Original Article

Association between Diabetes and Tooth Loss in Dental Patients- A Case-control Study

Siddika A.[1], Hafez M.A.[2], Chowdhury S.H.[3]

Abstract

Background and objectives: The prevalence of diabetes is increasing day by day. People with diabetes are at greater risk for oral health problems. Destructive features of periodontal disease are more common in diabetics. Tooth loss is a result of periodontal disease. This study aimed to determine the association between diabetes and tooth loss in dental patients.

Materials and methods: A matched case-control study was conducted where dental patients with tooth loss were the cases, and those with no tooth loss were in the control group. A total of 144 samples, 48 samples for the case group and 96 samples for the control group were selected by consecutive sampling technique. After completing informed consent, data were collected in two different phases. Data were collected by face-to-face interview method using a semi-structured questionnaire. After data collection, data were analyzed using Statistical Package for Social Studies (SPSS) version 22.

Result: The mean±Sd of age for the dental patients with tooth loss group it was 54.42±10.952 and for the dental patients without tooth loss, it was 50.06±8.228. 54% (26) for the case and 53% (51) for the control were male and females were 46% (22) and 47% (45) respectively in the case and control groups. Dental patients aged 45 to 56 years old had a higher prevalence of diabetes. 66.7% of dental patients with tooth loss were diabetic, and 36.5% of dental patients without tooth loss were diabetic. 50% of diabetes patients with tooth loss had diabetes for <5 years, and 50% had diabetes for >5 years. In this study, we found that there was a significant association between tooth loss and the presence and duration of diabetes and the odds ratio (95% CI) was 3.486 (1.680-7.233).

Conclusion: With the limitation of the study, it can be concluded that diabetes may be a risk factor for tooth loss**.** Duration diabetes can increase the risk of tooth loss**.**

Keywords: Dental patient, Diabetes, Tooth loss

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1. **Aeysha Siddika**, Assistant Professor and Head of Prosthodontics, Sapporo Dental College & Hospital, Dhaka Bangladesh
2. **Prof. MA Hafez**, Professor and Advisor, Department of Biostatistics, Faculty of Allied Health Sciences, Bangladesh University of Health Sciences (BUHS)
3. **Shamiul Hoque Chowdhury**, Assistant Professor, Department of Biostatistics, Faculty of Allied Health Sciences, Bangladesh University of Health Sciences (BUHS)

*Corresponding Author:

Dr.Aeysha Siddika, Assistant Professor and Head of Prosthodontics, Sapporo Dental College & Hospital, Dhaka Bangladesh. Email: aeyshasiddika18@gmail.com

Introduction

The largest numbers of people with diabetes were estimated by the WHO in South-East Asia and Western Pacific regions[1]. Over the past decade, diabetes prevalence has risen faster in low- and middle-income countries than in high-income countries[2]. According to the international diabetic federation, in 2017, 82 million people in the Southeast Asia Region were diabetic; by 2045 this will rise to 151 million[3]. People with diabetes are at greater risk for oral health problems. Periodontal disease has been proven as the sixth complication of diabetes mellitus[4]. Diabetes has been observed to increase the risk of experiencing continued periodontal destruction over time up to 5 folds[5]. Diabetes affected all periodontal parameters, including bleeding scores, probing depths, loss of attachment, and missing teeth[6-8]. Destructive features of periodontal disease are more common in diabetics[9]. The prevalence of periodontal disease in diabetic patients has been reported at 86.8% (gingivitis 27.3% and periodontitis 59.5%)[10].

Akhter R. et al (2008) concluded that caries is the main cause of tooth extraction and periodontitis was the second cause. It was reported that 30 to 35% of all tooth extractions are due to periodontitis, while approximately one-half result from dental caries[11]. In a few studies done on the Bangladeshi population, it was reported that 18.5%-42% of teeth were extracted due to periodontal disease in tertiary hospitals and hospitals in rural areas whereas it was about 34% in hospitals in urban areas[12,13].

