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Original Research Article

A Case-Control Study Assessing the Relationship between Diabetes Mellitus and Tooth Loss among Diabetic Patents

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Abstract

Aim: The aim of the present study was to assess the number of missing teeth and to examine the relationship between age and tooth-loss in diabetic patients.

Methods: This was an observational case-controlled study consisting of 100 diabetic patients and an equal number of non-diabetic patients as control in the Department of Dentistry for one year.

Results: There were more females as compared to males and most of the patients belonged to 45-54 years of age. Most of the patients had secondary level education. The mean fasting blood glucose recorded for non-diabetics was 72.88 ± 14.72 and 115.38 ± 22.52 at 2 hours post-prandial; the diabetic group had a mean of 124.96 ± 15.37 recorded as fasting and 208.94 ± 20.98 at 2 hrs post-prandial. In the present study, 58% were suffering from painful gum and 54% had gum swelling. 19% extracted tooth because of gum problem.

Conclusion: It can be stated that the higher number of missing teeth in the diabetic patients than the non-diabetic patients suggests that tooth loss has a direct relationship with diabetes mellitus. In addition, within the limitations of this study, it is believed that the number of tooth lost is directly related to the age of the diabetic patient. Therefore, the dental surgeon has an important role in the early detection of clinical features of diabetes mellitus in patients reporting to the dental clinic for oral health care.

Keywords: Age-group; Diabetes mellitus; Gingivitis; Periodontitis; Periodontal disease

Introduction

Tooth loss considerably affects oral health–related quality of life (OHRQoL), causing chewing difficulty, poor dietary intake and functional disorders. [1] A predominant reason for tooth loss is periodontitis, which is an inflammation of periodontal tissues. Damage from periodontal disease can lead to loosening of teeth and, in a final stage, to tooth loss. [2,3] The manifestation and progression are influenced by a wide variety of determinants and factors that have been linked with general health. Notably, the association between periodontitis and diabetes mellitus (DM) has been highlighted in the literature. Periodontal disease is considered the sixth complication of DM. [4] Another primary cause of tooth loss is dental caries. Its development of which is presumably enhanced in DM patients. [5,6]

Due to the ageing population, DM is a growing public health problem, and it likely contributes to a greater demand for health care. [7] The negative effects of elevated blood sugars on the immune system result in an increased susceptibility to infections. [8] The risk for development and progression of periodontitis is increased approximately threefold in DM patients as compared to non-diabetic individuals (non-DM). [9,10] About one-third of people with diabetes have severe periodontal disease (periodontitis) or severe gum disease In people with diabetes, periodontal disease eventually leads to the loss of one or more teeth. [11] Indeed, periodontitis, also known as gum disease, is a serious infection of the gums that can damage soft tissue and, if left untreated, the bone that supports your teeth.

Periodontitis can cause teeth to loosen or cause teeth loss. [12] In fact, the American Dental Association has published a new study that believes that one in five cases of tooth loss is related to diabetes. [13] In addition, most of these studies [14-16] showed that very few patients diagnosed with diabetes visit their dentist regularly for periodontal exams, and many patients are unaware

of the impact of diabetes on oral health. They do not even know that diabetes can cause tooth loss. [17] Severe tooth decay and chronic periodontal disease are the main causes of tooth loss in adults. [18,19] The severity and prevalence of tooth loss is still a major problem in many countries around the world. [20] According to the National Health and Nutrition Examination Survey (NHANES), the prevalence of edentulous among people aged 60 and older was 31 and 25% between 1988 and 1994 and 1999–2002, respectively. In addition, the average number of teeth in the mouth of people aged 60 and over during these years was 18.4 and 19.4, respectively. [21] Tooth loss and complete edentulous are both poor health outcomes that negatively affect a person's quality of life. [21,22] Elderly people with diabetes have more teeth lost and a lower quality of life than non-diabetics. [23]

The aim of the present study was to assess the number of missing teeth and to examine the relationship between age and tooth-loss in diabetic patients.

