ORIGINAL ARTICLE

The Prevalence of Periodontal disease by Community Periodontal Index in type II-diabetic and non-diabetic patients

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ABSTRACT

Background: Patients with type II- Diabetes Mellitus show macrovascular&microvascular complications including Periodontitis.
Aim: To assess periodontal disease prevalence by Community Periodontal Index(CPI)in type II-diabetic and non-diabetic patients.
Study design: Cross-sectional comparative study.
Place and duration: Dental Out-patient Department at Madina Teaching Hospital, Faisalabad in three months duration.
Methodology: CPIprobe (WHO probe) was used to record Community periodontal Index in seventy type-II diabetic and seventy non-diabetic subjectsfor assessment the periodontal disease.The data was collected and SPSS Version 22was used foranalyzing the data.
Results: Mean age was 56 years (range 31- 73) diabetic and 46 years (range 20-67) in non-diabetic group. There were more male subjects in both groups. In the non-diabetic group, subjects with good oral hygiene were 13(18.6%). In the diabetic subjects 30(7.14%) had code 3 and 9(2.14%) had code 4. There were 20(4.76%) diabetic subjects and17(4.05%) nondiabetic subjects with missing teeth.
Conclusion: Within the study population and limits, diabetic subjects are more likely to have severe periodontal destruction so regular periodontal assessment and treatment must be a part of their management protocol.
Keywords: Periodontal disease, Community Periodontal Index, Diabetic mellitus type-II

INTRODUCTION

Diabetes mellitus is a disorder ofcarbohydrate metabolism marked by high blood glucose levelsover a prolonged period of time due to inadequate insulin production or insulin action or both [1]. In recent years there is an alarming rise in the prevalence of diabetes mellitusworldwide and according to the World Health Organization (WHO) the estimated increase in number of diabetic patientswill be around 366 million by 2030[2].

In the patients with diabetes mellitus,there is dysfunction in carbohydrate, fat and protein metabolism whichmay result in chronic complications like retinopathy, neuropathy, nephropathy, and macrovascular disease, increased infections and poor wound healing[1]. In the patients with diabetes there is increased tendency to oral manifestations likexerostomia, altered taste, dental caries, gingivitis, candidiasis, ulcers, abscess, angular cheilitis, oral lichen planus,and periodontal disease (periodontitis). Periodontitis has been found as the sixth most common complication of diabetes mellitus[3].Periodontitis is a destructive disease of tooth attachment apparatuscaused by a group of micro-organismsand may result in bleeding gums, gingivitis, gingival enlargements, attachment loss, periodontal pocket formation, tooth mobility and eventually tooth loss. To assess periodontal status in a populationthe WHO and the FDI World Dental Federation developed and supported the Community Periodontal Index (CPI) and now it is used throughout the world. CPI was found easy to use, economical, fast, simple index which requires only CPI probe and has worldwide acceptance[6].

According to previous studies, the periodontal disease was more prevalent in diabetic patients than the non-diabetic patients[4,][17]. In another study lower levels of oral hygiene, more absent sextants and less sextants with periodontal health were found in diabetic patients than non-diabetic patients[5]. Studies showed association ofpoorly controlled diabetes with the increased periodontal disease prevalence and severity[16]. There are only few studies determining the periodontal disease prevalence in local population[9].

The aim of this study was to determine the periodontal disease prevalence by recording community Periodontal Index (CPI) in local patients with diabetes mellitus, type-II disease visiting dental out-patient department and compare it with non-diabetic patients. Thus, diabetic patients could beguided to give primeimportance toroutine oral health care anda regular dental checkup for periodontal assessment. This could lead to early disease detection and comprehensive treatment accordingly andlower the chance of severe periodontal disease and eventual tooth loss and help them maintain oral health for longer period of time.

METHODOLOGY

The study design was cross-sectional comparative study and it was carried out in subpopulation of patients visiting Dental section Out-patient Departmentat Madina Teaching Hospital, Faisalabad in a duration of three months.

Patients of both genders of anyage between 20-75 years were incorporated in the study. The study subjects were subdivided into two groups. In the first group seventy patients with known diabetes mellitus type-IIdiagnosed more than one year earlier and confirmed with random blood glucose test using WHO criteria of "random blood glucose ≥ 11.1 mmol/L (200 mg/ dl) along with signs and symptoms". The second group consisted of non-diabetic patients at the time of examination. The exclusion criteria werehistory of head and neck radiation, immune-compromised patients, complete edentulous in both arches, pregnant women, patients with artificial heart valve or a congenital heart disease and patient recently taken systemic antibiotics and periodontal treatment. The sampling method was non-Probability convenient method.

