A COMPARATIVE STUDY OF PERIODONTAL DISEASE INDEX (PDI) SCORES IN TYPE-2 DIABETICS AND NON-DIABETICS

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ABSTRACT:

OBJECTIVES:

The aim of this study was to compare the Type 2 diabetes mellitus patients and Non-Diabetics in terms of Periodontal Disease Index (PDI).

METHODOLOGY:

This comparative cross-sectional study recruited 105 subjects, 56 participants of Type 2 diabetes mellitus with periodontal disease and 49 non-diabetics (comparison group) having periodontal disease. Non-probability purposive sampling method was used for selecting the participants. This study was conducted at Peshawar Dental hospital, Prime Teaching hospital, and Sardar Begum Dental hospital. Determination of HbA1c to diagnose diabetes and periodontal examination was conducted for both the groups to compare Type 2 diabetics and non-diabetics in terms of Periodontal Disease Index (PDI) score that is one of the clinical parameters of periodontal disease. Data analysis was performed by using SPSS version 23.

RESULTS:

Out of 105 total participants, 33 (31.4 %) were males and 72 (68.6%) were females. The mean age of subjects was 51.48±7.92. The mean PDI scores of the two groups were compared. Mean Periodontal Disease Index (PDI) was recorded, score was 2.58 (±0.67) in diabetics and 1.11 (±0.41) in non-diabetic (comparison group). P-value was measured by Chi-square test and was found to be significant.

CONCLUSION:

We concluded that significant difference exists between the mean PDI scores of Type 2 diabetics and non-diabetics.

KEYWORDS: *Type-2 Diabetes Mellitus, Periodontal Disease, Periodontal Disease Index (PDI)*

How to cite this article:
Mariyum S, Naheed R, Anwar Z, Iqbal A, Mariyum K, Khalil ZUR. A Comparative Study of Periodontal Disease Index (PDI) Scores in Type-2 Diabetics and Non-Diabeticsr. J Gandhara Med Dent Sci. 2022;9(2): 55-59
https://doi.org/10.37762/jgmds.9-2.245

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INTRODUCTION:

Diabetes mellitus is one of the most common chronic metabolic disorders among all nations and the figure is rising because of sedentary lifestyle, reduced physical activities and high prevalence of obesity in developed countries[1]. The projected worldwide occurrence of diabetes mellitus among grown-ups in 2010 was 0.28 billion and this is expected to increase up to 0.44 billion by 2030[2]. Asian communities like Hong Kong, Singapore and

Pakistan have high prevalence rate of diabetes mellitus in adults[3]. The World Health Organization (WHO) stated that, the prevalence of diabetes among adults in Pakistan is 18 % as compared to 2 % in Sweden and 25% in Saudi Arabia[4]. Type 2 diabetes mellitus is more complex disorder as compared to type 1 diabetes, as there is resistance to insulin in liver and muscle together with compromised beta cells of pancreas causing relative insulin insufficiency. Adults are mostly the victims of type 2 diabetes mellitus and are usually associated with obesity, sedentary lifestyle, and unhealthy dietary habits. It is characterized by increased glucose level due to defective insulin secretion along with insulin resistance[5]. Type 2 diabetes mellitus is one of the main chronic public health issues around the world (Brussels International Diabetes Federation 2003). It has a variable prevalence among various racial/cultural populations[6]. One of the major causes in progression of the periodontal disease is diabetes mellitus. Out of many causal risk factors identified for the development of periodontal disease, diabetes remains the strong risk factor[7]. Periodontal disease is ranked to be the sixth major complication of diabetes by the American Society of Diabetes[8]. Research indicates a significant association between diabetes and periodontitis[9]. The periodontal diseases are a heterogeneous group of diseases that affect the periodontium. The periodontium surrounds the tooth is made up of the gingiva, cementum, periodontal ligament, and alveolar bone. It is resistant to mechanical, microbiological, and chemical trauma and is responsible for maintaining the attachment of the teeth. Periodontal disease is characterized by the gingivitis in its initial stages[10]. Periodontal disease index (PDI) is an important tool to measure the extent of periodontal disease. This index was developed by Ramfjord in 1959. This index scores the status of gingiva by using a 0 to 3 scale whereas periodontal attachment level is measured on a scale from 4 to 6, on a selected group of teeth called the Ramfjord teeth. These teeth (with the notation of the Fédération Dentaire Internationale: FDI) are: maxillary right first molar (tooth 16), maxillary left central incisor (tooth 11), maxillary left first bicuspid (tooth 24), mandibular left first molar (tooth 36), mandibular right central incisor (tooth 41) and mandibular right first bicuspid (tooth 44). Several factors have been suggested to highlight the raised frequency of periodontitis in diabetics involving the alteration in sub gingival micro flora, host response and wound healing. Local environmental fluctuations like salivary alterations and high glucose levels of Glucose Gingival Crevicular Fluid (GCF) in diabetics may cause changes in the microbial flora (Figure 1)[11].