Materials and Methods

This was an observational case-controlled study consisting of 100 diabetic patients and an equal number of non-diabetic patients as control in the Department of Dentistry, Lord Buddha Kosi Medical College & Hospital Saharsa, Bihar, India for one year . Included in this study are respondents who are 16 years and above at the time of the examination, voluntary participation, confirmed diabetic not less than 6 months and controlled of other systemic diseases (e.g. hypertension). Patients excluded are subjects who would not participate voluntarily, have systemic conditions that could have similar effects like diabetes mellitus, on the periodontium (e.g. lupus, Blood diseases, HIV/AIDS), known smokers, subjects who have used antibiotics or anti- inflammatory agents in the last three months and pregnant subjects.

A data collection sheet was filled for each patient, containing information such as age, sex, occupation, marital and educational status. In both the diabetic and non-diabetic group, blood sugar level was confirmed from patient's results of fasting blood sugar and two hours post-prandial. Self-administered questionnaires were distributed which contained close-ended questions such as "have you ever had gum swelling", "have you ever extracted a tooth as a result of gum swelling". Use questions were asked to determine the previous health status of periodontal tissues and respondents were required to answer "Yes" or "No". This was followed by an oral examination of each patient done by one examiner using a mouth mirror and a World Health Organization (WHO) periodontal dental probe. Subjects were examined sitting in an upright position under over-head electric light and the number of teeth present and missing were counted and recorded to assess tooth loss. Data was statistically evaluated using SPSS 20 version. (IBM Corp., Armonk, NY, USA).

Results

Table 1: Demographic data

Variables	Socio demographic variables		Total	P-value
	Diabetic	Non diabetic	n=200 (%)	
	n=100	n=100		
Gender				0.644
Male	48	42	80 (40)	
Female	52	58	120 (60)	
Age group (years)				0.220
35-44	16	18	34 (17)	
45-54	51	47	98 (49)	
55-64	23	24	47 (23.5)	
65-74	10	11	21 (10.5)	
Highest education level				0.832
Primary	30	30	60 (30)	
Secondary	37	37	76 (37)	
Tertiary	27	28	55 (22.5)	
Others	6	5	11 (10.5)	

There were more females as compared to males and most of the patients belonged to 45-54 years of age. Most of the patients had secondary level education.

Table 2: Mean blood glucose (mg/dl)

	Mean blood glucose (mg/dl)	
	Fasting	**Post-prandial**
Non-diabetics		
35-44	69.23 ± 8.92	114.12 ± 14.10
45-54	68.48 ± 10.32	113.27 ± 26.88
55-64	73.25 ± 14.75	115.15 ± 42.82
65-74	75.50 ± 38.12	118.06 ± 11.20
Mean	72.88 ± 14.72	115.38 ± 22.52
Diabetics		
35-44	104.42 ± 11.92	173.12 ± 12.64
45-54	114.32 ± 11.74	198.42 ± 10.90
55-64	124.55 ± 20.72	202.18 ± 40.85
65-74	154.54 ± 18.10	266.06 ± 18.58
Mean	124.96 ± 15.37	208.94 ± 20.98

The mean fasting blood glucose recorded for non-diabetics was 72.88 ± 14.72 and 115.38 ± 22.52 at 2 hours post-prandial; the diabetic group had a mean of 124.96 ± 15.37 recorded as fasting and 208.94 ± 20.98 at 2 hrs post-prandial.

Table 3: Previous Periodontal Health Status

	Health of Gingiva		**Total**	P-value
	Diabetic	Non diabetic	n=200	
Variables	n=100	n=100		
Suffer from painful gum				
Yes	68	48	116 (58)	
No	32	52	84 (42)	0.000
Ever had gum swelling				
Yes	64	44	108 (54)	0.000
No	36	56	92 (46)	
Ever extract any tooth because of gum problem				
Yes	22	16	38 (19)	
No	78	84	162 (81)	0.229
Impression of foul mouth odor				
Yes	18	12	30 (15)	
No	82	88	170 (85)	0.316

In the present study, 58% were suffering from painful gum and 54% had gum swelling. 19% extracted tooth because of gum problem.

