

ORIGINAL ARTICLE

Frequency of Periodontitis in Diabetes Patients. A Hospital Based StudySamia Kausar¹, Shamaila Burney², Khalil Ur Rehman³, Zunera Jahanzab⁴, Asim Zulfiqar⁵, Amna Shoaib⁶

ABSTRACT

Objective: To study the frequency of periodontitis in diabetes mellitus patients and the impact of glycaemic control on the severity of periodontitis.

Study Design: A descriptive observational study.

Place and Duration of Study: This study was completed in six months from May2018 to November2018 in Department of Medicine in collaboration with Dental Department of Railway General Hospital, Rawalpindi.

Materials and Methods: This study included 150 participants. Participants were divided in two groups with 75 individuals placed in each group. The study group comprised of well controlled and poorly controlled diabetics referred from medical OPD and medical wards, selected through non-probability consecutive sampling. The control group involved normal healthy individuals. Glycemic control was evaluated by HbA1c level. Community periodontal index (CPI) was recorded to compare the periodontal status of both groups using perioprobe. Confounders like personal and oral hygiene habits along with diabetes profile, treatment and duration were also recorded. Data analysis was done using SPSS, version 21.

Results: The frequency of periodontitis in diabetics and non-diabetics was 87.49 % and 8.51% respectively. Mean-CPI was higher in diabetics ($2.76 \pm .78$) compared to non-diabetics ($1.88 \pm .56$) and was statistically significant. Tooth loss was 59.8% in diabetics and 15% in non-diabetics. Poorly controlled diabetics had higher mean-CPI ($3.23 \pm .38$ vs $2.24 \pm .45$, $P < 0.001$) compared to well controlled diabetics. Mean-CPI score increased with increase in duration of diabetes, $1.89 \pm .51$, $3.15 \pm .56$ and $3.32 \pm .46$ in patients with 1-5, 6-10 and >10 years of diabetes respectively.

Conclusion: Diabetes mellitus patients have higher frequency of periodontitis as compared to non-diabetics. Its severity increases as glycaemic control worsens. Moreover, its severity also increases with duration of diabetes.

Key Words: *Community Periodontal Index, Diabetes Mellitus, Hb A1c, Periodontitis.*

Introduction

Periodontitis is the chronic inflammation of periodontium (gingival tissue and its supporting bone).¹ Plaque is a biofilm which accumulate on teeth near and below gums. When plaque is not taken care of by cleaning, it becomes hard tartar (calculus) and leads to gingivitis and periodontitis. Current research has suggested important role of

microbes. The exaggerated host immune response in attempt to destroy microbes results in continued destruction.²

Periodontitis is most common in elderly.³ Severe periodontitis affects about 10% to 15% of population mainly adults around the age of 50-60. Periodontitis causes economic burden of about 54 billion US dollars per year.⁴

Diabetes Mellitus a rapidly growing epidemic, is a chronic metabolic disorder characterized by hyperglycemia leading to complications like diabetic nephropathy, retinopathy, and neuropathy.⁵ Periodontitis is regarded as sixth complication of diabetes.⁶ T1DM previously called IDDM and type 2 diabetes (NIDDM) are associated with increased risk of periodontitis.^{7,8,9,10} The risk increases tremendously as glycaemic control worsens.^{11,12} Each 1% reduction in HbA1c level is associated with significant decline in micro and macro vascular complications of diabetes.⁹ Research has shown that reductions in HbA1c of up to 0.40% could be achieved with periodontal treatment.¹³

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The mechanisms underlying the link between the two diseases involve inflammation. Diabetes mellitus for both type-1 and type-2 were found to have elevated levels IL-6 and TNF-alpha.¹⁴ Serum levels of IL-6 correlate well with severity of periodontitis.¹⁵ Chronic hyperglycemia causes structural and functional damage to blood vessels and tissues.¹⁶ Moreover AGE and RAGE interaction result in local cytokine release.¹⁷ Local cytokine release increases insulin resistance.^{7,8} Impaired apoptosis and neutrophil function in diabetes is associated with increase tissue destruction.^{7,8} Moreover presence of diabetes enhances the pathogenicity of oral flora.¹⁸ So continued inflammation in periodontitis can adversely affect metabolic control of diabetes, and persistent hyperglycemia in turn potentiates periodontitis suggesting bidirectional relationship.¹⁰

A large body of evidence is available in current literature which confirms that uncontrolled diabetes worsens periodontitis and vice versa.^{7,8,9} Controlling diabetes is likely to improve periodontitis and vice versa.^{9,11} Teeuwet al. have suggested periodontitis as a possible early sign of diabetes mellitus.¹⁰ This fact could be exploited for better management of both conditions.

