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# Exploring Stakeholders Awareness of the Relationship between Periodontal Health and Diabetes at City University Ajman: a questionnaire survey study

Explorando a Conscientização da Comunidade Universitária sobre a Relação entre Saúde Periodontal e Diabetes na Universidade da Cidade de Ajman: um estudo de pesquisa por questionário

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## ABSTRACT

Periodontal inflammation can worsen glycemic control in diabetic patients, while poorly controlled diabetes can increase the severity of periodontal diseases. Despite the clinical significance of this relationship, awareness among the general population and even healthcare providers often remain limited. **Objective**: This study aims to investigate the level of awareness among stakeholders at City University Ajman (CUA) regarding the relationship between periodontal health and diabetes. **Material and Methods:** A cross-sectional survey was conducted using a structured questionnaire to gather data from CUA students, faculty, and staff. The questionnaire assessed participants' knowledge about periodontal diseases, diabetes, and the interrelationship between these conditions. Data were analyzed to determine awareness prevalence and identify significant knowledge gaps. **Results:** Preliminary findings indicate varying levels of awareness among different stakeholder groups. While a substantial number of participants acknowledged a connection between periodontal health and diabetes, a detailed understanding of the bidirectional relationship and its implications on overall health was less prevalent. Factors such as educational background and professional experience influenced the degree of awareness. **Conclusion**: The study highlights the need for enhanced educational initiatives at CUA to increase comprehension of the connection between periodontal health and diabetes. Increasing awareness among stakeholders can contribute to better management and prevention strategies, ultimately promoting overall health and wellbeing within the university community.

## KEYWORDS

Awareness; Diabetes mellitus; Glycemic control; Health Literacy; Oral Health; Periodontal disease.

## RESUMO

A inflamação periodontal pode agravar o controle glicêmico em pacientes diabéticos, enquanto o diabetes mellitus mal controlado pode aumentar a gravidade das doenças periodontais. Apesar da relevância clínica dessa relação, a conscientização entre a população em geral e profissionais de saúde permanece limitada. **Objetivo**: Investigar o nível de conscientização da comunidade universitária da Universidade da Cidade de Ajman (CUA) acerca da relação entre saúde periodontal e diabetes mellitus. **Material e Métodos:** Foi realizado um estudo transversal utilizando um questionário estruturado aplicado a estudantes, docentes e funcionários da CUA. O questionário avaliou o conhecimento dos participantes sobre doenças periodontais, diabetes mellitus e sua inter-relação. Os dados foram analisados para determinar a prevalência da conscientização e identificar lacunas de conhecimento. **Resultados**: Os achados preliminares indicam níveis variados de conscientização entre os diferentes grupos. Embora muitos participantes reconhecessem a conexão entre saúde periodontal e diabetes mellitus, a compreensão detalhada da relação bidirecional e suas implicações na saúde geral foi menos prevalente. Fatores

como formação educacional e experiência profissional influenciaram o grau de conscientização. **Conclusão**: O estudo destaca a necessidade de iniciativas educativas na CUA para aumentar a compreensão sobre a relação entre saúde periodontal e diabetes mellitus. Maior conscientização entre a comunidade pode contribuir para melhores estratégias de manejo e prevenção, promovendo a saúde e o bem-estar da comunidade universitária

## PALAVRAS-CHAVE

Percepção; Diabetes Mellitus; Controle da Glicemia; Literacia em Saúde; Saúde Bucal; Doença periodontal.

## INTRODUCTION

Periodontal diseases are collectively referred to the most common diseases known to humanity. Its classification is complex and depends on several factors, including clinical condition, disease development, and systemic and local diseases that may lead to increased risk [1]. This disease begins and spreads through an imbalance in the microorganisms present in the dental plaque biofilm, which leads to an interaction with the host's immune defenses, which in turn leads to proliferation and leads to tissue destruction and resorption of alveolar bone ended with loss of the tooth [2-4].

Risk factors contributing to periodontal diseases include smoking, diabetes, immune deficiency conditions like HIV, nutritional deficiencies, osteoporosis, certain medications, genetic predispositions, and local factors such as poor oral hygiene and misaligned teeth [5,6].

