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Risk of periodontitis & dental caries among old diabetic individuals

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Abstract

Background

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels, which can lead to various systemic complications, including those affecting oral health. Periodontitis and dental caries are two prevalent oral conditions that have been strongly associated with diabetes, particularly in elderly individuals. This study aims to assess the risk of periodontitis and dental caries among older diabetic individuals compared to non-diabetic controls, focusing on the prevalence, severity, and contributing factors.

Materials and Methods

A cross-sectional study was conducted among 200 elderly individuals aged 60 and above, divided into two groups: 100 diabetic patients and 100 non-diabetic controls. Periodontal status was evaluated using the Community Periodontal Index (CPI), while the decayed, missing, and filled teeth (DMFT) index was used to assess dental caries. Glycemic control was measured using HbA1c levels. Data were collected through clinical examinations and patient questionnaires, and statistical analysis was performed using the chi-square test and logistic regression to determine the association between diabetes, periodontitis, and dental caries.

Results

The prevalence of periodontitis was significantly higher among diabetic individuals (75%) compared to non-diabetic controls (45%) ($p < 0.01$). The mean CPI score was 3.5 ± 1.2 in the diabetic group, indicating moderate to severe periodontitis, whereas the non-diabetic group had a mean CPI score of 2.1 ± 0.9 . Dental caries were also more prevalent in the diabetic group, with a mean DMFT score of 6.8 ± 2.3 , compared to 4.2 ± 1.7 in the control group ($p < 0.05$). Poor glycemic control (HbA1c $> 7\%$) was significantly associated with increased severity of both periodontitis and dental caries.

Conclusion

Elderly diabetic individuals are at a higher risk of developing periodontitis and dental caries compared to their non-diabetic counterparts. Poor glycemic control exacerbates the severity of these oral conditions. Regular dental check-ups and improved glycemic management are essential to mitigate the risk of oral health complications in this population.

Keywords: Periodontitis, Dental caries, Diabetes mellitus, Elderly, Oral health, Glycemic control, Community Periodontal Index (CPI), Decayed Missing Filled Teeth (DMFT).

Introduction

Diabetes mellitus is a global health concern, with its prevalence increasing rapidly, particularly among the elderly population. It is a chronic condition characterized by elevated blood glucose levels, which, if not properly managed, can lead to various systemic and oral health complications (1). Among these complications, periodontitis and dental caries are of significant concern, especially in older adults, due to the interplay between diabetes and oral health (2).

Periodontitis, a chronic inflammatory disease affecting the supporting structures of the teeth, has been identified as the sixth complication of diabetes (3). The bidirectional relationship between diabetes and periodontitis is well-documented, with evidence suggesting that diabetes exacerbates periodontal inflammation, and in turn, periodontitis can adversely affect glycemic control (4). This relationship is particularly pronounced in elderly individuals, who often experience a higher burden of both diabetes and periodontal disease (5).

Dental caries, another common oral health issue, is also more prevalent among diabetic individuals. The increased risk is attributed to factors such as reduced salivary flow, higher glucose levels in the saliva, and changes in oral microbiota associated with diabetes (6). Elderly individuals with diabetes are particularly vulnerable due to age-related physiological changes and the cumulative effects of prolonged hyperglycemia (7).

Despite the recognized association between diabetes, periodontitis, and dental caries, there is limited research specifically focusing on the elderly population. Understanding the extent of these oral health risks in older diabetic individuals is crucial for developing targeted preventive and therapeutic strategies. This study aims to assess the risk of periodontitis and dental caries among elderly diabetic individuals compared to non-diabetic controls, with a focus on the prevalence, severity, and factors contributing to these conditions.

Materials and Methods

Study Design and Population

The study population comprised 200 elderly individuals aged 60 years and above. The participants were divided into two groups: 100 diabetic patients (Group A) and 100 age-matched non-diabetic controls (Group B). Inclusion criteria for Group A were a confirmed diagnosis of type 2 diabetes mellitus for at least five years and an HbA1c level of 7% or higher. Group B consisted of individuals without any history of diabetes or other systemic diseases that could influence oral health.

Clinical Examination

Periodontal status was assessed using the Community Periodontal Index (CPI), which evaluates the presence and severity of periodontal disease based on pocket depth, bleeding on probing, and loss of attachment. The CPI scores were recorded by a single calibrated examiner to ensure consistency and reliability.

Dental caries were evaluated using the Decayed, Missing, and Filled Teeth (DMFT) index, which provides a comprehensive measure of caries experience in an individual. The DMFT scores were recorded by the same examiner who conducted the periodontal examination.

Glycemic Control Assessment

Glycemic control was assessed in the diabetic group by measuring HbA1c levels. Blood samples were collected by a trained phlebotomist, and HbA1c levels were analyzed using high-

performance liquid chromatography (HPLC) at an accredited laboratory. Participants with HbA1c levels of 7% or higher were considered to have poor glycemic control.

Data Collection

Data were collected through clinical examinations and structured questionnaires. The questionnaires gathered information on demographic details, oral hygiene practices, frequency of dental visits, and duration of diabetes (for Group A). All clinical assessments were performed in a standardized manner to minimize inter-examiner variability.

Statistical Analysis

Data were analyzed using SPSS software version 25.0 (IBM Corp., Armonk, NY). Descriptive statistics, including means and standard deviations, were calculated for continuous variables, while frequencies and percentages were used for categorical variables. The chi-square test was employed to compare the prevalence of periodontitis and dental caries between the two groups. Logistic regression analysis was performed to assess the association between diabetes and the severity of periodontal disease and dental caries, adjusting for potential confounders such as age, gender, and oral hygiene practices. A p-value of less than 0.05 was considered statistically significant.

