ORIGINAL ARTICLE

Periodontal Health and its Impact on Oral Health-Related Quality of Life Among Diabetes Mellitus Patients

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ABSTRACT

Objectives: This study aimed to investigate the relationship between periodontal health and oral health-related quality of life (OHRQoL) in people with diabetes mellitus. The secondary objective was to compare the OHRQoL between diabetic and non-diabetic individuals.

Methodology: This study was performed at the Department of Operative Dentistry, Pakistan Institute of Medical Sciences (PIMS), Islamabad from April 2023 to June 2023. The study comprised 80 participants: 40 individuals with diabetes in case group and 40 individuals without the condition taken as control. Clinical periodontal disease examination was performed at six sites per tooth, to determine clinical attachment loss. After the examination, the patient was asked to complete self-administered questionnaires covering the OHIP-14 domains. To compare the clinical attachment loss between the two cohorts, a chi-square test was employed. An independent t-test was used to evaluate disparities in OHIP-14 domain scores between the diabetes and non-diabetes groups.

Results: There were 80 patients, with a mean age of 39.07± 5.96. Among those, 40 had diabetes and the remaining 40 did not. The majority of participants were women. In contrast to individuals without diabetes, a significantly higher proportion of those with diabetes exhibited a CAL (Clinical Attachment Loss) of =3mm. Significant associations between the two groups were observed in OHIP-14 domains such as Impaired functionality, physical impairment, psychological disability, and social disability, while the remaining domains showed no significant associations ($p>0.001$).

Conclusion: This research provided valuable insights into the intricate correlation among diabetes mellitus, periodontal health, and oral health-related quality of life, underscoring the multifaceted nature of their interrelation.

Key Words: Clinical attachment, diabetes mellitus, OHIP -14 domain, OHRQoL, periodontal disease

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INTRODUCTION

Periodontitis is a prevalent long-term inflammatory condition that influences the tooth's supporting structures. The subgingival bacterial biofilm initiates periodontal inflammatory conditions, however, tissue damage results primarily from the host's immune-inflammatory response to the microorganisms. Certain systemic conditions, such as Diabetes Mellitus (DM), have been connected to an increased risk of developing periodontitis. It is associated with a two-to three-fold elevated risk, particularly in cases where it is improperly managed[1]. Diabetes mellitus represents a chronic metabolic disorder with hyperglycemia, that results from a lack of insulin production or a resistance to insulin, or both[2-3]. Extensive research has been carried out on the correlation between diabetes and periodontitis; in individuals with diabetes as well as, surprisingly, in those without the disease, elevated levels of glycated hemoglobin (HbA1c) were linked to increased periodontal inflammation. In addition, severe periodontal breakdown was linked to metabolic syndrome and increased oxidative stress in patients with type 2 diabetes[4].

Diabetes mellitus not only affects the periodontal tissues but also increases the risk of several oral and dental diseases, such as tooth decay, gingival inflammation, decreased salivary flow, candida infection, taste

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disturbance, and delayed wound healing[5]. Oral complications/ manifestations of diabetes may be associated with various mechanisms, such as compromised neutrophil function, elevated collagenase action, decreased production of collagen, neuropathy, and microangiopathy[6].

Diabetes and periodontitis have complex relationships because of their multifactorial etiology and chronic inflammatory nature[7]. Research findings suggest that both diabetes and periodontitis exert an adverse influence on certain aspects of daily life and health-related quality of life[8]. Furthermore, certain original studies identified diabetes as a factor that may affect the quality of life related to oral health (OHRQoL)[9-11].

Oral health-related quality of life (OHRQoL) denotes an individual's assessment of the factors affecting their general health and overall quality of life. It encompasses components like discomfort and pain, in addition to elements of function like speech and mastication, psychological elements like appearance and self-esteem, and social elements like interpersonal interaction[12]. The most frequently used tool for measuring oral health related quality of life is OHRQoL. It is a questionnaire that assesses seven different domains of quality of life including: handicap, limitation in social activities, impairment in physical function, discomfort of psychological nature, physical pain, and functional limitations[13].