After taking demographic information and verbal consent, the oral cavity of allthe patients were carefully examinedin dental chairunder the dental operating light with the help of a mouth mirror. For evaluation of the oral hygiene condition facial and lingual surfaces of all present teeth were visually examined and were categorized as good if the plaque covered less than one-third of tooth surfaces, fair if itcovered one-third to two-thirds of tooth

surfacesand poor if it covered more than two-thirds of tooth surfaces.

CPI (community periodontal Index) is considered as standard index to assess the periodontal health status using CPI/ WHO probe. CPI probe has a ball ended tip of 0.5 mm diameter with one black band and two markings. It has black band that is present between 3.5 mm and 5.5 mm and first markings at 8.5 mm and second marking at11.5 mm.The mouth was divided into six sextants and the CPI recording was performed on the index teeth #17-16, 11, 26-27, 36-37, 31, 46-47. In each sextant the index recording was performed only when it contained two or more teeth. The probe was used to determine bleeding on probing, gingival sulcus/ pocket depth and calculus. The Probe tip was placed gently into the gingival sulcus around each index tooth at six points that are mesio-facial, mid-facial, disto-facial, disto-lingual, mid-lingual and mesio-lingual sites. The CPI recording was taken using the community periodontal index (CPI) coding system which had six codes. Code 0wasforhealthy gingiva/ periodontium with normal gingival sulcus depth <3mm and no gingival bleeding on probing and no calculus, code 1 wasfor gingival bleeding on probing with normal sulcus depth<3mm, code 2wasforsupra or subgingival calculus (and/or crown, overhanging fillings) and normal sulcus depth<3mm, code 3 wasforpathological pocket depth of 4-5 mm (shallow pocket), code 4wasforpathological pocket depth of 6mm or more (deep pocket); code Xwasformissing index teeth, or <2 teeth in the sextant.Periodontal status was divided into three subcategories based on the CPI codes. The first category represented gingival/ periodontal health or mild gingivitis with CPI code 0,1 and 2. The second category represented periodontal disease (shallow or deep pockets) with CPI code 3 or 4 with. The third category consisted of code Xrepresented missing teeth. All data is collected by a single operator. Data was collected and statistical analysis was done using SPSS Version 22. Specific statistical tests were used for data comparison to find out the statistical significance of the comparisons.

RESULTS

In diabetic group mean age was 56 years(range 31- 73). In the non-diabetic groupmean age of the patients was 46 years (range 20-67).There were more male subjects in the study as compared to females in both groups.In the diabetic group there were lesssubjects with good oral hygiene (7.1%)as compared to the non-diabetic group (18.6%). The subjects with fair oral hygiene were more in the diabetic group as compared tothe non-diabetic group.In the diabetic group the most prevalent CPI code among examined sextants wascode1(38.57%) followed by code 2 (31.43%) and in the non-diabetic group the most prevalent CPI code was code 2(37.38%) followed bycode 1 (31.19%) (Table-2).

In the diabetic group, the mean number of sextants with periodontal disease (category 2 with CPI codes 3 and 4) were more than the non-diabetic group (P-value = 0.039).In the non-diabetic group, the prevalence of healthy sextants (category 1 with CPI codes 0, 1 & 2) was more than the diabetic group (p-value=0.033)as shown in table-3. In the diabetic group, sextants with code x (representing missing index teeth or no teeth in the sextant) were more than the non-diabetic group.

Table-1: Distribution of subjects according to gender and Oral hygiene status in both groups

Variables	Category	Study groups	
		Diabetic	Non-Diabetic
Gender	Male	36(51.4%)	39(55.7%)
	Female	34(48.6%)	31(44.3%)
Oral Hygiene Status	Poor	18(25.7%)	18(25.7%)
	Fair	47(67.2%)	39(55.7%)
	Good	5(7.1%)	13(18.6%)

Table-2: Prevalence of CPI indices in Diabetic and Non-diabetic groups

	Diabetic	Non-diabetic
Sextants with code 0	67 (15.95%)	85 (20.24%)
Sextants with code 1	162 (38.57%)	131 (31.19%)
Sextants with code 2	132 (31.43%)	157 (37.38%)
Sextants with code 3	30 (7.14%)	28 (6.66%)
Sextants with code 4	9 (2.14%)	2 (0.47%)
Sextants with code X	20 (4.76%)	17 (4.05%)
Total	420 (100%)	420 (100%)

Table-3: Mean number of sextants by CPI code in Diabetic and Non-Diabetic group

CPI Codes	Diabetic	Non-Diabetic	P-value
Code 0,1,2	2.31±0.563	2.43±0.643	0.033
Code 3,4	3.01±0.892	2.86±1.322	0.039
Code x	2.41±1.042	1.98±0.743	0.048

DISCUSSION:

This study investigated periodontal disease status by measuring the CPI score in diabetic versus non-diabetic patients. According to systemic surveys an increase in the prevalence and severity of periodontal disease was observed in people with diabetes mellitus[4,17].

