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Evaluation of Knowledge, Attitude and Practice of Diabetic Patients Towards Periodontal Diseases in Zahedan

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Abstract

Background: This study was undertaken due to the high prevalence of periodontal diseases in diabetic patients and the known oral complications of diabetes mellitus. Besides, research on the periodontal diseases of diabetic patients and the relationship between these two conditions is inadequate in Zahedan, Iran.

Objectives: This study aimed to evaluate the level of knowledge, attitude, and practice of diabetic patients regarding periodontal diseases in the diabetes centers of Zahedan, Iran.

Methods: This study with a descriptive-analytical method was questionnaire-based. The study population consisted of diabetic patients, aged ≥ 40 years, with at least 10 teeth (n = 80), who were selected by convenience sampling. The validity and reliability of the questionnaire have been measured in previous research. Data were first extracted from the questionnaires and then entered into SPSS version 24; for data analysis, statistical tests were performed.

Results: The patients' mean scores of knowledge, attitude, and practice were 5.73 ± 1.48, 19.40 ± 3.68, and 3.25 ± 1.47, respectively. Besides, 68.8% of the participants had a moderate level of knowledge, 81.3% had moderate attitudes, and 60% had a poor practice. Also, the mean scores of knowledge, attitude, and practice were not significantly different in terms of demographic variables (age, sex, and education) ($P > 0.05$).

Conclusions: This study showed that the level of knowledge, attitude, and practice of diabetic patients regarding periodontal diseases is not at an acceptable level. Therefore, it is necessary to provide training and effective strategies to improve the level of knowledge, attitude, and practice of these patients.

Keywords: Diabetes Mellitus, Periodontal Disease, Knowledge, Attitude

1. Background

Diabetes mellitus is a metabolic disorder characterized by impaired insulin production or function, leading to abnormal metabolism of fats, carbohydrates, and proteins (1). It is a global health crisis with increasing prevalence in both developed and developing countries (2, 3). The global diabetes rate has risen from 7.4% in 1980 to 9.3% in 2019 (4). As the world's most costly endocrine disorder, diabetes causes tissue and organ damage, including periodontal disease in diabetic individuals (3).

In addition to periodontal disease, individuals with diabetes often experience other oral complications like dry mouth, slow-healing mouth ulcers, increased and worsened cavities, and burning mouth syndrome (3). Diabetes is a major risk factor for developing severe periodontal disease. It significantly impacts the gums and surrounding tissues by altering oral bacteria, glucose levels in gum fluids and blood vessels, immune responses, and collagen production. Periodontal disease is recognized as the sixth most common diabetes complication (1).

While diabetes doesn't directly cause periodontal disease, it worsens the impact of local factors like plaque buildup and oral bacteria. The relationship between these two conditions is complex. Not only does diabetes aggravate periodontal disease, but gum disease can also contribute to higher blood sugar levels (5).

Neglecting risk factors, such as smoking and diabetes, can hinder the success of periodontal treatments (1). While managing diabetes can be challenging in patients with severe gum disease, effectively treating periodontal disease can positively impact diabetes control (6, 7).

In a meta-analysis by Nascimento et al., diabetes was found to be a risk factor for periodontal diseases (8). Despite the global recognition of diabetes threats, many diabetic patients remain unaware of the effects of diabetes on oral health (9). The concurrent study of periodontal diseases and diabetes is of great importance in the control and treatment of these conditions, owing to their high prevalence in developed and developing countries due to unbalanced diet and lifestyle, besides the interactive effects of these two conditions. The present study aimed to investigate the awareness of diabetic patients about this disease and its associated oral complications in Zahedan, Iran

Paurobally et al. found that Mauritian diabetic patients had limited awareness of diabetes-related oral complications. Only a minority were aware of tooth decay, gum disease, and dry mouth. Education level, duration of diabetes diagnosis, and experience with oral complications influenced awareness. Consulting with endocrinologists was associated with higher awareness of tooth decay and gum disease, while age and diabetes type influenced knowledge of systemic complications ($P < 0.05$) (10).