At both the patient and population levels, OHRQoL should be taken into account when making decisions about diagnosis, options for treatment, and treatment results. It should also be taken into account when allocating resources and keeping an eye on oral health trends and policies[14]. In light of the rising importance of OHRQoL and the ever-increasing burden of diabetes mellitus, the objective of this study was to evaluate and contrast the oral health-related quality of life in individuals with and without diabetes. Furthermore, it aimed to investigate how periodontal health influences the oral health-related quality of life specifically among diabetic patients.

METHODOLOGY

After taking permission from the ethical board of the School of dentistry SZABMU (SOD/ERB/2023/36), this case control study was done at the Pakistan Institute of Medical Sciences' Operative Dentistry department from April 2023 to June 2023. The study was registered at Clinicaltrials.gov under the number (NCT06125561). The sample size was 80, calculated on the WHO calculator, and divided into two equal groups of diabetic and non-diabetic subjects, using a computer-generated randomization method. A convenient sampling technique was used to achieve the required sample. Diabetic patients and healthy participants with age range of 18 to 60 years and willingness to participate were included in case and control group respectively. Exclusion criteria for each group was:

1. Patients suffering from severe systemic illnesses like Papillon-Lefèvre syndrome, severe neutropenia, leukocyte adhesion deficiency syndromes, and Down's syndrome that can impact periodontal health

2. Women who were pregnant

3. Patients who smoked

4. Patients suffering from severe cognitive impairment

5. Patients with mental health conditions such as eating disorders,schizophrenia, depression, and anxiety disorders

A single examiner conducted the clinical examinations after receiving both verbal and written consent from each participant. Using a manual periodontal probe equipped with William's markings and a 0.45mm tip diameter, a comprehensive clinical periodontal disease examination was carried out at six sites per tooth. Importantly, the examiner remained blind to the diabetic status of the participants. The examination encompassed assessments of pocket depth and gingival recession, which were added up to get the CAL.

After completion of clinical examination, patients were asked to answer a brief questionnaire about their demographic data which included age and gender. The next task assigned to them was to finish the OHIP-14, a self-administered questionnaire consisting of 14 items that evaluate seven domains: physical pain, psychological discomfort, disability, social disability, functional limitation, and handicap.

A five-point Likert scale was used to record responses to the items (0, never; 1, hardly ever; 2, occasionally; 3, fairly often; 4, very often). Summing up all of the responses yields the OHIP-14's overall score, which goes from 0 to 56 points.

The study utilized SPSS software version 23 for conducting data analysis. Descriptive statistics, which included mean and standard deviation calculations, were performed for demographic variables like gender. To compare clinical attachment loss between the two groups, a chi-square test was employed. Additionally, an independent t-test was used to evaluate differences in OHIP-14 domain scores between the diabetic and non-diabetic groups.

RESULTS

The study had 40 diabetic patients and 40 non-diabetic patients divided into case and control groups. The mean age of study participants was 39.07 ±5.96. The diabetic group had 65% female and 35 % male participants (Figure 1).

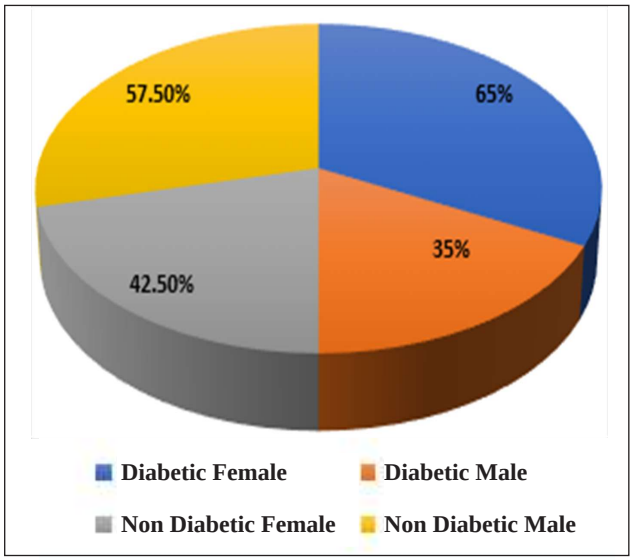

Figure 1: Distribution of Gender in Study

The other important factor is clinical attachment loss. A significantly greater proportion of individuals diagnosed with diabetes demonstrated a CAL (Clinical Attachment Loss) of =3mm compared to those without diabetes (Figure 2).