Discussion

Diabetes mellitus (DM) is a chronic, non-communicable, systemic disease and it is known as one of the major international public health issues. [24] Periodontal disease is one of the major causes of tooth loss and this refers to gingivitis, which is an exaggerated inflammatory condition of the gingiva and periodontitis, which is the destruction of the periodontal ligament, bone and cementum. [25] Epidemiological data suggest that diabetes mellitus is a major risk factor for periodontitis and it has been reported that the susceptibility of the periodontal tissue to periodontitis is increased by approximately threefold in people with diabetes mellitus. [26] On the other hand, periodontal disease has been described as the "Sixth Complication" of diabetes mellitus [27] and it is initiated by an overgrowth of a group of bacterial species, largely gram-negative anaerobic microaerophilic bacteria populating the subgingival sites. [28]

There were more females as compared to males and most of the patients belonged to 45-54 years of age. Most of the patients had secondary level education. The mean fasting blood glucose recorded for non-diabetics was 72.88 ± 14.72 and 115.38 ± 22.52 at 2 hours post-prandial; the diabetic group had a mean of 124.96 ± 15.37 recorded as fasting and 208.94 ± 20.98 at 2 hrs post-prandial. The study of Ochao et al [29] in Columbia reported that 47.4% of diabetic patients had a higher number of missing and were also reported to have suffered from gum problems in the past. The mean number of missing teeth reported in this study was statistically significant with a steady increase as patient grew older. This is

in agreement with the World Health Organization (WHO) statement that up to age thirty four (34) teeth are usually extracted as a result of caries but later as a result of periodontal disease as the individual grows older. [30] In addition, research on an Irish population reported that the number of missing teeth increased with increase in age of the patient and duration of diabetes mellitus. [31] The Irish study is in consonance with the result here where the 65-74years age-group who might had suffered from diabetes mellitus for a longer number of years, recorded the highest number of missing teeth with an average of 7.31 in diabetic patients. Also in agreement with our present study is the study of Bacic et al [32] in Croatia who reported 16.2 as the mean number of missing teeth for diabetic patients which was higher than non-diabetic; 34.4% of those patients older than 54 years old were partially edentulous while 60.9% of the same studied group older than 64 years were completely edentulous. Similarly, Kapp et al [33] reported that respondents with diabetes showed a considerably higher prevalence of tooth loss of up to 5 and 6 or more teeth, compared with no tooth loss in non-diabetic respondents.

In the present study, 58% were suffering from painful gum and 54% had gum swelling. 19% extracted tooth because of gum problem. The altered microflora in diabetics greatly affects host defenses and accelerates the progression of periodontal infection. Host response is further compromised by the inhibitory effects of elevated glucose concentration on polymorphonuclear leucocytes function. Consequently, the periodontal tissue is unable to carry out reparative functions in a hyperglycemic environment and this leads to increase in pockets depths, bone loss and finally tooth loss. [34]

Diabetic patients with poor metabolic control should be seen more often in the dental clinic, especially if periodontal disease is already present because periodontal treatment comprising motivation and debridement of periodontal pockets would resulted in improved metabolic control of the diabetes mellitus and decrease in tooth loss. [35] Thus, patients with well-controlled diabetes mellitus who have good oral hygiene and who are on regular periodontal preventive appointments have the same risk of severe periodontitis and tooth loss as non-diabetic patients.

