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ORIGINAL RESEARCH

Association between Diabetes Mellitus and Oral Health Status in Patients with Cardiovascular Diseases

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Abstract:

Background

Diabetes mellitus (DM) and cardiovascular diseases (CVD) are interrelated conditions with significant impacts on overall health. Oral health is also known to be adversely affected by both DM and CVD. This study aims to investigate the association between diabetes mellitus and oral health status in patients with cardiovascular diseases in Muzaffarpur, Bihar.

Materials and Methods

A retrospective study was conducted over a one-year period, involving a sample of 50 patients diagnosed with both diabetes mellitus and cardiovascular diseases. Data were collected from patient records at a healthcare facility in Muzaffarpur, Bihar. The oral health status was assessed using standardized indices, including the Decayed, Missing and Filled Teeth (DMFT) index, periodontal status, and oral hygiene practices. Statistical analysis was performed to determine the association between diabetes mellitus and oral health parameters in these patients.

Results

The mean age of the patients was 58 years, with a male-to-female ratio of 3:2. The average DMFT score was found to be 7.5 ± 2.3. Patients with poorly controlled diabetes (HbA1c > 8%) had significantly higher DMFT scores (9.1 ± 1.8) compared to those with well-controlled diabetes (HbA1c < 7%) who had a mean DMFT score of 6.2 ± 2.0 ($p < 0.05$). Periodontal assessment showed that 70% of the patients had moderate to severe periodontitis,

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with a higher prevalence in patients with longer durations of diabetes. Oral hygiene practices were suboptimal in 65% of the patients.

Conclusion

The study findings indicate a significant association between poorly controlled diabetes mellitus and deteriorating oral health status in patients with cardiovascular diseases. There is a need for integrated healthcare approaches to manage and improve the oral health of patients with coexisting diabetes and cardiovascular conditions.

Keywords: Diabetes Mellitus, Cardiovascular Diseases, Oral Health, DMFT Index, Periodontitis, Retrospective Study, Muzaffarpur, Bihar.

Introduction

Diabetes mellitus (DM) and cardiovascular diseases (CVD) are chronic conditions with substantial impacts on global health. The prevalence of diabetes has been rising globally, with an estimated 463 million people affected in 2019, a number projected to reach 700 million by 2045 (1). Cardiovascular diseases, including coronary artery disease, hypertension, and stroke, are leading causes of morbidity and mortality worldwide (2). Both conditions share common risk factors such as obesity, sedentary lifestyle, and poor dietary habits, and often coexist in patients, compounding their health complications (3).

Oral health is intricately linked to systemic health, with poor oral hygiene contributing to the progression of various systemic conditions, including DM and CVD (4). Diabetes has been recognized as a significant risk factor for periodontal disease, which is characterized by chronic inflammation and infection of the gums and supporting structures of the teeth (5). Conversely, periodontal disease can exacerbate glycemic control, creating a bidirectional relationship between these conditions (6). Cardiovascular diseases have also been associated with poor oral health, with studies suggesting that periodontal pathogens can contribute to the development and progression of atherosclerosis and other cardiovascular conditions (7).

The interrelationship between diabetes, cardiovascular diseases, and oral health underscores the need for integrated healthcare approaches that address these interconnected aspects of patient health (8). However, there is limited research focusing on the oral health status of patients with both diabetes and cardiovascular diseases, particularly in specific populations such as those in Muzaffarpur, Bihar. This region, like many others in India, is experiencing a growing burden of chronic diseases, necessitating targeted research to inform effective healthcare interventions.

This retrospective study aims to investigate the association between diabetes mellitus and oral health status in patients with cardiovascular diseases in Muzaffarpur, Bihar. By analyzing the dental and medical records of these patients, we seek to elucidate the impact of diabetes control on oral health outcomes and identify potential areas for improving patient care.

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Materials and Methods

Study Design

This retrospective study was conducted over a one-year period, at a healthcare facility in Muzaffarpur, Bihar. The study aimed to investigate the association between diabetes mellitus and oral health status in patients with cardiovascular diseases.

