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ORIGINAL ARTICLE

Prevalence and Pattern of Oral Diseases in Diabetic Patients

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ABSTRACT

Background & objective: The present case-control study was conducted to assess the prevalence and pattern of oral diseases among patients with diabetes.

Methods: The study was conducted at the Department of Dentistry, Shaheed Khalek-Ibrahim General Hospital (An Institution of Diabetic Association of Bangladesh), Dhaka, from April to September 2010 using a case-control design. A total of 100 subjects— 47 diabetics and 53 non-diabetics— who met the eligibility criteria were consecutively selected from outpatient attendees. Diabetic status was confirmed, and controls were free of diabetes. Data on socio-demographics, oral health practices, and clinical oral conditions were collected and analyzed.

Results: Diabetic patients were significantly older than controls ($p<0.001$), although there was no significant difference in terms of sex distribution and residential status between groups ($p=0.194$, $p=0.138$ respectively). Diabetics had a lower socioeconomic status and education level ($p=0.004$ and $p=0.010$, respectively) compared to their non-diabetic counterparts. Oral health disparities included higher prevalence of gingivitis (78.7% vs. 37.7%, $p<0.001$), periodontitis (48.9%), alveolar bone loss (29.8%), and collagen metabolism disturbances (27.7%) in diabetics, none of which were observed in controls ($p<0.001$). Diabetics also had higher rates of candidiasis and dental caries ($p=0.020$ and $p<0.001$). Conditions such as glossodynia, salivary dysfunction, taste impairment, xerostomia, and burning mouth syndrome were predominantly observed among diabetics. Oral hygiene practices were similar in both groups, although fluoridated toothpaste use was lower among diabetics ($p=0.002$). Diabetic patients infrequently visited dentists for routine care (12.8%), with many seeking treatment for restorations and cleaning.

Conclusion: Diabetes is associated with an increased prevalence of infectious, inflammatory, and neurosensory oral disorders. Gingivitis, candidiasis, and dental caries are particularly common, alongside mucosal symptoms like glossodynia and xerostomia. Enhanced interdisciplinary dental and medical management is essential to mitigate these oral health complications in diabetic individuals.

Key words: Prevalence, Pattern, Oral Diseases, Diabetic Patients.

INTRODUCTION:

The global landscape of oral health reflects the complex interplay of various risk factors shaped by socio-economic, environmental, and behavioral determinants across different populations. Epidemiological studies have consistently demonstrated that living conditions, lifestyle choices, and the accessibility of preventive oral health measures significantly influence oral disease prevalence and patterns.[1]

Diabetes mellitus, a chronic metabolic disorder characterized by a gradual onset of symptoms-particularly in individuals over the age of 40-affects over 100 million people worldwide.[2] The condition's persistent poor glycemic control has been closely linked to various oral

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complications, including gingivitis, periodontitis, and alveolar bone deterioration. Large-scale surveys reveal that individuals with diabetes, especially those with poorly managed blood sugar levels, are at a substantially higher risk of developing severe periodontal disease.[3] Moreover, diabetes predisposes patients to a spectrum of oral disorders, such as xerostomia (dry mouth), salivary gland dysfunction, and mucosal abnormalities.[4] Opportunistic infections like oral candidiasis are more prevalent among diabetic patients, reflecting the systemic immunosuppression associated with the condition. Taste perception, a vital component of oral health, is often impaired in diabetics, with studies indicating that more than one-third of adults with diabetes experience hypogeusia or diminished taste, potentially affecting dietary habits and glycemic control.[5,6]

Oral health behaviors and access to dental care are influenced by various factors, including awareness, attitude, and sociocultural beliefs. Patients who receive proper education and positive reinforcement are more likely to adhere to oral hygiene practices.[7] Research indicates that higher levels of dental knowledge correlate with increased preventive care-seeking behavior, which is crucial for managing oral health in diabetic populations.[8] The association between oral diseases-particularly periodontal disease-and non-communicable chronic diseases like diabetes stems from shared risk factors such as poor oral hygiene, smoking, and systemic inflammation. Notably, severe periodontal disease has been recognized as the sixth complication of diabetes, highlighting its significant health burden.[9] This bidirectional relationship exacerbates health outcomes, impairing quality of life and increasing healthcare costs.