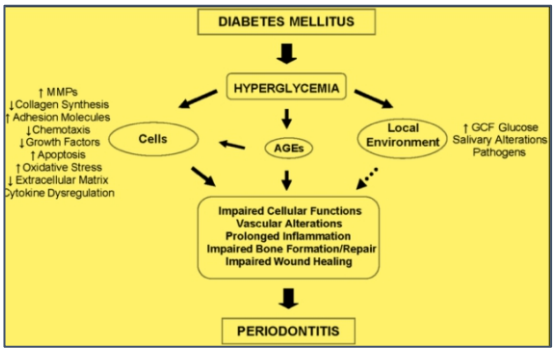

Figure 1: Mechanism of Increased Susceptibility to Periodontitis in Diabetics

The relationship between diabetes and periodontal disease has been explored in different geographical locations. There are numerous clinical parameters like papillary bleeding index (PBI), pocket depth, plaque index (PI), Periodontal Disease Index (PDI) that are available to establish the presence of periodontal disease. We aimed to focus on one of the clinical parameters of periodontal disease i.e., Periodontal Disease Index (PDI). The objective of the present study was to compare Type 2 diabetes mellitus patients and non-diabetics in terms of Periodontal Disease Index (PDI) to investigate the relationship between diabetes and periodontal disease.

METHODOLOGY:

This comparative cross-sectional study was conducted in three teaching hospitals of Peshawar that are: Prime Teaching hospital, Peshawar Dental hospital, and Sardar Begum Dental hospital from November 2020 till February 2021. Participants suffering from Type 2 diabetes mellitus and periodontal disease, reporting to Peshawar Dental hospital and Sardar Begum Dental hospital were recruited as cases in our study. Participants suffering from periodontal disease but not having diabetes were included as comparison group. Age range was set to be 40-65 years. Exclusion criteria were pregnancy; age less than 40 years, Smoking, Hypertension and Type 1 diabetes mellitus. Non-probability purposive sampling method was used for selecting the participants. The Open Epi Calculator was used to calculate the required sample size. Required sample size for this study was calculated to be 70 with 95% confidence level, two-sided significance level (α) of 0.05 to detect the Odds ratio (OR) of 5.5 calculated from previous research[12]. The sample size was approximated to 104 to improve the strength of the

study. The final sample comprised of 105 individuals, 56 participants in Type-2 diabetes group (cases) and 49 in Non- diabetes group (controls). The two groups were matched in terms of age, gender, socioeconomic status, education level and frequency of oral hygiene measures. The study participants were provided with the information regarding the study procedure. Subjects who agreed to participate and sign the consent form were recruited in the research. Demographic and study related information from the participants was gathered through a questionnaire developed for the present study. All the participants were clinically examined for periodontal disease through periodontal disease index (PDI). Periodontal examination to record periodontal disease of all subjects was carried out in periodontology department of the Peshawar dental hospital and Sardar begum dental hospital. Glycated hemoglobin (HbA1c) was carried out for all the participants free of cost by using Human Gmbh–Max–Planck–Ring 21-65205 Wiesbaden–Germany kit.

RESULTS:

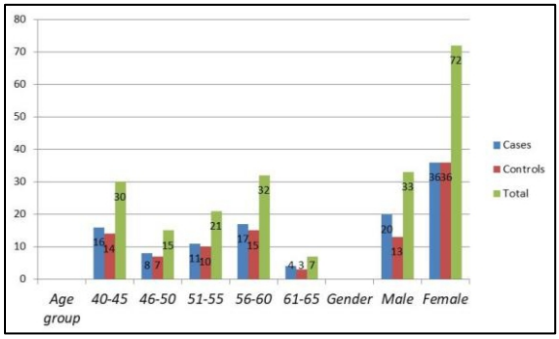

Figure 2: Demographic Features (Age Group and Gender)

