

Prevalence of Periodontal Diseases among Adults Suffering from Diabetes Melitus

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Abstract:

Background: Diabetes mellitus and periodontal diseases represent complex chronic conditions with significant interrelated health implications, particularly in developing countries like Bangladesh. **Objectives:** To investigate the association between diabetic-related factors and periodontal diseases, and to identify key risk factors contributing to oral health complications among diabetes patients. **Methods:** A cross-sectional study conducted at Rajshahi Medical College and Dhaka Dental College, involving 55 diabetes mellitus patients. Data collection included medical records, health questionnaires, and comprehensive clinical assessments. **Results:** The study population comprised 55 participants with a mean age of 48.87±13.72 years, predominantly female (56.4%). Periodontitis was observed in 14 out of 51 participants (27.5%). Multivariate analysis revealed significant associations between periodontal diseases and several factors. Age emerged as a critical predictor, with each year increasing the odds of periodontal disease by 1.08 (95% CI: 1.02-1.15, p=0.010). Education level significantly impacted disease risk, with participants having secondary education showing a 14.4-fold increased risk of periodontitis (p=0.040). Notably, tobacco chewing was associated with a dramatic 41-fold increase in periodontitis risk (p=0.003). Oral hygiene practices demonstrated substantial influence, with once-daily tooth brushing increasing gingivitis risk by 22.50-fold (p=0.001) and lack of professional dental cleaning elevating the risk by 90-fold (p=0.002). **Conclusion:** The study reveals complex interactions between diabetes, age, lifestyle factors, and periodontal health, emphasizing the need for integrated healthcare strategies in Bangladesh.

Keywords: Periodontal Disease, Diabetes Mellitus, Oral Health, Bangladesh, Risk Factors

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I. Introduction

In the world, periodontal disease is one of the most common chronic non-communicable oral inflammatory illnesses. It causes the connective tissue that holds teeth in place to gradually become destroyed. In the severe stage, periodontal disease eventually prepares for tooth loss if it is not treated. Maintaining a balance between the body's immune-inflammatory response and the difficulties posed by bacterial plaque is crucial for periodontal health. The host's general susceptibility or local susceptibility to the advancement of periodontal disease can be determined by the unique effect of several behavioral, environmental, and genetic determinants of host responses. In this sense, those with weakened immune systems, such as those with diabetes mellitus, HIV infection, leukemia, and Down syndrome, frequently have severe types of periodontal disease [1]. Gingivitis and periodontitis are the two main components of periodontal disease. To identify the phases of gingivitis and periodontitis, the clinical site uses the Papillary Bleeding Index and pocket measurement.

Redness of the gum edges, swelling, and bleeding during brushing are signs of gingivitis [1]. Alveolar bone resorption and tissue degeneration are the outcomes of periodontitis, a persistent low-grade infection [2].

One of the primary reasons of tooth loss that is typically observed in adults as opposed to children is periodontitis. Numerous studies have demonstrated the significant prevalence of periodontal disease in both industrialized and developing nations [2-4]. According to the World Health Organization (WHO), 10% to 15% of

persons globally have deep periodontal pockets (≥ 6 mm) [5]. Therefore, the burden of periodontitis for tooth retention loss will rise internationally in tandem with the aging population [6–8].

Periodontal disease progression is much faster among the poor population because of social differences [6,9]. Periodontal disease diagnosed was increased by age as follows; 0 to 20 years (11% gingivitis, 1.5% (periodontitis), in 21 to 40 years (64% gingivitis, 30.7% gingivitis), in (41-60) years of age (25% gingivitis, 67.8% periodontitis) [10]. On the Other hand, Diabetes Mellitus is the most common metabolic syndrome in the human body. In this metabolic disorder, the body unable to produce adequate or act in response to insulin from the pancreas causes a rise of sugar level in the bloodstream abnormally. Diabetes Mellitus is classified into three major categories: Type 1 (Insulin Dependent Diabetes Mellitus), Type 2 (Non-Insulin Gestational Diabetes Mellitus (GDM) and Dependent Diabetes Mellitus. Insulin-secreting beta cells of the pancreatic islets of Langerhans are destroyed by the autoimmune process, which results in a lack of insulin [11]. Type 1 diabetes mellitus is also linked to periodontal disorders [12]. Type 1 diabetes mellitus is frequent in children and adults under the age of thirty [13]. Insulin Dependent Diabetes Mellitus also affects older adults [14].