Dannan found that Syrian diabetic patients had limited knowledge about the connection between diabetes and periodontitis. Only 57.5% knew diabetes could affect periodontitis, and 61% knew periodontitis could affect blood sugar. Many patients had poor oral hygiene practices and relied on healthcare providers for information. Younger patients (20 - 30 years) were particularly unaware of the link between diabetes and periodontal complications (11).

Javid et al. studied diabetic patient knowledge of oral complications in Pakistan. Most patients were female, had a family history of diabetes, and had some education. Only 24% had received oral health information. Many patients brushed their teeth only once a day and were unaware of periodontitis as a common complication. Few patients visited a dentist regularly (12).

2. Objectives

While cross-sectional studies are common, collection of data from a large number of participants at a single point in time, providing a broad overview of the population. In our study, we explore how factors such as age, disease duration, and education influence the patients' knowledge, attitude, and practice.

By determining the level of knowledge, attitude, and practice of diabetic patients toward periodontal diseases, we can provide better methods of information delivery and more comprehensive care and health programs for diabetic patients to improve their oral health, reduce dental complications, and contribute to the management of diabetes. Accordingly, this study aimed to evaluate the level of knowledge, attitude, and behavior of diabetic patients regarding periodontal diseases in Zahedan, Iran, in 2021.

3. Methods

The study protocol was approved by the Ethics Committee of Zahedan University of Medical Sciences (ethics code: IR.ZAMUS.REC.1400.338). The study population consisted of diabetic patients, who were selected by convenience sampling. Convenience sampling as a non-probability sampling technique where participants are selected based on their accessibility and availability to the researcher. This method relies on voluntary participation and does not guarantee that all members of the population have an equal chance of being included in the sample.

The study included diabetic patients aged 40 years or older who had at least 10 teeth. Participants were excluded if they withdrew from the study at any point or failed to complete the questionnaire. Participants were recruited from diabetes clinics in Zahedan. Based on the objective of this study, the following formula was used to determine the sample size:

Equation 1.

$$n = \left(\frac{Z^2_{1-\frac{\alpha}{2}} P(1-P)}{d^2} \right)$$

α: 0.05; P: 0.44; d:0.1.Calculations indicated a required sample size of 80 eligible participants (13).

The necessary coordination was made with the authorities of these clinics, and the subject and objectives of the research were explained to them. It was also emphasized that the patient information remained completely confidential and would be only used for this study. Besides, after selecting eligible samples, all details about the subject and objectives of the study, and confidentiality of information were presented to each participant. If they agreed to cooperate with us and enter the study, they were asked to sign a written consent form. After obtaining the informed consent form, a patient information form, including the

patient's demographic information (education level, age, duration of disease, and sex), and a questionnaire related to the knowledge, attitude, and practice of periodontal diseases were completed by diabetic patients. The illiterate patients completed the questionnaire with assistance from their companions. The questionnaire consisted of four sections:

First section included the study objectives, demographic information, and questions about the participants' education. Second and third sections evaluate the level of knowledge and attitude, these sections consisted of 5 knowledge and 15 attitude questions that were answered using a Likert scale (2 points for "Yes," 1 point for "Unsure/Somewhat," and 0 points for "No"). Last section consisted of four questions that assessed participants' practice.

In the present study, participants' scores were categorized into three groups based on their frequency distribution of knowledge: Poor (score below 4), moderate (score 4 to 7), and good (score above 7). Similarly, participants' scores were classified into three groups according to their frequency distribution of attitude: Poor (score below 11), moderate (score 11 - 20), and good (score above 20). Although, participants' scores were classified into three groups according to their frequency distribution of practice: Poor (score below 5), moderate (score 5 to 8), and good (score above 8).