The latest studies suggest that better glycemic control may be achieved by resolution of periodontal inflammation by regular periodontal treatment. Non-surgical treatment of periodontitis reduces insulin requirements, systemic inflammation and leads to better metabolic profile.¹³ Although large randomized control studies are required to validate these results.

There is need to further explore the relationship between diabetes mellitus and periodontitis as the prevalence of diabetes is expected to increase in next few decades. The beneficial effect of periodontal management on diabetes and its complications illuminates potential value of enhanced understanding of relation between two conditions.

There is a dearth of community based epidemiological data from Pakistan on this association. No separate guidelines/protocols for screening of diabetes in patients with periodontitis and vice versa exist.

The objective of study was to find the frequency of periodontitis in diabetes mellitus patients and to

determine the effect of glycemic control on severity of periodontitis.

Material and Methods

This was a descriptive observational study. It was conducted at department of Medicine and department of Dentistry at Railway General Hospital from May2018 to November2018.

Sample size was 150 patients. Patients with type-2 diabetes (duration >1 year) were included into the study group using consecutive non-probability sampling. They were referred to Dental Department for examination from Medical In and Out Patient Department. Non-diabetic patients visiting the Dental Department were randomly selected for the control group while ensuring the age and sex matched the diabetic-study group patients. Inclusion criteria for both groups were individuals having no fewer than 20 teeth. Patients on prophylactic antibiotics for rheumatic fever, drug causing gum hypertrophy (phenytoin, cyclosporine), heart problem, type-1 diabetes mellitus, pregnant and lactating mothers were excluded. The study was initiated after approval from the Institutional Ethical Review Committee of Riphah international university. Informed written consent was taken from all participants.

A brief patient history was taken along with examination. Relevant information about the age, sex, personal habits (pan, chewing tobacco, smoking, naswar, gutka), oral hygiene aids (toothbrush, toothpaste, mouth washes, tooth powder, tongue cleaner) frequency of tooth brushing (occasional, once, twice daily) were recorded. The diabetes status (HbA1c values), diabetes duration (1-5 years, 6-10 years, >10 years) and the detail of diabetes treatment (diet restriction, physical exercise, oral hypoglycemic drugs and or insulin) were entered in specially designed Performa.

Periodontal status was assessed by single trained examiner for both groups. Perioprobe (single ended probe by Marquis dental) with blunt rounded tip and millimeter marking, was used for examination. Ten index teeth (11, 16, 17, 26, 27, 31, 36, 37, 46, and 47) were examined. CPI was applied in each six sextants as per laid down criteria by WHO.¹⁹

Diagnosis of diabetes was made per WHO criteria.⁵ Hemoglobin A1c (Roche-diagnostic, Basel, Switzerland) was checked once in all participant of

study group to assess glycemic control. Diabetic patients were divided based on HbA1c level into two categories :< 7% well controlled, >7% poorlycontrolled.²⁰

Data (parametric) was analyzed by SPSS-21. Descriptive statistics including patient's age, gender and admission number were entered. Mean and standard deviation was calculated for age and CPI. Frequency of qualitative variable was expressed as frequencies and percentages. Independent samplet-test was used to compare quantitative data.

Results

One hundred and fifty individuals were selected for study after meeting inclusion and exclusion criteria. 75 (40 females and 35 males) were diabetics and 75 were non-diabetics who were age and sex matched. The mean age was 53.91 ±9.50 in diabetic group and 49.15±8.7 in non-diabetic group. The age range was 18-70 years. The frequency of periodontitis in diabetic was 87.49%.The mean-CPI score was 2.78±.78 in diabetic group and 1.88± .95 in non-diabetic group. Periodontal status of diabetic and non-diabetics is shown in Figure 1 and Table 1. Patients with well controlled and poorly controlled diabetes groups had mean-CPI score of 2.24±.45 and 3.33±.56 respectively. Periodontal status of well controlled vs. poorly controlled was also statistically significant (Table 3, Figure 2).

Most of the patients, 48% had diabetes duration of 1-5 years while26.6% and 25.3% patients had diabetes for 6-10 years and >10 years respectively. CPI score in these groups were, 1.89± .51, 3.15±.56 and 3.32±.46 respectively as shown in Figure 3.

In our study tooth loss was present in 59.5% in diabetic vs. 15% of non-diabetic. There were 12% smokers in diabetic group vs. 11.5% in non-diabetics. None of the study participant used gutka, pan or naswar.