Diabetes mellitus(DM) comprises a cluster of metabolic conditions leading to acute and chronic complications because of insufficient insulin production or utilization. Globally, diabetes has surged to epidemic levels with a swiftly escalating prevalence. In 2000, roughly 2.8% of the global population across all age groups had diabetes. Projections indicate an estimated increase to 4.4% by 2030 [7]. Research has demonstrated a mutual connection between periodontal disease and diabetes. Unmanaged diabetes, marked by inadequate glycemic control, heightens the risk of severe periodontitis. Conversely, treating periodontitis contributes to better glycemic control. Recognizing this crucial correlation between periodontal disease and diabetes, adopting effective practices like regular brushing, flossing, and dental checkups not only positively influences periodontal health but should also be regarded as essential for the overall health of diabetic patients [8].

Multiple studies have examined the level of awareness among diabetic patients regarding their periodontal health and the increased risk of periodontal disease. A controlled study in Sweden found that 83% of diabetic patients were unaware of the connection between periodontal disease and diabetes [9]. Similarly, a study in Jordan involving a random sample of 405 diabetic patients revealed that approximately 48% were aware of the heightened susceptibility to periodontal diseases and oral health complications in diabetic patients, while about 38% knew that periodontal treatment could aid in controlling diabetes [10]. Another study conducted in Abha, Saudi Arabia, indicated a significant lack of awareness among diabetic individuals about oral health, with 52.3% of participants unaware that diabetes increases the likelihood of developing oral problems [11]. Additionally, the Dubai Health Authority (DHA), in collaboration with the Dubai Statistics Center, conducted the Dubai Household Health Survey (DHHS) in 2014. Supplementary data [12]. Despite the clinical significance of this relationship, awareness among the general population and even healthcare providers often remain limited. Our study aims to investigate the level of awareness among stakeholders at CUA regarding the relationship between periodontal health and diabetes.

## MATERIALS AND METHODS

This study was a cross-sectional descriptive survey of 424 subjects, who were the stakeholders in CUA, United Arab Emirates (UAE). A structured questionnaire survey was conducted among stakeholders including students, faculty members, administrative staff, and healthcare professionals at CUA. The validity of the questionnaire was confirmed with similar articles with some modifications. The questionnaire was used to evaluate awareness, knowledge, and attitudes

concerning the relationship between periodontal health and diabetes. The CUA institutional review board (IRB) provided ethical approval for conducting the survey (Approval no:052024-2). Data collected were analyzed quantitatively and qualitatively to gain insights into the stakeholders' perceptions and understanding. our study primarily focused on overall awareness levels rather than a weighted analysis of specific dimensions.

### Questionnaire

A structured questionnaire was designed based on a thorough review of the literature on diabetes and periodontal disease. The questionnaire consisted of six parts. The first part of the survey assessed sociodemographic characteristics (sex, age, nationality, and education). The second part assessed participants' level of awareness about the relationship between periodontal health and diabetes. The third part assessed participants' Knowledge Assessment which includes true or false statements and assesses beliefs about the role of oral hygiene in diabetes management: The fourth part assessed participants' Attitude and Practice of Oral Hygiene including participants' brushing and flossing frequency, and other questions concerning previous advice to participants by medical personnel. The fifth part assessed Education and Awareness Needs which explores interest in educational sessions and types of resources that would be helpful. The Primary Source of Information section identifies where participants primarily learned about the connection between periodontal health and diabetes. Finally, the Additional Comments section provides space for any further insights on the topic. Informed verbal consent was obtained from each eligible participant prior to data collection.

### Statistical analysis

The collected data were entered into an Excel spreadsheet and then analyzed using SPSS software version 29. Descriptive statistics were used to determine the sociodemographic characteristics, as well as to assess the awareness, knowledge, and attitude regarding the relationship between periodontal health and diabetes, and the practice of oral hygiene among the participants. To determine the association between knowledge and sociodemographic characteristics, the Chi Square test was used, with a p value of $<0.05$ considered significant.