In the present study, the knowledge, attitude, and practice questionnaire, used in the study by FakhrTabatabaei (13), which has adequate reliability (Cronbach's alpha > 0.7), was used and the validity of the questionnaire was assessed using the content validity method, yielding a score of 81%. Patients who did not answer all the questions were excluded from the study.

The collected data was analyzed using SPSS software version 24. The data was initially checked for quality. Descriptive statistics like frequencies, means, medians, standard deviations, and interquartile ranges were calculated to summarize the data. The study also estimated average scores and frequencies of knowledge, practice, and attitude. It should be noted that the Kolmogorov-Smirnov test was used to assess normality.

Comparisons between groups were made using *t*-tests when applicable. In all analyses, a p-value of less than 0.05 was considered statistically significant.

4. Results

In this study, 80 diabetic patients, presenting to the diabetes clinics of Zahedan, Iran, who were willing to participate in this study, were included. Overall, 43 (53.8%) patients were male, and 37 (46.3%) were female. Also, the mean age and duration of disease were 49.21±6.80 and 8.58±3.80 years, respectively (Table 1).

According to Table 2, the mean scores of knowledge, attitude, and practice were 5.73 ± 1.48, 19.40 ± 3.68, and 3.25 ± 1.47, respectively.

According to Table 3, the majority of diabetic patients had moderate levels of knowledge and attitude (68.8% and 81.3%, respectively) and a poor practice (60.0%) regarding periodontal diseases.

According to Table 4, there was no significant difference between male and female diabetic patients regarding the mean scores of knowledge, attitude, and practice ($P > 0.05$). Also, the mean scores of knowledge, attitude, and practice were not significantly different between diabetic patients under 50 years and above 50 years. Besides, there was no significant difference in the mean scores of knowledge, attitude, and practice between literate and illiterate diabetic patients ($P < 0.05$). It should be noted that due to the low number of patients with academic education (n = 4), this group was merged with the group of high school diploma, and then, independent t-test was performed.

5. Discussion

Periodontal diseases are common and can range from mild gingivitis to severe periodontitis, affecting gums and surrounding tissues. Good oral hygiene can often manage gingivitis, while periodontitis requires more extensive treatment. Oral health is a vital indicator of overall well-being (14).

Periodontal disease, commonly referred to as the sixth most frequent complication of diabetes, stands as the prevailing oral complication associated with diabetes. This highlights the significant influence of diabetes as a crucial risk factor contributing to the higher occurrence of periodontal diseases (15, 16).

A research study conducted by Basil and Rakan (17) found that a large majority of patients with diabetes demonstrated a good understanding and awareness of the connection between diabetes and oral health problems. Specifically, over 80% of participants were aware that diabetes could increase the risk of experiencing oral health issues, and nearly 80% recognized the increased risk of developing periodontal problems. These findings did not align with present study, which have consistently reported that many individuals with diabetes are not knowledgeable about the potential oral health complications associated with the condition.

Table 1. Frequency Distribution of the Demographic Characteristics of Diabetic Patients Presenting to Diabetes Centers in Zahedan, Iran

Variables	No. (%)
Gender	
Female	37 (46.2)
Male	43 (53.8)
Age (y)	
< 50	50 (62.5)
> 50	30 (37.5)
Duration of disease (y)	
0 - 6	29 (36.3)
7 - 12	38 (47.5)
13 - 18	13 (16.2)
Education	
Illiterate	36 (45)
Under high school diploma or high school diploma	50 (50)
Academic education	4 (5)

Table 2. The Mean Scores of Knowledge, Attitude, and Practice of Diabetic Patients Regarding Periodontal Diseases in the Diabetes Centers of Zahedan, Iran

Variables	Mean ± SD	Status
Awareness	5.73 ± 1.48	Moderate
Attitude	19.40 ± 3.68	Moderate
Practice	3.25 ± 1.47	Poor

Table 3. The Frequency Distribution of Knowledge, Attitude, and Practice of Diabetic Patients Regarding Periodontal Diseases, Presenting to the Diabetes Centers of Zahedan, Iran [a]

Variables	Poor	Moderate	Good
Awareness	5 (18.7)	55 (68.8)	10 (12.5)
Attitude	0 (0)	65 (81.3)	13 (18.7)
Practice	48 (60.0)	31 (38.8)	1 (1.2)

[a] Values are expressed as No. (%).