Globally, disadvantaged populations bear the greatest burden of oral diseases, underscoring the need for targeted prevention and intervention strategies. This study aims to elucidate the prevalence and patterns of oral diseases among diabetic patients, identify specific risk factors within this cohort, and explore their implications for oral health promotion and disease prevention. The findings will inform the development of guidelines to enhance oral health management and improve the overall well-being of diabetic individuals.

METHODS:

This case-control study was conducted at the Department of Dentistry, Shaheed Khalek-Ibrahim General Hospital, an affiliated institution of the Diabetic Association of Bangladesh, Dhaka. The study period spanned six months, from April 2010 to September 2010. Prior to commencement, ethical approval was obtained from the Ethical Review Committee of Atish Dipankar University of Science & Technology (ADUST), Dhaka.

A total of 256 diabetic patients attending the outpatient department (OPD) were enrolled as cases, while an equal number of non-diabetic patients served as controls. Inclusion criteria for diabetic patients comprised individuals diagnosed with either type 1 or type 2 diabetes, having at least one natural tooth, and a diagnosis of diabetes was established at least six months prior to the index day of inclusion in the study. Patients with physical or mental handicaps that could influence oral health or data collection were excluded from the study.

Data collection involved comprehensive clinical examinations and structured interviews. The collected data were processed and analyzed using SPSS (Statistical Package for Social Sciences), version 20. Descriptive statistics summarized the demographic and clinical characteristics of the participants. For inferential analysis, the Chi-squared (χ^2) test or Fisher's Exact Test was employed to compare categorical variables. The level of significance was set at 0.05, with p-values less than 0.05 considered statistically significant.

RESULTS:

In the case group, 64% of patients were male, compared to 50.9% in the control group. The difference in gender distribution between the groups was not statistically significant (p=0.194). Regarding residence, approximately 74.5% of cases and 73.6% of controls were from urban areas. Rural residents comprised 20% of the case

and 26.4% of the control groups. Only 6.4% of cases in the case group were slum-dwellers. Residence distribution did not differ significantly between the groups (p=0.138). Occupationally, 36.2% of cases were businessmen, followed by 31.9% housewives, 19.1% service-holders, 8.5% laborers, and 4.3% farmers. In contrast, among controls, 37.7% were housewives, 29.1% service-holders, and 13.2% were involved in business. The occupational distribution was statistically similar across groups. Income analysis revealed that nearly 80% of cases earned Taka 15,000 or less per month, compared to 50.9% of controls with mean monthly income was significantly lower in the case group (13744 ± 6045 Taka) compared to controls (15981 ± 6523 Taka) (p = 0.004), indicating that patients with diabetes generally had a lower socio-economic status. Educational levels differed significantly between the groups, with 40% of cases having primary education, 34% secondary, 23.4% SSC/HSC, and 4.3% graduate or higher. Conversely, in the control group, 37.7% had primary education, 13.2% secondary, and 49.1% SSC/HSC (p=0.010).

A significantly higher proportion of diabetic patients were current smokers (48.8%) compared to controls (27.7%) (p=0.047). The frequency of tooth brushing was similar between groups (p=0.897). Notably, 17% of cases used fluoridated toothpaste, whereas none in the control group did use fluoridated toothpaste (p=0.002). Additionally, only 12.8% of cases visited a dentist within the past 12 months for routine examinations, compared to 24.5% of controls (p=0.004). Among diabetics, visits for dental cleaning, restorations, and other reasons were recorded at 25, 50, and 25%, respectively, with similar patterns observed in the control group (Table II).

Regarding clinical symptoms, classic features such as polyphagia, polydipsia, and polyuria were significantly more prevalent among cases (11.3%) than controls (p=0.018). Oral health assessments showed a significantly higher prevalence of gingivitis in the case group (78.7%) compared to controls (29.8%) (p<0.001). Furthermore, nearly half (48.9%) of diabetic patients had periodontitis, 29.8% exhibited alveolar bone loss, and 27.7% showed collagen metabolism disturbances-all significantly higher than controls, who showed no such conditions (p<0.001 for all) (Table III).