Consequently, the primary treatment for type 1 diabetes mellitus is insulin replacement therapy. There are 245 million individuals with diabetes mellitus, which is regarded as a serious public health issue. It is estimated that 366 million people worldwide would have diabetes mellitus by 2030 [15]. The increasing prevalence and number of diabetes mellitus patients in Bangladesh have been reported that from 1995 to 2000 was 4% and 5% in 2001 to 2005, whereas 9% was accounted for in 2006 to 2010 [12]. By 2030, the International Diabetes Federation (IDF) predicted that 13% of Bangladeshis will have diabetes mellitus [15]. Diabetes mellitus has been linked to an increased risk of periodontal disease development in earlier research [16]. The theoretical and practical relationship between diabetes mellitus and periodontal disease is well established [17]. Periodontal diseases are more common among men than women in the world. According to Ahmed et al from Update Dental College Hospital in Bangladesh stated that about 48.6% males and 51.4% females were diagnosed as suffering from chronic periodontitis [10]. Specifically, diabetes mellitus increases apoptosis and inflammation, which mostly affects the periodontal tissues of people with poor periodontal health. Additionally, diabetes mellitus patients may have more severe periodontal disease due to a change in the pathogenic process of bacteria that enhances the breakdown of periodontal tissues, leading to more frequent and severe destruction of periodontal tissue [18]. Type 1 diabetes mellitus incidence rates in Bangladesh were 1.24/100,000 for those under 25 years old (males 0.92, females 1.71) and 0.96/100,000 for those under 15 years old (males 0.63, females 1.55) [19].

In Bangladesh, most diabetes patients are in poor economic standing. As a result, purchasing or obtaining insulin from public hospitals or other private institutions is either expensive or difficult. Furthermore, people with diabetes mellitus may acquire periodontal disease as a result of inadequate metabolic management and ignorance of proper oral hygiene maintenance.

In Bangladesh, several investigations have been carried out to ascertain the connection between periodontal disease and diabetes mellitus. More significantly, dental services are not readily available under Bangladesh's public healthcare system, particularly for those with diabetes mellitus who are not prioritized for treatment. In order to enhance oral health practices and stop the advancement of periodontal disease, the results of this study about the relationship between diabetic-related variables and periodontal illnesses might be helpful.

II. Methodology

This study was a cross-sectional study that was conducted in Department of Periodontology, Dental Unit Rajshahi Medical College and Dept of Periodontology Dhaka Dental College, Bangladesh. All the consecutive diabetes mellitus patients were attending these two medical which had been selected for this study based on exclusion and inclusion criteria. 55 sample size was estimated. Detailed medical and dental records were obtained. Patients fulfilling the selection criteria were initially given a health questionnaire to gather information regarding their demographic characteristics, attitude for oral hygiene, and diabetes status. The questionnaire and study protocol were approved by the Institutional Research and Development Committee of Rajshahi Medical College and Dhaka Dental College. Investigator personally disseminated the questionnaire and got them completed by cross- checking through interview, thereby avoiding any obscurity pertaining to questionnaire. All participants provided written informed consent.

III. Result

Table 1: General information of survey population (n=55)

Parameter	Effective Response	Female (n = 31)	Male (n = 24)	Total (n = 55)
Age (years)	55	47.24±12.88	51.05±14.50	48.87±13.72
Smoking (n)	54	0	7	7
BMI (kg/m ²)	51	25.57±4.40	26.19±3.92	25.84±4.21

Total cholesterol (mmol/L)	50	4.85±1.80	4.86±1.05	4.85±1.53
Triglycerides (mmol/L)	50	1.86±1.52	2.10±1.62	1.96±1.57
HDL-C (mmol/L)	50	1.30±0.40	1.31±0.57	1.30±0.48
LDL-C (mmol/L)	50	1.97±0.61	2.11±0.59	2.03±0.60
Mean SBP (mmHg)	51	118.72±24.12	124.30±21.02	121.10±23.00
Mean DBP (mmHg)	51	75.56±15.54	77.70±14.46	76.59±15.11
Fasting blood glucose (mmol/L)	50	5.06±1.75	5.24±2.53	5.14±2.12
Metabolic syndrome (n)	50	15	13	28
Hypertension (n)	51	19	14	33
Diabetes mellitus (n)	55	16	17	33
Periodontitis (n)	51	7	7	14

Table 2. Factors associated with gingivitis by multivariate analysis (n=55)

Factors	Adjusted Odds Ratio (95% CI)	P-value
Sociodemographic and lifestyle factors		
Age (18 years and above)	1.12 (1.05, 1.19)	0.000
Gender		
Female	1	0.215
Male	2.15 (0.62, 7.40)	
Income		
31,000 to 40,000 Taka	1	0.220
21,000 to 30,000 Taka	0.32 (0.08, 1.30)	0.125
Less than 20,000 Taka	0.41 (0.12, 1.32)	0.150
Education		
Masters or Higher	1	0.080
Bachelor	4.00 (0.72, 22.00)	0.105
Secondary (Lower & Higher)	4.20 (1.15, 15.10)	0.030
Tobacco smoking		
No	1	0.810
Yes	0.87 (0.30, 2.60)	
Tobacco chewing		
No	1	0.185
Yes	0.42 (0.10, 1.50)	
Diabetes-related factors		
Duration of diabetes	0.97 (0.93, 1.01)	0.140
Hba1c	1.04 (0.88, 1.25)	0.630
Self-compliance score	1.22 (1.02, 1.46)	0.025

Oral hygiene practice		
Frequency of toothbrush		
Twice	1	0.001
Once	22.50 (3.30, 150.00)	
Clean by doctor		
Yes	1	0.002
No	90.00 (5.30, 1550.00)	
Use of mouthwash		
Yes	1	0.900
No	0.92 (0.25, 3.00)	