Diabetes and periodontal health status have been considered to be linked with each other. Poorly controlled diabetes causes a constantly increased level of glucose in the blood. Chronic destructive periodontitis coexists with hyperglycemia. Hyperglycemia impairs gingival fibroblast synthesis, resulting in the loss of periodontal fibers and supporting alveolar bone[16]. Few studies evaluated the relationship between impaired glucose tolerance and periodontal disease and reported that periodontal disease was positively associated with impaired glucose tolerance[14-15]. Grossi & Genc and Casanova, Hughes & Preshaw concluded that Periodontitis and diabetes are common, complex, chronic diseases having a bidirectional relationship[16,17].

Campus, G. et. al. concluded that patients with diabetes have higher chance of severe periodontal disease than nondiabetic patients among adult Sardinians[18]. Pant B. et al concluded that the prevalence of periodontitis was significantly higher in diabetic persons compared to nondiabetic patients in Nepal[19].

Since the early loss of teeth has nutritional complications and psychological effects, it could affect the quality of life. So, identifying diabetes associated with this condition leads to preventive measures and effective treatment to keep the teeth and delay the loss of teeth. In Bangladesh, few studies have been done to find out the prevalence of periodontitis in diabetic patients. This study was conducted to determine the association between diabetes and tooth loss.

Materials and Method

A matched case-control study was conducted to determine the association between diabetes and tooth loss among dental patients. In this study, dental patients with tooth loss were the cases, and those with no tooth loss were in the control group. A consecutive sampling technique was used to select the samples from the population. Based on the inclusion and exclusion criteria, 144 samples were collected: 48 samples for the case group and 96 samples for the control group.

The case group: Participants aged above 18 years, both male and female, who had tooth loss due to periodontitis and had good oral hygiene were selected as cases after applying the following exclusion criteria.

Exclusion criteria-

- Pregnant women
- Mentally retarded patient
- 3rd molar tooth missing
- Tooth missing due to accident or trauma
- Tooth missing due to caries
- Congenitally missing tooth

The control group- Participants of the same age group and both male and female, having no tooth loss were selected as the control. Pregnant women and mentally retarded patients were excluded.

After completing the informed consent, Data were collected by face-to-face interview method using a semi-structured questionnaire. A brief introduction was given verbally to each participant at the beginning of the interview. Data were collected regarding socio-demographic variables, history of diabetes, and duration of diabetes. After data collection, data were checked thoroughly for missing data, consistency, and completeness. Data were analyzed using Statistical Package for Social Studies (SPSS) version 22.

Results

Table 1: Distribution of Participants by Age Group

Age group (in years)	Case		Control	
	Frequency	Percentage	Frequency	Percentage
35-45	12	25%	24	25%
46-55	18	37.5%	36	37.5%
56-65	8	16.7%	16	16.7%
65-75	10	20.8%	20	20.8%
Total	48	100%	96	100%

The above table shows equal percentages of participants were selected from each age group in case and control.

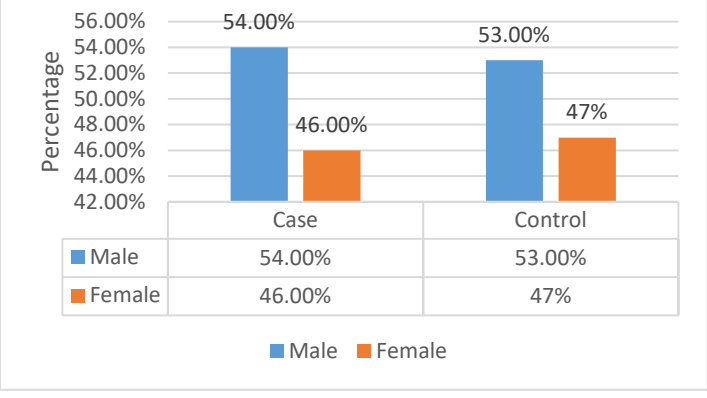

Figure 1: Distribution of Participants by Gender

The above figure shows males were 54%(26) for the case and 53% (51) for the control. Females were 46% (22) and 47% (45) respectively in the case and control groups.