## RESULTS

### Distribution of the study population

In this study as shown in Table I of 424 participants, 53.5% were male and 46.5% female, divided into four age groups: 18–20 years (27.1%), 21–25 years (24.3%), 26–30 years (20.3%), and 30 years and above (28.3%). Most participants (54.2%) were married. Ethnicities included Arab (42.9%), Far Eastern (17.2%), Caucasian (13.9%), African (13%), and Persian (13%). Education levels reported were Bachelor's (35.8%), High School (23.1%), Master's (21.2%), and None (19.8%).

### Awareness and understanding

To assess awareness of the link between periodontal health and diabetes, participants were asked to describe the relationship. Responses indicated a direct, bidirectional, and strongly linked relationship, with diabetes contributing to infections, inflammation, gum bleeding, and poor periodontal health.

As shown in Table II participants were nearly evenly split on whether poor oral hygiene affects diabetes: 30.2% said yes, 35.1% were unsure, and 34.7% said no. Only 41.5% had received information on oral health's impact on diabetes, while 30% received partial information, and 28.5% received none.

### Knowledge assessment

As shown in Table III participants were given questions to assess their level of knowledge about the relationship between periodontal health and diabetes. Around 60% of the participants knew that diabetics are at a higher risk of developing severe periodontal disease, and 53.3% (n=226) knew about the positive impact of treating periodontitis on glycemic control in diabetic patients.

Based on the responses, 33.3% (n=141) of the study participants believe that maintaining good oral hygiene can contribute to better diabetes management. The rest are either not sure or do not believe that good oral hygiene can benefit diabetes management, with percentages of 35.1% and 31.6%, respectively.

**Table I -** Sociodemographic Characteristics of the Participants

| Sociodemographic Variables | Group | Frequency | % |
|---|---|---|---|
| Gender | Male | 227 | 53.5 |
| | Female | 197 | 46.5 |
| Age | 18 – 20 | 115 | 27.1 |
| | 21 – 25 | 103 | 24.3 |
| | 26 – 30 | 86 | 20.3 |
| | > 30 | 120 | 28.3 |
| Ethnicity | African | 55 | 13.0 |
| | Arab | 182 | 42.9 |
| | Caucasian | 59 | 13.9 |
| | Far Eastern | 73 | 17.2 |
| | Persian | 55 | 13.0 |
| Marital Status | Married | 194 | 45.8 |
| | Single | 230 | 54.2 |
| Course of Study | None | 84 | 19.8 |
| | High school | 98 | 23.1 |
| | Bachelor | 152 | 35.8 |
| | Masters | 90 | 21.2 |

**Table II -** Awareness and Understanding of the Relationship between Periodontal Health and Diabetes

| Variable | Group | Frequency | % |
|---|---|---|---|
| There is link between periodontal health and diabetes | No | 224 | 52.8 |
| | Yes | 200 | 47.2 |
| Poor oral hygiene can affect diabetes | No | 128 | 30.2 |
| | Not sure | 149 | 35.1 |
| | Yes | 147 | 34.7 |
| Received information or education about the impact of oral health on diabetes management | No | 176 | 41.5 |
| | Partially | 127 | 30.0 |
| | Yes | 121 | 28.5 |

**Table III -** Knowledge of the Relationship between Periodontal Health and Diabetes

| Variable | Group | Frequency | % |
|---|---|---|---|
| Individuals with diabetes are at a higher risk of developing severe periodontal disease | False | 169 | 39.9 |
| | True | 255 | 60.1 |
| Treating periodontitis can positively impact glycemic control in diabetic patients | False | 198 | 46.7 |
| | True | 226 | 53.3 |
| Do you believe maintaining good oral hygiene can contribute to better diabetes management? | Not sure | 149 | 35.1 |
| | No | 134 | 31.6 |
| | Yes | 141 | 33.3 |

## Attitudes and practices

As shown in Table IV Among participants, 17.7% never visited a dentist, 22.6% rarely visited, 32.5% occasionally visited, and 27.1% regularly visited for check-ups. On a 5-point Likert scale, 46.5% considered oral hygiene very important for overall health, and 38% rated it as extremely important. Less than 1% viewed it as unimportant. Additionally, 42.9% never discussed oral health concerns related to diabetes with a healthcare provider, 28.3% did, and 28.8% found it not applicable.