Conclusion

It can be stated that the higher number of missing teeth in the diabetic patients than the non-diabetic patients suggests that tooth loss has a direct relationship with diabetes mellitus. In addition, within the limitations of this study, it is believed that the number of tooth lost is directly related to the age of the diabetic patient. Therefore, the dental surgeon has an important role in the early detection of clinical features of diabetes mellitus in patients reporting to the dental clinic for oral health care. Prompt referral of such cases to the endocrinologist for expert management is imperative. Early treatment of oral infections like periodontal diseases is an effective way of preventing tooth loss, insulin resistance and complications like hyperglycemic coma.

References

1. Gerritsen AE, Allen PF, Witter DJ, Bronkhorst EM, Creugers NH. Tooth loss and oral health-related quality of life: a systematic review and meta-analysis. Health Qual Life Outcomes. 20 10 Nov 5;8:126.
2. Ramseier CA, Anerud A, Dulac M, Lulic M, Cullinan MP, Seymour GJ, Faddy MJ, Bürgin W, Schätzle M, Lang NP. Natural history of periodontitis: Disease progression and tooth loss over 40 years. J Clin Periodontol. 2017 Dec;44(12):1182-1191.
3. Preshaw PM, Alba AL, Herrera D, Jepsen S, Konstantinidis A, Makrilakis K, Taylor R. Periodontitis and diabetes: a two-way relations -hip. Diabetologia. 2012 Jan;55(1):21-31 .
4. Löe H. Periodontal disease. The sixth complication of diabetes mellitus. Diabetes Care. 1993 Jan;16(1):329-34.
5. Selwitz RH, Ismail AI, Pitts NB. Dental caries. Lancet. 2007 Jan 6;369(9555):51-9.
6. Lamster IB, Lalla E, Borgnakke WS, Taylor GW. The relationship between oral health and diabetes mellitus. J Am Dent Assoc. 2008 Oct;139 Suppl:19S-24S.
7. International Diabetes Federation . IDF Diabetes Atlas, 6th edn. (International Diabetes Federation, 2013).
8. Linden GJ, Herzberg MC; Working group 4 of joint EFP/AAP workshop. Periodontitis and systemic diseases: a record of discussions of working group 4 of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. J Clin Periodontol. 2013 Apr;40 Suppl 14:S20-3.
9. Mealey BL, Ocampo GL. Diabetes mellitus and periodontal disease. Periodontol 2000. 200 7;44:127-53.
10. Chávarry NG, Vettore MV, Sansone C, Sheiham A. The relationship between diabetes mellitus and destructive periodontal disease: a meta-analysis. Oral Health Prev Dent. 2009;7 (2):107-27.
11. Vidone L. A healthy mouth: an important part of a diabetes management plan. AADE Pract. 2018;6(3):22–27. doi:10.1177/232516031876 7140. [CrossRef] [Google Scholar]
12. Wilder RS, Moretti AJ. Overview of gingivitis and periodontitis in adults. Waltham: Up To Date; 2021.