Kumar, also showed that most diabetic patients had inadequate knowledge (62%) about oral health and its relationship with periodontal diseases, and only a small percentage of them (29%), who were in the age group of 35 - 45 years, had adequate knowledge (14). Besides, in another study by Eldarrat (18), it was found that the awareness of diabetic patients of their increased risk for oral diseases is low compared to their awareness of systemic diseases. Also, a study by Shetgaonkar et al. (2022), showed that the level of knowledge, awareness, and attitude of diabetic patients about periodontal diseases was not satisfactory. Additionally, Shetgaonkar (2022) reported that there is a need to educate patients regarding periodontal complications in poorly controlled diabetics if oral healthcare is ignored (19).

In this regard, Shanmukappa et al. (20), showed that the oral health knowledge of diabetic patients was unfavorable (24.2%). Similarly, Dannan et al. (11), reported that most diabetic patients were unaware of the effects of diabetes on periodontitis. In another study by Nigarish et al. (12), only a small percentage of diabetic patients (10%) were aware of periodontitis in diabetes. Paurobally et al. (10), also revealed that diabetic patients had limited understanding of the oral problems associated with diabetes, with only 29% aware of tooth decay, 37% aware of gum disease, and 52% aware of dry mouth. Additionally, the study found that education level and the number of years since diagnosis were the most significant factors influencing patients' awareness of these complications. Compared to previous research,

Table 4. Measurement and Comparison of the Mean Scores of Knowledge, Attitude, and Practice of Diabetic Patients Regarding Periodontal Diseases in Relation to Demographic Variables in the Diabetes Centers of Zahedan, Iran [a, b]

Demographic variables	Knowledge	P-Value	Attitude	P-Value	Practice	P-Value
Gender		0.35		0.90		0.14
Male	5.88 ± 1.53		19.34 ± 3.06		3.02 ± 1.38	
Female	5.56 ± 1.42		19.45 ± 4.34		3.51 ± 1.55	
Age		0.45		0.48		0.50
< 50 years	5.85 ± 1.29		19.11 ± 3.31		3.14 ± 1.63	
> 50 years	5.60 ± 1.66		19.71 ± 4.07		3.36 ± 1.3	
Education		0.43		0.66		0.65
Illiterate	5.88 ± 1.75		19.19 ± 4.15		3.33 ± 1.33	
Literate	5.61 ± 1.22		19.56 ± 3.29		3.18 ± 1.60	

[a] Values are expressed as mean ± SD.

[b] P-Value: Independent *t*-test.

the patients in this study demonstrated slightly higher knowledge and attitude, which could be attributed to the use of different tools to evaluate their understanding, the frequency of dental visits, or their access to information from medical and dental professionals.

Additionally, Shivam et al. (21), found that 50% of diabetic patients were aware that they were more prone to oral diseases, while 52% were not informed about the effects of diabetes on gingival problems. Another study by Weinspach et al. (22), revealed that diabetic patients receiving dental treatment have not been given adequate focus on improving their awareness. Additionally, the study findings indicated that there were no notable differences in the average scores of knowledge, attitude, and practice regarding periodontal diseases among diabetic patients in relation to demographic factors such as gender, age, and education. These findings align with the present study.

