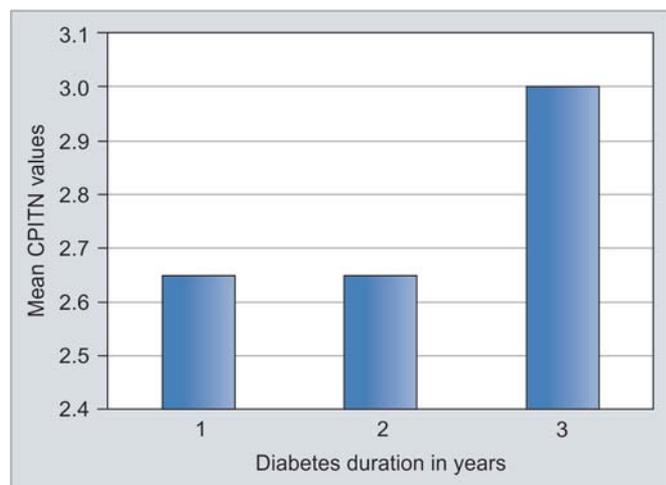
Graph 3: Mean CPITN scores against diabetes duration
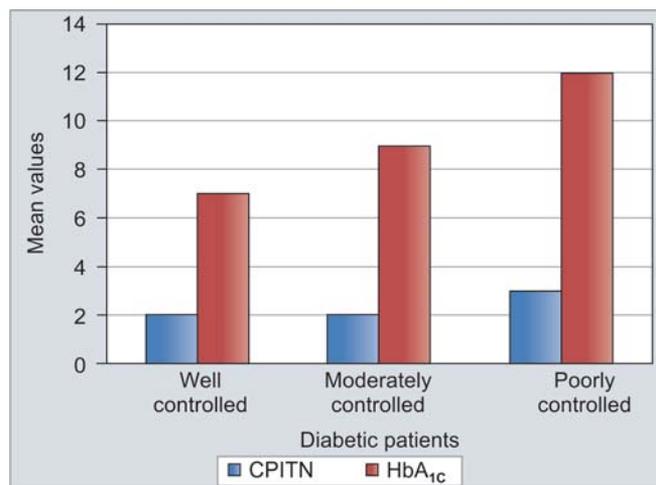
Graph 4: CPITN scores with HbA_{1C}

drug and insulin, diet restriction, combination of oral hypoglycemic drugs and physical exercise. Majority of diabetic patients were on a combination of oral hypoglycemic drugs and physical exercise (43.21%). No association between mode of diabetic therapy and periodontal destruction was found. The severity of periodontal disease increased with the increase in blood sugar levels.

Higher HbA_{1C} was associated with severe periodontitis. Poorly controlled diabetics had more severe periodontal destruction than moderately and well controlled diabetics. The mean CPITN score was higher in diabetics as compared to nondiabetics, and was statistically significant ($p = 0.05$).

Tooth mortality or the number of missing teeth is a good indicator of past periodontal disease. In our study, diabetics had more missing teeth compared to nondiabetics. The prevalence of periodontal disease was found to be more severe in diabetic patients as compared to nondiabetics.

The risk factors like HbA_{1C}, duration of diabetes, personal habits and oral hygiene habits showed a positive correlation with the periodontal destruction, whereas mode of diabetic therapy showed negative correlation according to multiple regression analysis.

Our study has made an attempt to find out the association between type II DM (NIDDM) and periodontal disease in Gulbarga, Karnataka, India. It was found that type II DM (NIDDM) subjects manifested relatively higher prevalence and severity of periodontal disease as compared to nondiabetics.

CONCLUSION

Periodontal disease was more prevalent and severe in type II DM patients as compared to nondiabetic subjects. The number of sextants with missing teeth was higher in the diabetic group. Duration of diabetes significantly influenced the periodontal status of the diabetic subjects, longer the duration of diabetes higher the severity of periodontal disease. Glycated hemoglobin influenced the periodontal status of the diabetic patients. Higher the HbA_{1C} more severe is the periodontal disease. The risk factors like HbA_{1C}, duration of diabetes, personal habits and oral hygiene habits showed a positive correlation with periodontal destruction. Whereas mode of diabetic therapy showed negative correlation with periodontal destruction.

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