Burning mouth syndrome was observed in 68.1% of cases and 52.8% of controls, though this difference was not statistically significant (p=0.120). Significantly higher frequencies of candidiasis and dental caries were documented among diabetic patients (p=0.020 and p<0.001, respectively). Additionally, conditions such as glossodynia, lichen planus, salivary dysfunction, taste impairment, and xerostomia were exclusively observed in the case group, with xerostomia alone affecting 66% of these patients (Table IV).

Table I. Distribution of socio-demographic characteristics between study groups

Socio-demographic characteristics	Group		p-value
	Case (n = 47)	Control (n = 53)	
Sex			
Male	30 (63.8)	27(50.9)	0.194
Female	17(36.2)	26(49.1)	
Resident			
Rural	9(19.1)	14(26.4)	0.138
Urban	35(74.5)	39(73.6)	
Slum	3(6.4)	0(0.0)	
Occupation			
Farmer	2(4.3)	0(0.0)	
Business	17(36.2)	7(13.2)	
Service	9(19.1)	26(49.1)	0.001
Labour	4(8.5)	0(0.0)	
Housewife	15(31.9)	20(37.7)	
Monthly income			
≤ 15000	37(78.7)	27(50.9)	
>15000	10(21.3)	26(49.1)	0.004
Mean ± SD	13744 ± 6045	15981± 6523	
Educational status			
Primary	18(38.3)	20(37.7)	
Secondary	16(34.0)	7(13.2)	0.010
SSC&HSC	11(23.4)	26(49.1)	
Graduate & above	2(4.3)	0(0.0)	

#Data were analyse using **Chi-square (χ^2) Test**. Figures in the parentheses denote corresponding percentage

Table II. Comparison of oral health behaviours between study groups

Oral health behavior	Group		p-value
	Case (n = 47)	Control (n = 53)	
Tobacco use			
Current smoker	21(48.8)	13(27.7)	
Smoked/chewed tobacco ever before	7(16.3)	6(12.8)	0.047
Use smokeless tobacco	15(34.9)	28(59.6)	
Frequency tooth brushing			
Less than once per day	16(34.0)	20(37.7)	
Once a day	21(44.7)	18(34.0)	0.897
Twice per day	4(14.9)	15(28.3)	
More than twice per day	3(6.4)	0 (0.0)	
Use fluoridated toothpaste	8(17.0)	0 (0.0)	0.002
Visited a dentist within past 12 months	6(12.8)	13(24.5)	0.004
Reason for last visit			
Cleaning	2(25.0)	12(48.0)	
Restoration	4(50.0)	13(52.0)	0.030
Others	2(25.0)	0 (0.0)	

#Data were analyse using **Chi-square (χ^2) Test**. Figures in the parentheses denote corresponding percentage

Table III. Comparison of presenting signs and symptoms between groups

Sign & symptoms	Group		p-value
	Case (n = 47)	Control (n = 53)	
Classic tried of polyphagia, polydipsia and polyuria	14(29.8)	6(11.3)	0.018
Gingivitis	37(78.7)	20(37.7)	<0.001
Periodontitis	23(48.9)	0 (0.0)	<0.001
Alveolar bone loss	14(29.8)	0 (0.0)	<0.001
Collagen metabolism	13(27.7)	0 (0.0)	<0.001
Vascularity	7(14.9)	6(11.3)	0.596

#Data were analyse using **Chi-square (χ^2) Test**. Figures in the parentheses denote corresponding percentage

Table IV. Comparison of diagnosis of oral diseases between groups

Diagnosis	Group		p-value
	Case (n = 47)	Control (n = 53)	
Burning mouth syndrome	32(68.1)	28(52.8)	0.120
Candidiasis	22(46.8)	13(24.5)	0.020
Dental caries	33(70.2)	8(15.1)	<0.001
Glossodynia	2(4.3)	0(0.0)	0.218
Lichen planus	2(4.3)	0(0.0)	0.218
Salivary dysfunction	17(36.2)	0(0.0)	<0.001
Taste dysfunction	16(34.0)	0(0.0)	<0.001
Xerostomia	31(66.0)	0(0.0)	<0.001

#Data were analyse using **Chi-square (χ^2) Test**. Figures in the parentheses denote corresponding percentage

DISCUSSION

The findings of this study underscore the considerable impact of diabetes mellitus on oral health. Notably, the diabetic patients (cases) were significantly older than non-diabetic controls, which predominantly affects middle-aged and older adults ($p<0.001$). Gender distribution was comparable between groups, suggesting that sex was not a confounding factor influencing outcome of the study.