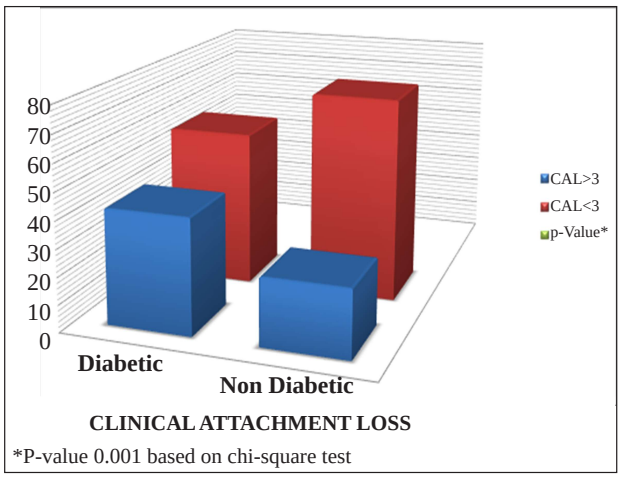

Figure 2: Clinical Attachment Loss in Both Groups

Table 1 shows a notable correlation between the groups in terms of OHIP-14 domains, encompassing functional limitation, psychological discomfort, psychological disability, and social disability (P value <0.001). In both groups, no significant correlation was found between physical handicap, physical disability, or physical pain.

DISCUSSION

In the present case-control study, our objective was to explore the association between periodontal health and the oral health-related quality of life (OHRQoL) in individuals diagnosed with diabetes mellitus. A robust periodontium is pivotal for efficient masticatory function and oro-motor competence, ensuring effective food processing and speech articulation[15.16]. Our findings shed light on the intricate connection between periodontal health and the overall well-being of individuals with diabetes. The majority of study participants were female in both diabetic and non-diabetic groups with the mean age of 39.07 ± 5.96, which is different from the previous study in which the mean age was 56 years[17].

Research outcomes suggest an elevated prevalence and severity of periodontal disease in individuals with diabetes compared to those without the condition. The potential mechanistic connections between diabetes and periodontitis are established through interactions involving advanced glycation end products and their receptors, along with pathways mediated by oxidative stress[18]. To determine the severity of periodontal diseases and evaluating the periodontal health, clinical attachment loss is used as important indicator[19]. Clinical Attachment Loss (CAL) staging is commonly used in periodontics to assess the severity of periodontal diseases. CAL was categorized into three levels: Slight attachment loss was defined as 1–2 mm, moderate attachment loss as 3–4 mm, and severe attachment loss as 5 mm or more. For the study's objectives, CAL was categorized as < 3 mm, signifying slight attachment loss, and = 3 mm, indicating moderate or severe attachment loss. In our study, there was a significantly higher number of diabetic participants (42.5%) with moderate to severe attachment loss, compared to non-diabetic group (25%) ; p value (0.001). This finding is consistent with the results from a study by Nadia Khalifa et al. in which diabetic group has higher CAL (23%) than non-diabetic patients (10%)[20]. These statistics further support the notion that diabetes may elevate the likelihood of developing periodontitis.