In both groups tooth brush was most frequently practiced for oral hygiene. Fewer participants were finger user. Few patients used tooth powder, miswak and mouthwash. Most of diabetics brushed only once a day 85% compared to 83% non-diabetics. About 8% participants brushed occasionally.

Majority of diabetics, 60%, were on both insulin and oral hypoglycemic drugs. 25% were taking only oral hypoglycemic drugs and rest 15% were using insulin only. Mode of therapy, both insulin and oral

hypoglycemic drugs did not affect periodontal status.

Table I: Distribution of Study Population according to Age and Sex. (Patients n=150)

Age in years	diabetics		Non-diabetics		total
	Male	Female	Male	Female	
18-30	9	13	10	14	44
31-50	14	16	13	17	60
51-70	12	11	11	12	40
Total	35	40	35	40	150

Table II: Comparison of Periodontal Status of Diabetic and Non-Diabetic Patients

CPI Score	Non-Diabetics	Diabetics	P value
Male	2.01±.45	2.93±.06	<0.001
female	1.73±.60	2.59±.23	<0.001
Mean	1.88±.56	2.76±.78	<0.001

Table III: Comparison of Periodontal Status of Well Controlled and Poorly Controlled Diabetics

CPI Score	Well controlled diabetics	Poorly controlled diabetics	P value
Male	2.32±.21	3.29±.24	<0.001
female	2.16±.13	3.17±.24	<0.001
Mean	2.24± .45	3.23± .38	<0.001

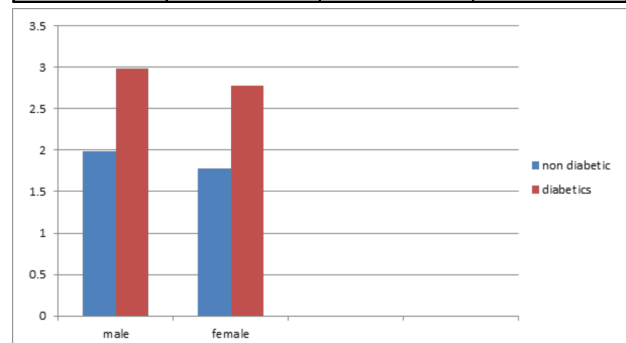


Fig 1: Mean Community Periodontal Index In Diabetics and Non-Diabetics.

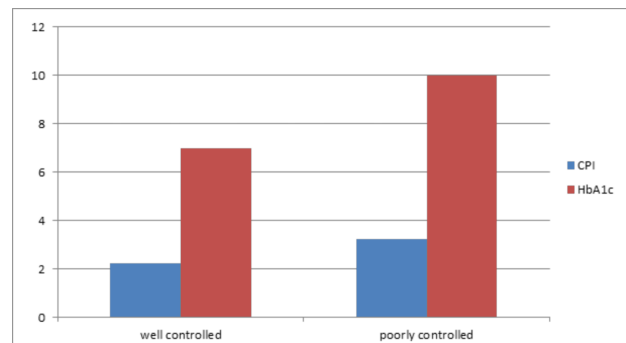


Fig 2: Community Periodontal Index Score with Glycated Haemoglobin

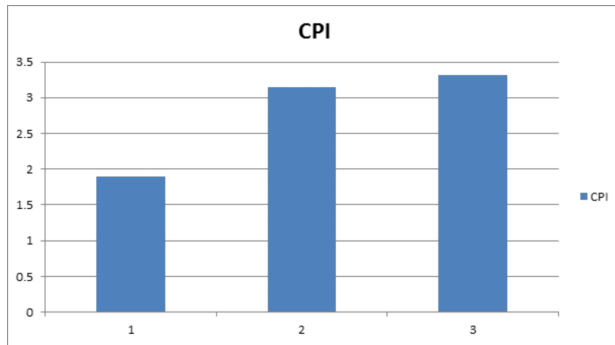


Fig 3: Mean Community Periodontal Index Score against Diabetes Duration

Discussion

Results of our study showed high prevalence of periodontitis (87.49%) in diabetics. Diabetics had higher mean-CPI score ($2.76 \pm .78$) as compared to non-diabetics ($1.88 \pm .95$). Poor glycemic control was associated with worse periodontal status as compared to good glycemic control in diabetics.

Worldwide studies have shown that diabetic patients have increased prevalence of periodontal disease. A study from Eastern Mediterranean Region in Lebanon has shown prevalence of 94.5%,²¹ while Yeluri et al.²² and Rajhans et al.²³ have reported from India 84.5% and 86.4% of diabetics had periodontitis respectively. Our study has shown that 87.49% diabetics had periodontitis.