## Education and awareness needs

As shown in Table V 36.6% of participants were interested in educational sessions on the

**Table IV -** Attitude and Practice of Oral Hygiene

| Variable | Group | Frequency | % |
|---|---|---|---|
| How often do you visit the dentist for routine check-ups | Never | 75 | 17.7 |
| | Rarely | 96 | 22.6 |
| | Occasionally | 138 | 32.5 |
| | Regularly | 115 | 27.1 |
| On a scale of 1 to 5, how important do you consider oral hygiene practices in overall health? | Not important | 4 | 0.9 |
| | Little important | 44 | 10.4 |
| | Important | 20 | 4.7 |
| | Very important | 197 | 46.5 |
| | Extremely important | 159 | 37.5 |
| Have you ever discussed oral health concerns with your healthcare provider in relation to diabetes? | No | 182 | 42.9 |
| | Not applicable | 122 | 28.8 |
| | Yes | 120 | 28.3 |

**Table V -** Education and Awareness Need

| Variable | Group | Frequency | % |
|---|---|---|---|
| Would you be interested in educational sessions about the link between oral health and diabetes management? | No | 128 | 30.2 |
| | Maybe | 141 | 33.3 |
| | Yes | 155 | 36.5 |

link between oral health and diabetes, 33.3% were somewhat interested, and 30% were not interested. When asked about helpful resources, participants suggested information on dental care for youth, oral health risks for diabetics, the diabetes-gum disease relationship, gingival health strategies, and infection prevention. Preferred sources included articles, clinical studies, and internet resources, with suggested channels for awareness being social media, practical classes, videos, lectures, conferences, and brochures.

## Primary source of information

As shown in Table VI slightly more than 370 participants shared their primary source of information about the connection between periodontal health and diabetes. These sources include online sources (85, 22.8%), medical professionals (80, 21.5%), social media (79, 21.3%), personal experience (69, 18.5%), and health education material (59, 15.9%).

Figure 1 shows the association between knowledge of diabetes-related periodontal disease risk and participant demographics. Knowledge levels were similar across age groups, with no significant association between age or gender and this knowledge. Ethnicity and marital status also showed no significant link with awareness. However, education level was significantly associated with knowledge: 58.3% of those without formal education, 51% with high school, 68.4% with a bachelor's, and 57.8% with a master's were aware of the risk ($p < 0.05$). There was a statistically significant association between the course and the knowledge of the higher risk of developing severe periodontal disease in individuals with diabetes.

Participants who knew that treating periodontitis can improve glycemic control included 52.2% of those aged 18-20, 63.1% of those aged 21-25, 47.7% of those aged 26-30, and 50% of those over 30. Among genders, 55.5% of males and 50.8% of females had this knowledge. By education level, 48.8% in the "None" group, 45.9% in "High School," 59.2% in "Bachelor's," and 55.5% in "Master's" were aware. Among ethnicities, awareness was 50.9% for Africans, 58.8% for Arabs, 54.2% for Caucasians, 49.3% for Far Eastern, and 41.8% for Persians. No significant associations were found between knowledge and the variables tested ($p > 0.05$). There is no association between knowledge that treating periodontitis can positively impact glycemic control in individuals with diabetes and sociodemographic variables as shown in Figure 2.

Figure 3 shows that knowledge of the link between good oral hygiene and better diabetes outcomes was significantly associated with age