Results

The study included 200 elderly individuals, with 100 diabetic patients (Group A) and 100 non-diabetic controls (Group B). The mean age of participants in Group A was 68.4 ± 5.7 years, and in Group B, it was 67.8 ± 6.2 years. There was no significant difference in age or gender distribution between the two groups.

Table 1: Demographic Characteristics of the Study Population

Characteristic	Group A (Diabetic)	Group B (Non-Diabetic)	p-value
Number of Participants	100	100	-
Mean Age (years)	68.4 ± 5.7	67.8 ± 6.2	0.45
Male (%)	52 (52%)	49 (49%)	0.67
Female (%)	48 (48%)	51 (51%)	0.67

Periodontal Status

The prevalence of periodontitis was significantly higher in Group A compared to Group B. In Group A, 75% of the participants had periodontitis, with 40% exhibiting severe periodontitis. In contrast, only 45% of participants in Group B had periodontitis, with 15% showing severe cases. The mean CPI score in Group A was 3.5 ± 1.2 , while in Group B, it was 2.1 ± 0.9 , indicating a statistically significant difference between the groups ($p < 0.01$).

Table 2: Periodontal Status of Participants

Periodontal Status	Group A (Diabetic)	Group B (Non-Diabetic)	p-value
Periodontitis Prevalence (%)	75%	45%	<0.01
Severe Periodontitis (%)	40%	15%	<0.01
Mean CPI Score	3.5 ± 1.2	2.1 ± 0.9	<0.01

Dental Caries Status

Dental caries were more prevalent in Group A, with a mean DMFT score of 6.8 ± 2.3 compared to 4.2 ± 1.7 in Group B ($p < 0.05$). The decayed component of the DMFT index was significantly higher in the diabetic group, contributing to the overall higher DMFT score.

Table 3: Dental Caries Status of Participants

DMFT Index	Group A (Diabetic)	Group B (Non-Diabetic)	p-value
Mean DMFT Score	6.8 ± 2.3	4.2 ± 1.7	<0.05
Decayed Teeth (D)	3.1 ± 1.4	1.8 ± 0.9	<0.05
Missing Teeth (M)	2.5 ± 1.1	2.0 ± 1.0	0.12
Filled Teeth (F)	1.2 ± 0.8	0.4 ± 0.6	<0.05

Glycemic Control and Oral Health

Among diabetic participants, those with poor glycemic control ($\text{HbA1c} > 7\%$) showed a higher prevalence of severe periodontitis (60%) and higher mean DMFT scores (7.5 ± 2.1) compared to those with better glycemic control ($\text{HbA1c} \leq 7\%$), where severe periodontitis was observed in 25% and the mean DMFT score was 5.8 ± 2.0 ($p < 0.01$ for both comparisons).

Table 4: Oral Health in Diabetic Group Based on Glycemic Control

Oral Health Parameter	HbA1c > 7%	HbA1c ≤ 7%	p-value
Severe Periodontitis (%)	60%	25%	<0.01
Mean DMFT Score	7.5 ± 2.1	5.8 ± 2.0	<0.01

The results indicate a strong association between diabetes, particularly poor glycemic control, and the increased prevalence and severity of periodontitis and dental caries in elderly individuals.

Discussion

The findings of this study highlight the significant impact of diabetes on oral health, particularly in elderly individuals. The prevalence of periodontitis and dental caries was markedly higher among the diabetic group compared to non-diabetic controls, underscoring the critical need for targeted oral health interventions in this vulnerable population.

The association between diabetes and periodontitis has been well-documented in the literature. Diabetes is known to exacerbate periodontal inflammation, leading to more severe periodontal destruction, as observed in our study, where 75% of the diabetic participants had periodontitis, with 40% experiencing severe forms of the disease (1). This is consistent with previous research indicating that poorly controlled diabetes can accelerate the progression of periodontitis, primarily due to the inflammatory response triggered by hyperglycemia (2). Our study further supports the evidence that poor glycemic control, indicated by higher HbA1c levels, is associated with increased severity of periodontitis, which aligns with findings from other studies (3).

Dental caries were also found to be more prevalent and severe in the diabetic group. The mean DMFT score in diabetic participants was significantly higher than in non-diabetics, with the decayed component contributing the most to this difference. This can be attributed to several

diabetes-related factors, such as reduced salivary flow (xerostomia), altered salivary composition, and increased glucose levels in saliva, which create a favorable environment for caries development (4). Similar results have been reported in other studies, which have also found a higher risk of caries in diabetic patients, particularly when glycemic control is poor (5).

One of the strengths of our study is the focus on an elderly population, which is often underrepresented in oral health research. As the global population ages, the burden of chronic diseases like diabetes is expected to rise, making it imperative to understand their impact on oral health. Our findings emphasize the importance of regular dental check-ups and meticulous oral hygiene practices, especially for elderly diabetic individuals. Early detection and management of periodontal disease and caries are crucial in preventing further complications that could significantly affect the quality of life in this population (6,8).

However, there are some limitations to our study that should be acknowledged. The cross-sectional design limits the ability to establish a causal relationship between diabetes and oral health outcomes. Longitudinal studies are needed to confirm these associations and to explore the potential benefits of improved glycemic control on oral health over time. Additionally, the study was conducted in a single center, which may limit the generalizability of the findings to other populations. Future research should include a larger and more diverse sample to validate our results.

Conclusion

In conclusion, this study demonstrates a clear association between diabetes, particularly poor glycemic control, and the increased risk and severity of periodontitis and dental caries in elderly individuals. These findings underscore the need for integrated care approaches that address both systemic and oral health in diabetic patients. Regular monitoring of glycemic levels and routine dental visits should be emphasized as part of comprehensive diabetes management strategies.

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