13. Manish K, Raman N, Gautam A, Jain S, Jha PC, Kumar A. A study on association 0f tooth loss & periodontal disease in patients suffering from diabetes from bihar region. Int J Med Biomed Stud. 2020;4(2):220–6.
14. Al Habashneh R, Khader Y, Hammad MM, Almuradi M. Knowledge and awareness about diabetes and periodontal health among Jordanians. J Diabetes Complicat. 2010;24(6): 409–414.
15. Control CfD, Prevention Dental visits among dentate adults with diabetes--United States, 1999 and 2004. MMWR Morb Mortal Wkly Rep. 2005;54(46):1181–1183.
16. Jansson H, Lindholm E, Lindh C, Groop L, Bratthall G. Type 2 diabetes and risk for periodontal disease: a role for dental health awareness. J Clin Periodontol. 2006;33(6):40 8–414.
17. Ogunbodede E, Fatusi O, Akintomide A, Kolawole K, Ajayi A. Oral health status in a population of Nigerian diabetics. J Contemp Dent Pract. 2005;6(4):75–84.
18. Yoo JJ, Kim DW, Kim MY, Kim YT, Yoon JH. The effect of diabetes on tooth loss caused by periodontal disease: a nationwide population-based cohort study in South Korea. J Periodontol. 2019;90(6):576–583.
19. Thorstensson H, Johansson B. Why do some people lose teeth across their lifespan whereas others retain a functional dentition into very old age? Gerodontology. 2010;27(1):19–25.
20. Sensorn W, Chatrchaiwiwatana S, Bumrerraj S. Relationship between diabetes mellitus and tooth loss in adults residing in Ubonratchathani province, Thailand. J Med Assoc Thai. 2012; 95(12):1593–1605.
21. Patel MH, Kumar JV, Moss ME. Diabetes and tooth loss: an analysis of data from the National Health and nutrition examination survey, 2003–2004. J Am Dent Assoc. 2013;14 4(5):478–485.
22. Wiener RC, Shen C, Findley PA, Sambamoorthi U, Tan X. The association between diabetes mellitus, sugar-sweetened beverages, and tooth loss in adults: evidence from 18 states. J Am Dent Assoc. 2017;148 (7):500–9. e4.
23. Greenblatt AP, Salazar CR, Northridge ME, Kaplan RC, Taylor GW, Finlayson TL, et al. Association of diabetes with tooth loss in Hispanic/Latino adults: findings from the Hispanic Community Health Study/Study of Latinos. BMJ Open Diabetes Res Care. 2016;4 (1):e000211.
24. Azodo CC. Current trends in the management of diabetes mellitus: the dentist's perspective. Benin journal of postgraduate medicine. 2009; 11(1).
25. Kinane DF. Causation and pathogenesis of periodontal disease. Periodontology 2000. 2001 Feb;25(1):8-20.
26. Preshaw PM, Alba AL, Herrera D, Jepsen S, Konstantinidis A, Makrilakis K, Taylor R. Periodontitis and diabetes: a two-way relationship. Diabetologia. 2012 Jan;55:21-31.
27. Grossi SG, Skrepcinski FB, DeCaro T, Zambon JJ, Cummins D, Genco RJ. Response to periodontal therapy in diabetics and smokers. Journal of periodontology. 1996 Oct; 67:1094-102.
28. Kornman KS, Page RC, Tonetti MS. The host response to the microbial challenge in periodontitis: assembling the players. Periodontology 2000. 1997 Jun;14(1):33-53.
29. Ochoa SP, Ospina CA, Colorado KJ, Montoya YP, Saldarriaga AF, Miranda Galvis M, Muñoz Pino N, Gómez ME, Yepes FL, Botero JE. Condición periodontal y pérdida dental en pacientes diabéticos del Hospital Universitario San Vicente de Paúl. Biomédica. 2012 Mar; 32(1):52-9.
30. WHO Scientific Group on Epidemiology, Etiology and Prevention of Periodontal Diseases (1978) Epidemiology, etiology and prevention of periodontal disease: a report of WHO scientific group [meeting held in Moscow from 23 Nov-2 Dec.1977]. World Health Organ Tech Rep Ser No.621 Geneva.
31. Hayden P, Buckley LA. Diabetes mellitus and periodontal disease in an Irish population. Journal of Periodontal Research. 1989 Sep;24 (5):298-302.
32. Bačić M, Plančak D, Granić M. CPITN assessment of periodontal disease in diabetic patients. Journal of periodontology. 1988 Dec; 59(12):816-22.
33. Kapp JM, Boren SA, Yun S, LeMaster J. Peer reviewed: Diabetes and tooth loss in a national sample of dentate adults reporting annual dental visits. Preventing chronic disease. 2007 Jul;4(3).
34. Oliver RC, Tervonen T. Diabetes–a risk factor for periodontitis in adults?. Journal of periodontology. 1994 May; 65:530-8.
35. Varon F, Mack-Shipman L. The role of the dental professional in diabetes care. The Journal of Contemporary Dental Practice. 2000 Feb 15;1(2):1-27.