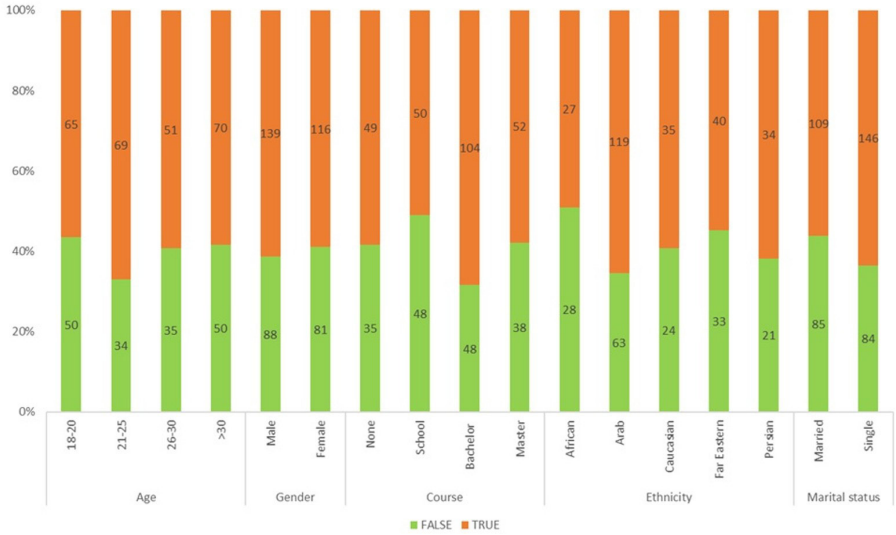


**Figure 1 -** Association Between Knowledge of the Higher Risk of Developing Severe Periodontal Disease in Individuals with Diabetes and Sociodemographic Variables.

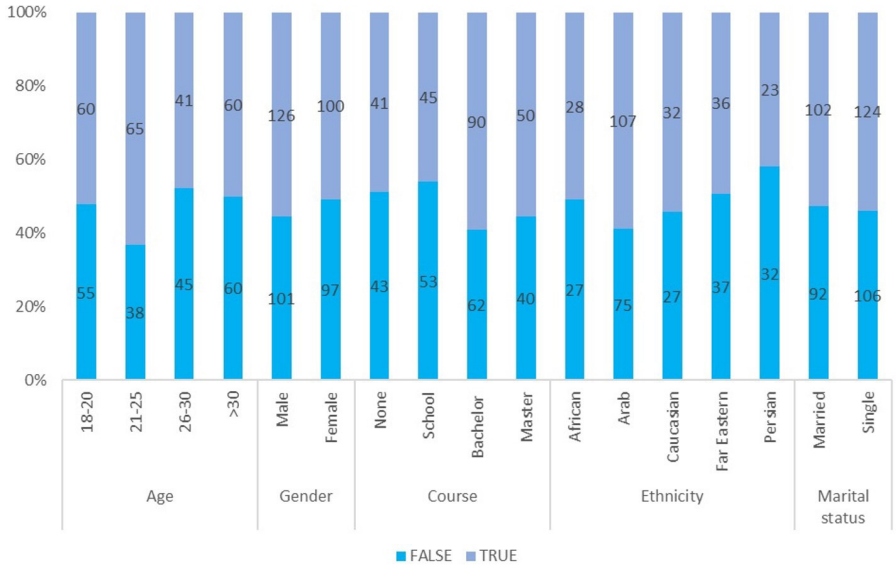


**Figure 2 -** Association between Knowledge that Treating Periodontitis Can Positively Impact Glycemic Control in Individuals with Diabetes and Sociodemographic Variables.

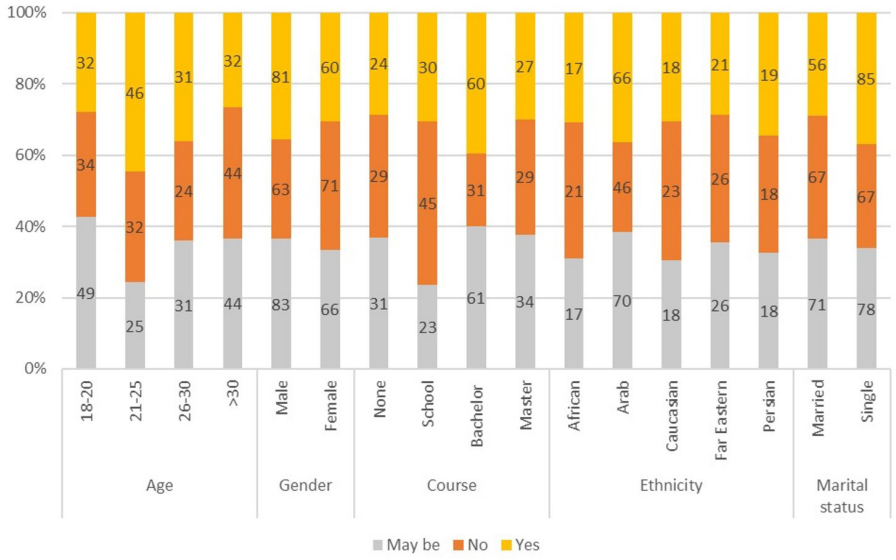


**Figure 3 -** Association between Knowledge that Maintaining Good Oral Hygiene Can Contribute to Better Diabetes Outcomes and Sociodemographic Variables.