The association of diabetes with periodontal inflammation has been subject of various studies. Diabetes has been implicated in initiation, progression as well as severity of periodontitis.^{9,10} Diabetes increases the risk of developing periodontitis about three fold. This was demonstrated by Emrich et al. in a study on Pima Indians, who have highest prevalence of type-2 diabetes mellitus in the world. He used probing attachment loss and alveolar bone loss parameters for this purpose. The odd ratio for diabetic subjects was 2.81 when attachment loss was used as parameter and 3.43 when bone loss was used.²⁴ Studies from Pakistan also confirmed increased frequency of periodontitis in patients with diabetes.^{25,26} In study done by Fatima et al., using different parameters for periodontal disease showed higher deposition of plaques (87% vs.13%) and mobility index (85.5% vs.65%) in diabetics as compared to non-diabetics.²⁵ Approva et al. performed a study in Bangalore involving patients

from all ethnic groups and found that diabetics had higher CPI score compared to non-diabetics and the difference was statistically significant.²⁷ Our results are in agreement with above mentioned studies as mean-CPI scores were higher in diabetics as compared to non-diabetics. Another aspect our study was to observe how severity of periodontitis is related to glycemic control. Many studies have confirmed that periodontal status deteriorates with poor glycemic control.^{7,11,28} In this study higher CPI scores were observed with rise in HbA1c levels. A study was done at Services Hospital Lahore by Haseeb et al. where they included study subjects with good oral hygiene only. They analyzed the periodontal status of individual tooth in each study subject, using different parameter like probing depth, gingival recession and attachment loss. Results showed that periodontitis was significantly ($p < 0.001$) more severe in poorly controlled diabetic group compared to well controlled diabetics.²⁹ Similarly other studies showed glycemic control was significantly related to severity of periodontitis.^{23,27} However Basic et al. were unable to confirm this association.³⁰

Longer the duration of diabetes greater will be the severity of periodontal inflammation. Possible explanation is long standing hyperglycemia. Rajhans et al. had declared that it was significant factor.²³ Approva et al. observed that CPI score was 2.658 ± 0.635 when diabetes duration was less than 5 years, and it rose up to 2.940 ± 0.562 and 3.000 ± 0.576 in patients with diabetes duration of 6-10 and >10 years respectively.²⁷ We observed high CPI score with longer duration of diabetes, $1.89 \pm .51$, $3.15 \pm .56$ and $3.32 \pm .46$ in patients with diabetes duration of 1-5, 6-10 and >10 years respectively. Contrary to these results Bacic et al. and Yeluri et al. were unable to demonstrate significant effect of diabetes duration on severity of periodontitis.^{22,30}

Altered immune response with decreased neutrophil phagocytosis and fibroblast function in diabetes causes enhanced tissue destruction.^{7,8} This is stated to be responsible for high frequency of tooth mortality observed in diabetics. In this study, 59.8% diabetics had missing teeth as compared to 15% of healthy volunteers. A study from Pakistan reported tooth loss of 58.4% in diabetics and 10.7% became edentulous.²⁵ Similarly other studies showed

that periodontitis is major cause of tooth loss in diabetics.^{22,23,27} Number of missing teeth increased significantly with time in diabetes mellitus patients.²⁴ It has been demonstrated that infrequent brushing is associated with severity of periodontitis. Higher CPI score was seen in individuals who brushed once daily compared with those who brushed twice daily.³¹ Majority of patients in both groups (brushed once a day) had poor oral hygiene so nullifying its confounding effect. Thus diabetes was an added risk for population already at risk for periodontitis.²³ Similar observation was made by Tanweer et al.²⁶ The high prevalence 87.49% in this study suggests that there is connection between the two chronic diseases. As both condition aggravate each other, recognition and treatment of periodontitis is essential. Importance of oral health should be emphasized in diabetic patients. It should be an essential element of diabetes management plan. There is a need for in depth patient education and consistent reinforcement by health care professionals.

Limitation of our study was that we possibly overlooked the confounding factors like age and poor oral hygiene as periodontitis severity increases with age and poor oral hygiene.²³ Present study was hospital based study with small sample size. Further large community based studies are required to investigate this important association.

Conclusion

Diabetes Mellitus patients have higher frequency of periodontitis as compared to non-diabetics. Its severity increases as glycemic control worsens. Moreover, its severity increases with duration of diabetes.

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