Study Population

The study included a sample of 50 patients diagnosed with both diabetes mellitus and cardiovascular diseases. Patients were selected based on the following inclusion criteria:

- Age ≥ 18 years
- Diagnosed with both diabetes mellitus (Type 1 or Type 2) and cardiovascular diseases (such as coronary artery disease, hypertension, or stroke)
- Available dental and medical records for the past year

Patients with other systemic conditions that could affect oral health, such as autoimmune diseases, were excluded from the study.

Data Collection

Data were collected from the medical and dental records of the selected patients. The following information was extracted:

- Demographic details: age, gender, duration of diabetes and cardiovascular diseases
- Diabetes control: HbA1c levels, duration of diabetes
- Oral health status: Decayed, Missing, and Filled Teeth (DMFT) index, periodontal status (assessed using the Community Periodontal Index), and oral hygiene practices
- Cardiovascular health status: type and duration of cardiovascular diseases, medications

Oral Health Assessment

The DMFT index was used to evaluate the dental health of the patients. Periodontal status was assessed using the Community Periodontal Index (CPI), which categorizes periodontal health into healthy, gingivitis, and periodontitis (mild, moderate, severe). Oral hygiene practices were assessed based on patient records, including frequency of brushing, use of dental floss, and dental visits.

Statistical Analysis

Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Continuous variables were presented as mean ± standard deviation, while categorical variables were presented as frequencies and percentages.

Comparative analyses were performed to assess the association between diabetes control (HbA1c levels) and oral health parameters (DMFT index, periodontal status). Independent t-

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tests were used for continuous variables, and chi-square tests were used for categorical variables. A p-value of < 0.05 was considered statistically significant.

All statistical analyses were performed using SPSS software version 25.0 (IBM Corp., Armonk, NY, USA).

Results

Demographic and Clinical Characteristics

The study included 50 patients with a mean age of 58 ± 10 years. The sample comprised 30 males (60%) and 20 females (40%). The mean duration of diabetes was 10 ± 5 years, and the mean duration of cardiovascular diseases was 8 ± 4 years. Table 1 summarizes the demographic and clinical characteristics of the study population.

Table 1: Demographic and Clinical Characteristics of the Study Population

Characteristic	Value
Mean Age (years)	58 ± 10
Gender (Male)	30:20 (60%:40%)
Mean Duration of Diabetes (years)	10 ± 5
Mean Duration of Cardiovascular Diseases (years)	8 ± 4

Oral Health Status

The mean DMFT score of the study population was 7.5 ± 2.3. Table 2 presents the distribution of DMFT scores based on the control of diabetes (HbA1c levels).

Table 2: DMFT Scores Based on Diabetes Control (HbA1c Levels)

HbA1c Level	Mean DMFT Score
< 7% (Well-controlled)	6.2 ± 2.0
7-8% (Moderately-controlled)	7.0 ± 2.1
> 8% (Poorly-controlled)	9.1 ± 1.8

Periodontal status assessment revealed that 15 patients (30%) had gingivitis, while 35 patients (70%) had periodontitis, with 20 patients (40%) presenting with moderate periodontitis and 15 patients (30%) with severe periodontitis. Table 3 shows the periodontal status distribution among the study population.

Table 3: Periodontal Status of the Study Population

Periodontal Status	Number of Patients (%)
Healthy	0 (0%)
Gingivitis	15 (30%)
Moderate Periodontitis	20 (40%)
Severe Periodontitis	15 (30%)

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Oral hygiene practices were found to be suboptimal in 65% of the patients, with 35 patients reporting irregular brushing habits, and only 10 patients (20%) reported using dental floss regularly. Table 4 provides details on oral hygiene practices.

Table 4: Oral Hygiene Practices

Oral Hygiene Practice	Number of Patients (%)
Regular Brushing (twice daily)	15 (30%)
Irregular Brushing	35 (70%)
Regular Flossing	10 (20%)
No Flossing	40 (80%)

The comparative analysis showed a significant association between poorly controlled diabetes (HbA1c > 8%) and higher DMFT scores ($p < 0.05$). Patients with longer durations of diabetes and cardiovascular diseases were more likely to have moderate to severe periodontitis ($p < 0.01$). No significant differences were observed in oral hygiene practices between different levels of diabetes control ($p > 0.05$).