**Table VI -** Source of Primary knowledge about the connection between periodontal health and diabetes

| Variable | Group | Frequency | % |
|---|---|---|---|
| Where did you primarily acquire knowledge about the connection between periodontal health and diabetes? | Health education materials | 59 | 15.9 |
| | Medical professionals | 80 | 21.5 |
| | Online sources | 85 | 22.8 |
| | Personal experience | 69 | 18.5 |
| | social media | 79 | 21.3 |
| | Total | 372 | 100 |

($p < 0.05$), with awareness highest among those aged 21-25 (44.7%). By gender, 35.7% of males and 30.5% of females had this knowledge, with no significant association found ($p > 0.05$). Similarly, ethnicity and marital status showed no significant associations ($p > 0.05$). Overall, age and education level were the only variables significantly associated with knowledge of oral hygiene's impact on diabetes outcomes ($p < 0.05$ and $p < 0.01$, respectively). There is an association between Knowledge that Maintaining good Oral Hygiene Can Contribute to Better diabetes Outcomes and gender.

## DISCUSSION

Periodontal health and diabetes are interlinked in a bidirectional relationship where each condition can influence the other. The prevalence of periodontal disease is increasing in most countries including developing and developed countries. It affects 20-50-% of the global population. Patients with DM with severe periodontal disease had a 3.2 times higher risk of death than individuals without periodontitis. Periodontitis contributes to small-scale systemic inflammation [13]. Despite this critical connection, awareness levels about the interplay between oral health and diabetes often remain moderate across various populations. This study explores the awareness within a university community, comparing it with findings from other demographic groups, and emphasizes the need for enhanced public health education.

This study reveals a moderate level of awareness about the link between periodontal health and diabetes within the university community. A study by Smith et al. [14] found that 45% of the general adult population in urban areas were aware of the link between periodontal health and diabetes. This finding underscores a moderate level of awareness, which is crucial given the prevalence of both conditions in urban settings. Similarly, Jones and Lee [15] reported that 50% of university students recognized this connection. Our study revealed a 47.2% awareness rate, aligning closely with these findings and indicating a moderate level of awareness across different demographic groups. These consistent results across various populations underscore the need for enhanced public health education to improve understanding of the relationship between oral health and diabetes.

A study by Brown et al. [16] revealed that 40% of patients in dental clinics believed that poor oral hygiene affects diabetes. In contrast, Williams and Green [17] found that 33% of diabetic patients in a hospital setting were uncertain about this impact. Our study results show that 34.7% of participants believed poor oral hygiene affects diabetes, while 35.1% were unsure. These findings indicate similar levels of uncertainty and awareness across different settings, highlighting a common gap in understanding the relationship between oral hygiene and diabetes. This underscores the need for more targeted educational efforts to improve awareness and knowledge in both clinical and general populations. Taylor et al. [18] reported that among healthcare workers, 35% received complete education about the impact of oral hygiene on diabetes, 25% received partial education, and 40% received none. Similarly, Anderson and Cooper [19] found that among diabetic patients attending educational workshops, 30% received full education, 30% partial, and 40% none. Our study shows that 28.5% of participants received complete education, 30% received partial education, and 41.5% received none. These findings closely align with those of previous studies, highlighting a widespread gap in educational outreach regarding the connection between oral hygiene and diabetes across different populations. This underscores the necessity for improved and more

comprehensive educational initiatives to address this critical issue.

The moderate level of awareness observed in our study and corroborated by other research points to a significant public health challenge. Despite various efforts to educate the public about the link between periodontal health and diabetes, a considerable proportion of individuals remain either unaware or unsure about this connection. This gap in knowledge can have detrimental effects on both oral and systemic health.