Table 2: Diabetes Characteristics of Participants

Variables	**Case (n=48)**		**Control (n=96)**	
	Number	Percentage	Number	Percentage
Diabetic				
Yes	32	66.7%	35	36.5%
Duration of diabetes				
<5years	16	50%	30	85.7%
>5 years	16	50%	5	14.3%
No	16	33.3%	61	63.5%

Table 2 shows the diabetes characteristics of all dental patients- 48 from the case group (patient having tooth loss) and 96 from the control group (patient having no tooth loss). In the case group, 66.7% were diabetic, and in the control group, 36.5% were diabetic. Among 32 diabetic patients in the case group, 50% had diabetes for <5 years, and 50% had diabetes for >5 years, in the control group the percentages were 85.7%, and 14.3% respectively.

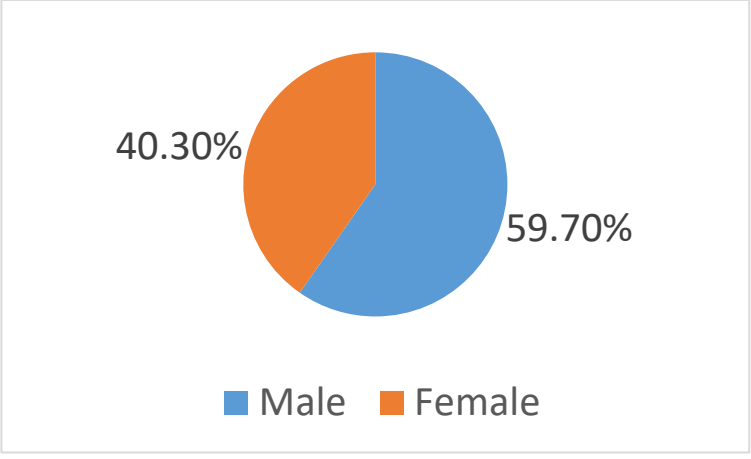

Figure 2: Percentage distribution of dental patients having diabetes according to gender

Figure 2 shows the percentage of male and female dental patients having diabetes. The male was 59.7% (40) and the female was 40.3% (27).

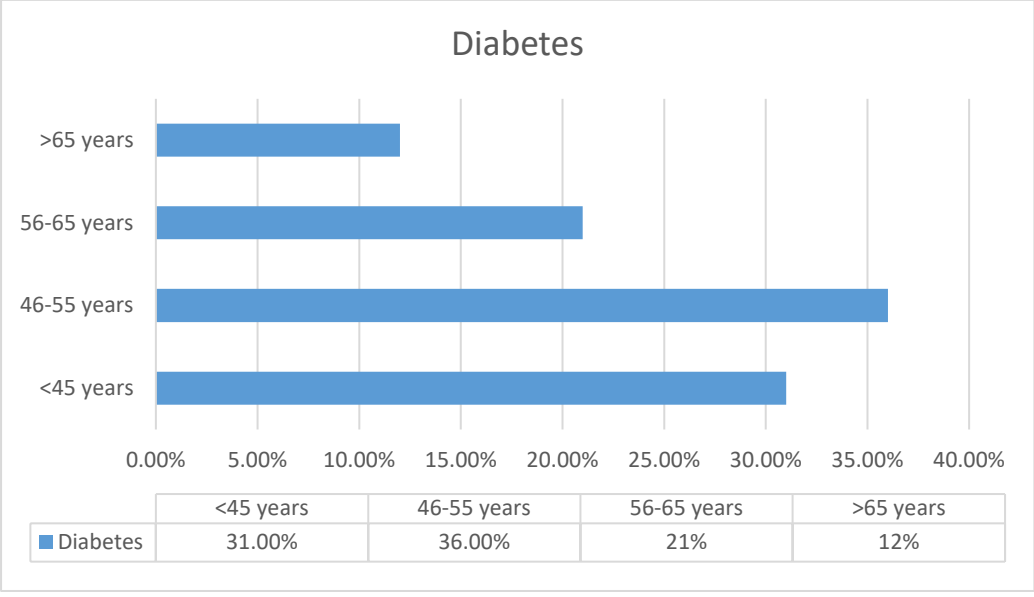

Figure 3: Percentage distribution of dental patients having diabetes according to age groups

Figure 2 shows the percentage of different age groups among dental patients having diabetes**.** The highest percentage 36**%** was in the age group of 46-55 years and the least percentage 12**%** was in the age group of >65 years**.**