The study findings indicate a significant association between poorly controlled diabetes mellitus and deteriorating oral health status in patients with cardiovascular diseases. There is a need for integrated healthcare approaches to manage and improve the oral health of patients with coexisting diabetes and cardiovascular conditions.

Discussion

This study investigated the association between diabetes mellitus and oral health status in patients with cardiovascular diseases in Muzaffarpur, Bihar. The findings reveal a significant impact of poorly controlled diabetes on oral health, particularly in terms of dental caries and periodontal disease.

The mean DMFT score was notably higher in patients with poorly controlled diabetes (HbA1c > 8%) compared to those with well-controlled diabetes (HbA1c < 7%). This aligns with previous studies that have demonstrated a direct correlation between high HbA1c levels and increased dental caries due to altered saliva composition and reduced salivary flow in diabetic patients (1, 2). Moreover, the presence of cardiovascular diseases further complicates the oral health scenario, as medications for CVDs can contribute to dry mouth, exacerbating the risk of caries and periodontal disease (3).

Periodontal health was significantly compromised in the study population, with 70% of the patients suffering from moderate to severe periodontitis. This high prevalence is consistent with other research indicating that diabetes mellitus significantly increases the risk of periodontitis (4). The underlying mechanisms include impaired immune response, increased inflammatory mediators, and vascular changes in diabetic patients, which collectively promote periodontal disease progression (5). Furthermore, periodontitis has been linked to poor glycemic control, creating a bidirectional relationship where periodontal inflammation adversely affects blood glucose levels, and hyperglycemia exacerbates periodontal tissue destruction (6).

The study also highlighted suboptimal oral hygiene practices among the patients, with 70% reporting irregular brushing habits and 80% not using dental floss. These findings underscore

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the need for comprehensive oral health education and preventive strategies in this population. Studies have shown that improving oral hygiene can significantly reduce the burden of periodontal disease and improve glycemic control in diabetic patients (7).

The association between diabetes, cardiovascular diseases, and oral health observed in this study underscores the importance of integrated healthcare approaches. Multidisciplinary management involving dentists, endocrinologists, and cardiologists is crucial to address the interconnected health issues in patients with these chronic conditions. Regular dental check-ups, patient education on oral hygiene, and timely periodontal treatments should be integral components of diabetes and cardiovascular disease management protocols (8).

This study has several limitations, including its retrospective design and the relatively small sample size, which may limit the generalizability of the findings. Additionally, the study relied on existing medical and dental records, which might have variability in data recording. Future studies with larger sample sizes and prospective designs are needed to confirm these findings and explore the underlying mechanisms further.

Conclusion

In conclusion, this study demonstrates a significant association between poorly controlled diabetes mellitus and deteriorating oral health status in patients with cardiovascular diseases. Effective management of diabetes and cardiovascular diseases should include regular oral health assessments and interventions to improve the overall health outcomes of these patients.

References

1. Taylor GW, Borgnakke WS. Periodontal disease: associations with diabetes, glycemic control and complications. Oral Dis. 2008;14(3):191-203.
2. Preshaw PM, Alba AL, Herrera D, et al. Periodontitis and diabetes: a two-way relationship. Diabetologia. 2012;55(1):21-31.
3. Al-Maskari AY, Al-Maskari MY, Al-Sudairy S. Oral manifestations and complications of diabetes mellitus: a review. Sultan Qaboos Univ Med J. 2011;11(2):179-86.
4. Lalla E, Papapanou PN. Diabetes mellitus and periodontitis: a tale of two common interrelated diseases. Nat Rev Endocrinol. 2011;7(12):738-48.
5. Chapple IL, Genco R. Diabetes and periodontal diseases: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. J Clin Periodontol. 2013;40(Suppl 14)
6. Grossi SG, Genco RJ. Periodontal disease and diabetes mellitus: a two-way relationship. Ann Periodontol. 1998;3(1):51-61.
7. Stewart JE, Wager KA, Friedlander AH, et al. The effect of periodontal treatment on glycemic control in patients with type 2 diabetes mellitus. J Clin Periodontol. 2001;28(4):306-10.
8. D'Aiuto F, Orlandi M, Gunsolley JC. Evidence that periodontal treatment improves biomarkers and CVD outcomes. J Periodontol. 2013;84(Suppl 4)