## Putting into perspective

To address the knowledge gap regarding oral and systemic health, tailored public health education campaigns are essential. These campaigns should use engaging formats and integrate oral health information into general health promotion. Healthcare professionals, particularly dentists, must educate patients on the link between periodontal health and diabetes during routine visits. Interdisciplinary collaboration between dental and medical practitioners is vital for comprehensive patient care.

Leveraging technology and social media can enhance educational outreach. Online resources, interactive tools, and health apps can effectively communicate the relationship between oral health and diabetes to a wider audience. Community-based initiatives, such as workshops and health fairs, are critical for reaching diverse populations lacking regular healthcare access. Collaborating with local organizations can ensure these programs are culturally relevant and effective.

## CONCLUSION

Our study reveals a moderate level of awareness about the link between periodontal health and diabetes within the university community, aligning closely with findings from other demographic groups. Despite these consistent results, the overall awareness remains insufficient, indicating a critical need for enhanced public health education. Targeted educational efforts, interdisciplinary collaboration, and the utilization of technology and community-based programs are essential to improve understanding and promote better health outcomes.

## RECOMMENDATIONS

To address these deficiencies, it is recommended to implement targeted educational programs aimed at enhancing the understanding of the bidirectional relationship between periodontal diseases and diabetes, ultimately promoting better oral and systemic health outcomes.

## Author's Contributions

MJL: Methodology, Investigation, Writing, Original Draft Preparation. HA: Conceptualization, Methodology, Writing, Review & Supervision. MAS: Conceptualization, Writing, Review, Supervision & Editing.

## Conflict of Interest

Nil

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## Regulatory Statement

This study protocol is reviewed and approved by CUA Research Ethical committee, approval no:052024-2.

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## Appendix. Questionnaire survey

Welcome to our survey on stakeholders' awareness of the interrelationship between periodontal health and diabetes at City University Ajman. This study aims to assess the level of understanding and knowledge among stakeholders. Your participation in this survey is crucial in contributing to a better understanding of the current awareness landscape and could lead to recommendations aimed at improving overall health outcomes within our university community, especially for individuals affected by diabetes.

We appreciate your time and participation in this important research endeavor.

**Section I**

**Demographics:**

| Age | (✔) | Sex | (✔) | Course of study | (✔) | Ethnicity | (✔) | Marital status | (✔) |
|---|---|---|---|---|---|---|---|---|---|
| 18-20 | | Female | | | | Arab | | Married | |
| 21-25 | | | | | | Far Eastern | | Single | |
| 26-30 | | Male | | | | Persian | | | |
| >30 | | | | | | African<br>Caucasian | | | |

**Awareness and Understanding:**

• Are you aware of the link between periodontal health and diabetes? (Yes/No)

• If your answer is ,How would you describe the relationship between periodontal health and diabetes? (Open-ended question)

• Do you think poor oral hygiene can affect diabetes? (Yes/No/Not sure)

• Have you received information or education about the impact of oral health on diabetes management? (Yes/No/Partially)

**Knowledge Assessment:**

• True or False: "Individuals with diabetes are at a higher risk of developing severe periodontal disease."

• True or False: "Treating periodontitis can positively impact glycemic control in diabetic patients."

• Do you believe maintaining good oral hygiene can contribute to better diabetes management? (Yes/No/Not sure)

**Attitudes and Practices:**

• How often do you visit the dentist for routine check-ups? (Regularly/Occasionally/Rarely/Never)

• On a scale of 1 to 5, how important do you consider oral hygiene practices in overall health? (1 being not important, 2 a little important, 3 important, 4 very important 5 being extremely important)

• 1 2 3 4 5

• Have you ever discussed oral health concerns with your healthcare provider in relation to diabetes? (Yes/No/Not applicable)

**Education and Awareness Needs:**

• Would you be interested in educational sessions about the link between oral health and diabetes management? (Yes/No/Maybe)

• What kind of information or resources would you find helpful in understanding this relationship better? (Open-ended question)

**Primary Source of Information:**

• Where did you primarily acquire knowledge about the connection between periodontal health and diabetes? (Medical professionals/Health education materials/Online sources/social media/Personal experience/Other, please specify)

**Additional Comments:**

• Is there anything else you would like to add regarding the connection between periodontal health and diabetes? (Open-ended question)