Moreover, a study by Kumar showed that there was no significant difference in the level of patients' knowledge with respect to age, while there was a significant difference in the attitudes of different age groups (35 - 45, 46 - 55, and > 55 years) (14). In another study by Dannan et al. (11), it was found that the level of knowledge varies according to the age of diabetic patients. On the other hand, in a study by, Shetgaonkar et al. (19), there was a significant difference in the knowledge of diabetic patients regarding periodontal diseases in terms of education, which contradicts the findings of the present study. This discrepancy can be attributed to differences in the sample size of these studies, as well as differences in the age and educational level of the participants. In the present study, the number of individuals with academic education was low, which is one of the limitations of this study.

Diabetes increases the risk and severity of periodontal disease. Diabetic patients have impaired immune function, particularly neutrophils, which contributes to periodontal tissue destruction. The inflammatory response in periodontal disease, characterized by increased TNF-α, can worsen diabetes by inducing insulin resistance (14). Mealey and Ocampo (23), showed that the risk of periodontitis in diabetic patients is almost three times higher than non-diabetic people. However, there seems to be a two-sided relationship between periodontal diseases and glycemic level.

According to the findings of the present study, it is clear that the knowledge and attitude of diabetic patients are at moderate levels, while their practice is poor. Therefore, considering the patients' lower practice scores compared to their knowledge and attitude scores, as well as the existing gap, it is necessary to propose solutions to improve the patients' practice. Activities, such as insurance coverage of patients by active centers, supporting them after diagnosis, and also referring them to specialized centers, play an important role in motivating the patients and increasing their cooperation and trust.

It should be noted that the referral rate of diabetic patients by specialists to dentists was relatively low in the present study. Physicians deal with patients who have oral problems more than others, and therefore, cooperation is necessary between specialists, dentists, and medical centers (24). To achieve this goal, in the future, joint meetings and conferences can be held by Zahedan Dental School by inviting physicians and medical centers to identify the oral symptoms of

diabetes and periodontal diseases and to refer patients to dentists in a timely manner. Of course, this goal can be only achieved with the financial support of Zahedan Dental School. Also, regular dental visits can provide opportunities for patients to receive professional care regarding the prevention, early diagnosis, and treatment of oral diseases; therefore, they are of great significance to diabetic patients. Finally, it is important to acknowledge that the physician's understanding of the correlation between diabetes and oral health holds significance.

5.1. Limitations

One limitation of the present study is the reliance on self-reported data collected through questionnaires. The questionnaire-based nature of the study may have led participants to provide socially desirable responses. To mitigate this bias, questionnaires were collected anonymously. Additionally, the study was conducted solely in Zahedan, and therefore, generalizing the findings to other regions of the world should be done with caution. It is recommended that future studies assess the knowledge and behaviors of diabetic patients in various cities to inform improvements in dental education.

5.2. Conclusions

The findings of this study indicate that the overall knowledge, attitude, and practice levels of participants regarding periodontal diseases were moderate. While the majority exhibited moderate attitudes towards the subject, a significant proportion demonstrated a poor level of practice. Interestingly, demographic factors such as age, sex, and education did not significantly influence these scores. These results highlight the need for targeted interventions to enhance practical skills and behaviors related to periodontal diseases in diabetic patients.

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Footnotes

Authors' Contribution: S. A. developed the original idea and the protocol, abstracted and analyzed data, wrote the manuscript. M. A. and M. D. collected the clinical data, and interpreted them. M. A. and S. A. contributed to the development of the protocol, abstracted data, and prepared the manuscript.

Conflict of Interests Statement: Authors confirm that there are no relevant financial or non-financial competing interests to this study.

Data Availability: The data used in this study is available upon reasonable request. Please contact corresponding author to inquire about data access.

Ethical Approval: After obtaining approval from the ethics committee of Zahedan University of Medical Sciences (IR.ZAMUS.REC.1400.338) and obtaining permission to collect the required data for this study, the researcher visited the diabetes clinics in Zahedan, Iran.

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Informed Consent: After obtaining the informed consent form, a patient information form, including the patient's demographic information (education level, age, duration of disease, and sex), and a questionnaire related to the knowledge, attitude, and practice of periodontal diseases were completed by diabetic patients.

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