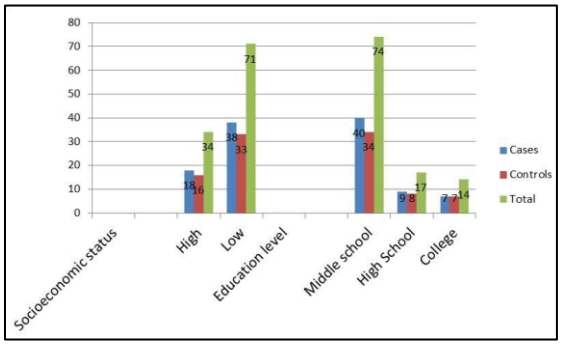

Figure 3: Demographic Features (Socioeconomic Status and Education Level)

Table 1: Periodontal Disease Index among Sample (n=105)

Parameter	Cases Mean±SD (n=56)	Controls Mean±SD (n=49)	P-Value
PDI	2.58±0.67	1.11±0.41	[a]0.0004*

Table 2: Severity Level of Diabetes and Periodontal Disease index among Sample (n=105)

Diabetes Status	Periodontal Disease Index				Total
	Normal	Mild	Moderate	Severe	
Type 2 Diabetics	1	16	34	5	56
Non-Diabetics	9	39	1	0	49
Total	10	55	35	5	105

Table 3: Type 2 Diabetes Mellitus and Severity Level of Periodontal Disease in Terms of Periodontal Disease Index (PDI)

Parameter	Diabetes Status	
	r_s	P
Periodontal Disease Index (PDI)	0.684	.000*

r_s=Spearman's Rank Correlation Coefficient
*=Significant (significance level p<0.05)

DISCUSSION:

The participants of the present study consisted of more female participants than male (Figure 2). The study was undertaken in dental patients and the general trend in population is that females utilize more dental facilities, as they are more concerned for the esthetic appearance of their dental status. Hamasha et al found the same trend in the gender-wise utilization of dental services[13]. A cross sectional survey in the private dental hospitals of Peshawar by Qazi et al, reported dominance of females (60%) over males (40%) in dental patients[14]. Similar trend has been reported by some other studies conducted in the different countries of the world[15,16]. Although the educational level of the female participants in our study was mostly of middle-class level but females are more concerned regarding the physical appearance irrespective of the education level. Patients of age less than 40 were not included in the present study because diabetes mellitus type II is not common in that age group. In addition, periodontal disease is a slow process that requires a very long time to develop[17]. We have found a strong association between diabetes and Periodontal Disease Index (r_s=0.684). The mean of Periodontal Disease Index (PDI) score recorded in our study is 2.58±0.67 in diabetics (cases) whereas the mean score is 1.11±0.41 in non-diabetics (control) group. The difference between the two groups is significant with a p-value=0. 0004.These results show that diabetes promotes the severity level of periodontitis. This finding is in accordance with a study in Peshawar by Anwar et al, that diabetes is related to the

severity of periodontitis, although a different index was used to assess the periodontal status[18]. Gomez et al also reported similar findings and the mean PDI score of the total population was reported to be 3.52±1.92[19]. Ahad et al, reported similar findings with mean PDI score of 3.91 0.745 in diabetics (cases) whereas the mean score was 3.19±0.92 in non-diabetic (control) group. The difference between the two groups was significant with a p value of 0.004[20]. The Periodontal Disease Index (PDI) is a modification of Russell's Periodontal Index used for assessing the status of gingivitis and periodontitis in the populations. Different other indices are also used by different investigators for this purpose. Irrespective of the index used, the findings of Joshipura et al and Adnan et al are in accordance with our findings that periodontitis severity is high in diabetics as compared to non-diabetic controls[21,22]. However, Ueno et al, Chaung et al and Hatch et al have found no significant difference between the periodontal status of diabetics and non-diabetics. The possible explanation may be the difference in the type of study participants, inability to control the effect of different confounders and method for use of the index[23,24,25]

CONCLUSION:

We concluded that significant difference exists between the periodontal disease status of Type 2 diabetics and non-diabetics measured through Periodontal Disease index (PDI)

LIMITATIONS:

The present study was a hospital-based retrospective study. Longitudinal and community-based studies are required to obtain more generalizable findings.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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4. **Amjad Iqbal -** Data Analysis/Interpretation; Drafting Manuscript; Final Approval
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