Table 3. Factors associated with periodontitis by multivariate analysis

Factors	Adjusted Odds Ratio (95% CI)	P-value
Sociodemographic and lifestyle factors		
Age	1.08 (1.02, 1.15)	0.010
Gender		
Female	1	0.180
Male	3.10 (0.60, 16.00)	
Income		
31,000 to 40,000 Taka	1	0.065
21,000 to 30,000 Taka	0.43 (0.08, 2.00)	0.290
Less than 20,000 Taka	2.75 (0.55, 13.00)	0.210
Education		
Masters or Higher	1	0.120
Bachelor	8.50 (0.70, 99.00)	0.090
Secondary (Lower & Higher)	14.40 (1.10, 183.00)	0.040
Tobacco smoking		
No	1	
Yes	2.05 (0.40, 10.50)	0.380
Tobacco chewing		
No	1	0.003
Yes	41.00 (6.50, 258.00)	
Diabetic history		
Duration of diabetes	0.95 (0.90, 1.00)	0.045
Hba1c	1.32 (1.00, 1.75)	0.060
Self-compliance management	1.22 (0.92, 1.60)	0.165
Oral hygiene practice		
Frequency of toothbrush		
Twice	1	0.000
Once	42.70 (5.70, 320.00)	
Clean by doctor		

Yes	1	0.095
No	9.60 (0.65, 135.00)	

IV. Discussion

Diabetes mellitus and periodontitis are prevalent chronic illnesses that are multifactorial and multigenetic, and their incidence increases with age. The quality of life is impacted by both morbidities as they have a detrimental effect on systemic and periodontal health [19]. Numerous recent studies have confirmed that diabetes and periodontitis are correlated in both directions. Although diabetes itself is a risk factor for periodontitis [20], the chronic inflammation caused by periodontitis negatively affects the metabolic regulation of diabetes [21]. Specifically, among all diabetic complications, periodontitis comes in sixth [22].

Age was a significant predictor of both gingivitis and periodontitis, indicating a higher risk of developing periodontal disease. Previous research has revealed that one predictor of the severity of gingivitis and periodontitis is growing age. The frequency of gingivitis and periodontitis was rising with age, which was consistent with prior research [23]. This research's findings were in line with those of another study that found that as diabetes individuals have aged, so too have the prevalence and severity of periodontal disease [24]. Similar to other research, the current study found that, in comparison to those with greater levels of education, those with lower levels were more likely to develop gingivitis and periodontitis [25, 26].

Living in a destitute region, having a low level of education, and working in a profession that is low in reputation and remuneration are all likely to contribute to poor oral health awareness, poor preventative practices, and low utilization of oral health services. There was a substantial correlation between periodontitis and smokeless tobacco. The results of this study were in line with Kamath et al.'s earlier discovery that Asians who chewed tobacco had higher scores and a higher likelihood of developing periodontal disease [27].

Developed nations like Sweden and the United States also showed a similar correlation [28, 29]. Users of smokeless tobacco were more likely than non-users to develop periodontal pockets in the current study. There is a favorable correlation between periodontitis and diabetes duration. This result is consistent with the earlier discovery that there is a relationship between the severity of periodontitis and the length of diabetes [30]. The clinical attachment level, bleeding on probing, and probing pocket depth can all be impacted by the length of the illness. The severity of the periodontal disease was significantly influenced by the length of diabetes [31].

Moreover, type 1 diabetes is onset at a younger age; hence the longer duration of diabetes implies that the patient is older. There was no significant association between periodontal disease and glycemic control (HbA1c) in our study. In contrast, the majority of earlier research concurred that HbA1c was linked to the severity of periodontitis [34]. Participants with better dental self-efficacy, which is linked to good periodontal health, are more likely to comply with diabetic self-management [32]. To avoid and treat oral health issues, it is advised to practice good oral hygiene and routine dental cleaning [33]. The findings of this study have a number of ramifications for diabetes care providers, legislators, and oral health specialists. Diabetes care providers and oral health specialists have to be more proactive in encouraging their patients to participate in oral health initiatives.

In this survey, Hypertension, metabolic syndrome, elevated blood lipids, and impaired fasting glucose were all considerably more common. Our findings showed that age, BMI, hyperlipidemia, hypertension, metabolic syndrome, and periodontitis were risk factors for diabetes mellitus in the survey group, according to the multivariate logistic regression analysis for the condition and its associated risk factors.

Limitations of the study

V. Conclusion

This research underscores the intricate relationship between diabetes mellitus and periodontal diseases in Bangladesh. The findings reveal that multiple factors, including age, education, lifestyle habits, and diabetes management, significantly influence periodontal health.

The study emphasizes the importance of comprehensive healthcare strategies that address both systemic and oral health, particularly for individuals with diabetes. By highlighting the bidirectional impact of diabetes and periodontal disease, this research calls for enhanced collaboration between oral health professionals and diabetes care providers to develop more effective prevention and management programs.

VI. Recommendation

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