Table 3**:** Association between Tooth Loss and Diabetes

	Tooth loss		Chi value	P-value	Odds ratio (95% CI)
	Yes	**No**			
Diabetic	32	35	11.737	.001*	3.486 (1.680-7.233)
Non-diabetic	16	61			

*P-value less than 0.05 and significant

Table 2 shows the association between diabetes and tooth loss. Chi-square was done and an odds ratio with 95% confidence interval (CI) was calculated. The obtained p-value from the Chi-square test was 0.001 (<0.05). The odds ratio, (95% CI) was 3.486 (1.680-7.233)

Table 4: Association between Tooth Loss and Duration of Diabetes

Duration of Diabetes	Tooth loss		Chi value	P-value
	Yes	No		
<5 years	08	25		
>5 years	24	10	9.9083	.001*

*P-value less than 0.05 and significant

Table 4.10 shows that the Chi-square test was done to find our association between tooth loss and the duration of diabetes. A significant p-value (<0.05) was found.

Discussion

Tooth loss is the worst consequence of different dental diseases like caries, periodontitis, etc. It has an impact on esthetics, speech, eating, and nutrition. One's social and functional life is compromised due to tooth loss. In the last few years. Periodontal diseases causing tooth loss have become the most important global oral health burden. Periodontal disease is a chronic condition where continuous destruction of the gingiva, alveolar bone, and periodontal ligament occurs, this results in the mobility of the tooth. As a consequence, tooth loss occurs. One of the factors for periodontitis is diabetes. This study was designed to find out the association of diabetes in tooth loss and without tooth loss patients.

The mean±Sd of age for the dental patients with tooth loss group was 54.42±10.952 and for the dental patients without tooth loss, it was 52.06±8.228. The percentage of diabetes patients was higher in males than in females (figure 2). Dental patients of age 45 to 56 years old had a higher prevalence of diabetes. This result supports the data from CDC (Centres for Disease Control and Prevention). 66.7% of dental patients with tooth loss were diabetic, and 36.5% of dental patients without tooth loss were diabetic. 50% of diabetes patients with tooth loss had diabetes for <5 years, and 50% had diabetes for >5 years. (table 2).

In this study, we found that there was a significant association between tooth loss and the presence and duration of diabetes and the odds ratio (95% CI) was 3.486 (1.680-7.233). A study was conducted by Kaur G et al. on "Association between type 1 and type 2 diabetes with periodontal disease and tooth loss" confirmed a strong association between both type 1 and type 2 Diabetes Mellitus with periodontitis and tooth loss[20]. Another study done by Bagic I C et. al. showed that the number of extracted teeth per subject was significantly greater in the group of diabetes than in the non-diabetic group and the number of teeth was found to be increased with the duration of diabetes[21]. A study done on the Latino population reported that patients with DM were at higher risk of having severe forms of periodontal disease compared with non-diabetic patients with OR=1.40, 95% CI 1.12 to 1.76[22].

A meta-analysis showed that the risk for tooth loss in diabetes patients was higher as compared to non-diabetes and they found an RR for Europe of 1.39 at a 95% CI (1.35; 1.42, $p < 0.0001$), North America 1.22 at a 95% CI (1.20; 1.24, $p < 0.00001$), Asia 2.30 at a 95% CI (2.25; 2.36, $p < 0.00001$) and South America 2.27 at a 95% CI (2.00; 2.58, $p < 0.00001$). They also concluded that there was a higher risk of tooth loss in poorly controlled DM patients compared to non-DM individuals (RR = 1.25 with a 95% CI of 1.22 to 1.29 ($p < 0.00001$)). Furthermore, an analysis of DM status was performed. No significant difference was found regarding tooth loss when DM was well controlled[23].

Conclusion

Despite the study's limitations, it can be concluded that diabetes may be a risk factor for tooth loss. Long-term diabetes can increase the risk of tooth loss.

Recommendation

- The policy should be made to aware patients about the effects of diabetes on oral health
- Each diabetes patient should be aware of the benefits of control of diabetes
- Regular dental check-ups of diabetes patients must be advised

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