Diabetes is not a direct cause of the disease and the mechanism may be related to altered sub-gingival microflora, impaired polymorphonuclear leukocyte function and altered collagen metabolism that contribute to the severity of periodontal disease.In diabetes, the accelerated periodontal disease demonstratesmainly the unusual host responses to the local microbial factors like endotoxins that results in the rapid destruction of the periodontal tissue[7].

In this study non-diabetic subjects have more mean number of sextants with periodontal health in comparison with the diabetic subjects (p-value= 0.033). In the study subjects,the sextants with periodontal disease are more in the diabetic group as compared to the diabetic group with statistically significant difference (P-value = 0.039).Pant BN et al examinedhundred diabetic and equal number of non-diabetic subjects in theresidents of Nepal by using the CPITN probe and suggested that diabetes mellitus and periodontitis may be correlated[8]. They observedthat the most prevalent condition in the non-diabetic group was calculus (78%) followed by shallow pockets (12%)[8]. The present study shows the similar result in which calculus (37.38%) was the most prevalent conditionfollowed by gingival bleeding on probing (31.19%)in the non-diabetic group.In the present study gingival bleeding on probing (38.57%) was the most prevalent condition in the diabetic group.

In the present study, the prevalence and frequency of periodontitis in the diabetic group is39(9%) and30(7.13%) in the non-diabetic group.In a study of diabetic subjects aged 20-60 years (2015), the prevalence of periodontitis was found as 34.5%[9]. Similar studies in Bangladesh (1990), the prevalence of periodontitis was found as 42%[10]. In a study of Brazil residents (2004) the prevalence of clinical attachment loss was found as 79%[11]. A study by Ochao et al (2012), at Columbia found the prevalence of gingivitis as 27.4% and periodontitis as 72.6% and there were 47.4% diabetic subjects who had missing teeth[12].In another studyconducted in Germanyfound a prevalence of periodontitis as 60-67%[17]. In a study by Susanto A et al (2020) found the prevalence of gingivitis as 43.3% and periodontitis as 53.3%amongdiabetic type-II patients' Indonesian residents[15]. Study by Patel ED (2022) in Indian residents found that 36.18% of the study subjects had code 3 and 88(19.29%) had code 4[16].

In relation to glycemic control there are multiple research studies on type II diabetes mellitus showing association of diabetes mellitus with periodontal inflammation with variable results. Study conducted by Preshaw et al., showed positive association between glycemic control and the severity of periodontal inflammation[13].

Study by L Ueno concluded no significant association between glycemic control and type 2 diabetic subjects compared to controls[14]. In another systemic review found strong bidirectional relationship between type II-diabetes mellitus and periodontitis[18].

One of the limitations of CPI index is that it a partial survey of the mouth used as a primary screening method for determining periodontal status and usually under-estimate the condition of elder population and does not represent the full mouth periodontal condition. Tooth mobility or attachment loss or furcation involvement cannot be assessed by CPI index and so it does not access the true periodontal status of the whole mouth.Also, the present study did not consider the diabetic control of the diabetic patients which may bean important determinant of periodontal health or disease. Gingival recession is not estimated in the present study which is mostly due to past periodontal destruction and lead to minimal pocket depths and CPI scores 0 or 1.The sample size in this study was limited and data collection method was non-Probability convenient sampling and only represent the small proportion of the population. To access the true prevalence of the periodontal disease in diabetic patients, future studies of larger sample size and detailed periodontal examination is recommended.

CONCLUSION

Within the study population and limits, it was found that diabetic patients are more likely to have severe periodontal destruction. They should be guided to give prime importance to routine oral health care and a regular dental checkup. Their management protocol should include periodontal assessment for early disease detection and comprehensive treatment accordingly. This could lower the chance of severe periodontal disease and eventual tooth loss and also help them maintain oral health for longer period of time.

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Author contribution: AS: Concept, data collection and main drafting of the article, **NZ:** Help in drafting abstract and checking plagiarism, **SQ:** Revising the article critically and proof reading, **SYD:** Help in drafting discussion, **MM:** Help in drafting results, **SS**: Help in designing the study

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