Various domains of OHIP-14 were evaluated in study and determined the OHRQoL. Our results revealed a significant association between poor periodontal health and diminished oral health-related quality of life in few domains of OHIP-14. Mean score of both groups had significant association in Functional Limitations, Psychological Discomfort and Psychological Disability. These findings contrast with the results reported in earlier studies of Shahla Kakoei et al and Yuan-Jung Hsu et al[21,22]. However, most of the studies support

Table 1: Relationship Between Diabetes Status and OHIP-14 Domains

Domain	Diabetic Mean (SD)	Non-Diabetic Mean (SD)	p-value*
Impaired functionality (difficulty articulating words/ intensified deterioration in taste)	3.2(0.84)	1.7(1.06)	0.01
Physical Impairment (oral pain or discomfort during meals)	3.3(0.86)	2.1(0.98)	0.46
Emotional Discomfort (sense of tension/ self-consciousness)	3.6(0.80)	2.6(1.2)	0.95
Psychological Discomfort (feeling tense/self conscious)	2.05(1.48)	1.9(1.14)	0.01
Emotional Impairment (difficulty in relaxing/experiencing embarrassment)	1.47(1.35)	1.7(1.06)	0.01
Social Impairment (irritability/challenges in performing regular tasks)	1.45(1.44)	1.77(1.02)	0.005
Handicap (functional Impairment/life less gratifying/ difficulty in functioning)	1.6(0.9)	1.45(1.03)	0.91

** Denotes P-value 0.001, based on chi-square test*

our results, indicating that diabetic group has poorer quality of life than non diabetic group[23]. Regarding other parameters of OHIP, Physical Disability interrupting normal meals and eating had no significant association in diabetic and non-diabetic patients. The findings were very close to another study of Rokhsareh Sadeghi et al that concluded insignificant association of diabetes on OHRQoL parameters[24].

The other important domain of OHIP-14 which influences quality of life is Physical Pain including oral pain and discomfort while eating. More patients in diabetic group were affected by pain during eating; however, similar to other studies, no significant association between diabetic and non-diabetic individuals was found[25]. Periodontal diseases can also contribute to psychological discomfort and disability, impacting individuals emotionally and psychologically. Individuals may become self-conscious about the shape of their teeth and surrounding tissue, leading to feelings of embarrassment and tension, especially in social situations. The current study showed a significant association of diabetes with these parameters of OHIP-14, but a previous study has found little impact of diabetes on psychological discomfort and disability[26].

Periodontal disease and diabetes can have implications for social disability and feelings of handicap, impacting individuals emotionally and functionally. Chronic pain, discomfort, and inflammation associated with periodontal disease can contribute to irritability. Individuals may find it challenging to cope with persistent oral health issues, leading to increased emotional stress. However, our study did not find strong association of variable between diabetic and non-diabetic patients. Elevated blood sugar levels create an environment conducive to bacterial growth and inflammation, exacerbating periodontal disease. Through effective glycemic control, patients can attenuate inflammation and optimize the health of periodontal tissues.

The study is limited by its sample size and the characteristics of the study participants may not comprehensively capture the diversity present in the broader population of individuals with diabetes mellitus. Additionally, the study might have overlooked all possible confounding factors that could impact the relationship between periodontal health and the oral health-related quality of life in patients diagnosed with diabetes mellitus. Factors like socioeconomic status, comorbidities, and treatment adherence could confound the results.

CONCLUSION

In conclusion, our research, exploring the intricate correlation between periodontal health and the oral health-related quality of life among individuals with diabetes mellitus, contributes meaningful insights into the multifaceted dynamics of these interconnected factors. The association between good glycemic control and oral hygiene underscores the critical interplay between diabetes management and oral health. Effective glycemic control is an integral component of diabetes management, for patients and healthcare providers. It can proactively address the multifaceted challenges posed by diabetes-related oral health complications. The results highlight the substantial influence of periodontal health on the general well-being of individuals with diabetes. The recognition of periodontal health as a vital component in enhancing the overall quality of life for diabetes mellitus patients underscores the necessity for integrated and interdisciplinary healthcare approaches.

Conflict of interest: Authors declare that there is no conflict of interest.

Authors' Contributions: SAK conceptualized the study, provided supervision throughout the research process, and contributed to the review of the manuscript; NS was primarily responsible for drafting the manuscript, developing the methodology, conducting literature reviews, and overseeing data collection; AW contributed to drafting the manuscript, conducted data collection and analysis, and participated in the editing process; M focused on editing and reviewing the manuscript to ensure clarity, coherence, and accuracy in the final version.

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