Sociodemographic analysis revealed that the majority of both groups resided in urban areas, with no significant difference in residence distribution. However, the diabetic group had a significantly lower socioeconomic status, demonstrated by lower monthly income, and educational attainment was markedly poorer in cases, with only 23.4% having SSC/HSC or higher education compared to 49.1% in controls. These socioeconomic parameters may influence health awareness, access to dental care, and health-related behaviors. The prevalence of smoking was notably higher among diabetic patients (48.8%) compared to controls (27.7%), aligning with existing evidence that smoking exacerbates periodontal & systemic complications in diabetes. Similar to prior research, the frequency of tooth brushing was comparable across groups; however, the use of fluoridated toothpaste was significantly more common among controls, indicating a possible gap in oral health practices among diabetics ($p=0.002$).

Dental care utilization was suboptimal among diabetics; only 12.8% had visited a dentist in the past year for routine examinations, versus 24.5% of controls. This reduced engagement in preventive care could contribute to the higher prevalence of oral diseases observed. The reasons for dental visits were similar across groups, primarily for periodontal issues such as cleaning or restorations. Clinically, diabetic patients exhibited a higher prevalence of classic diabetic symptoms-polyphagia, polydipsia, & polyuria-with 29.8% presenting these features compared to 11.3% in controls. Oral manifestations were substantially more prevalent in diabetics, with

gingivitis observed in 78.7% versus 29.8% of controls. Periodontitis was present in nearly half (48.9%) of diabetics, along with alveolar bone loss and collagen metabolism disturbances-conditions absent in the control group.

Additionally, fungal infections such as oral candidiasis were significantly more common among diabetics, corroborating previous findings that systemic immunosuppression and hyposalivation in diabetes predispose to fungal colonization.[10,11] Xerostomia was exclusively observed in the diabetic group, consistent with earlier research indicating salivary gland dysfunction in diabetic individuals.[12,13] Taste disturbances, notably glossodynia, were significantly more prevalent among diabetics, affecting approximately two-thirds of the cases. This sensory impairment can hinder dietary management, potentially worsening glycemic control.[14] Other mucosal conditions, including lichen planus and recurrent aphthous stomatitis, were also observed more frequently among diabetic patients, possibly reflecting the effects of chronic immunosuppression.

Overall, the results support the notion that diabetes predisposes individuals to a spectrum of oral health issues-ranging from infectious and inflammatory conditions to neurosensory dysfunctions-necessitating integrated care involving both medical and dental professionals.

CONCLUSION:

Based on the study findings, it can be concluded that diabetes significantly increases the risk of developing various oral diseases, primarily due to opportunistic infections, and neurosensory disorders. Gingivitis and candidiasis emerged as common infectious manifestations, while dental caries remained a notable dental concern in diabetic individuals. Additionally, many diabetics experience xerostomia, taste disturbances, and other mucosal changes, which are often associated with underlying neurosensory disturbances.

Effective glycemic control remains the cornerstone of preventing these oral complications. Dental practitioners should maintain a high index of suspicion when encountering patients with oral diseases or mucosal abnormalities, particularly in those with known or suspected diabetes. Moreover, behavioral change communication (BCC) strategies aimed at optimizing oral hygiene practices and promoting routine dental visits could substantially reduce the burden of oral diseases among diabetics.

The data generated by this study offer valuable insights and could serve as a basis for developing comprehensive guidelines for the prevention and management of oral health problems in diabetic populations. Interdisciplinary collaboration between physicians and dental professionals is essential to ensure holistic care, improve quality of life, and reduce the oral health disparities faced by diabetic patients.

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