Original Article

Oral Health Status in Type 2 Diabetes Patients: A Questionnaire-Based Study

Gyanendra Pandey[1]*, Rajul Vivek[2], Monika Kumari[3], Binod Shankar[4], Lav Kumar Neeraj[5], Shashi Kumar[6]

[1]Department of Oral Medicine and Radiology, Purvanchal Dental College, Badgahan, Uttar Pradesh, India.
[2]Department of Prosthodontics, Purvanchal Dental College, Badgahan, Uttar Pradesh, India.
[3]Department of Public Health Dentistry, Dental College Azamgarh, Azamgarh, Uttar Pradesh, India.
[4]Private Consultant, Prosthodontist, Bihar, India.
[5]Department of Public Health Dentistry, DJ College of Dental Sciences and Research, Niwari Dehat, Uttar Pradesh, India.
[6]Department of Periodontology and Implantologist, DJ College of Dental Sciences and Research, Niwari Dehat, Uttar Pradesh, India.

Abstract

Background: Diabetes mellitus (DM) describes a group of disorders characterized by elevated levels of blood glucose and leads to variety of abnormalities of carbohydrate fat and protein metabolism. DM has two major types – Type 1 and Type 2. **Materials and Methods:** The study participants were 250 consecutive patients with type 2 diabetes who sought treatment completed a self-report questionnaire as they awaited their appointment at the outpatient clinic. Informed consent was obtained from the subjects. The data were entered into a Microsoft Excel spread sheet and imported into Statistical Package for the Social Sciences (SPSS) version 17 (SPSS Inc., Chicago, IL, USA) for statistical analysis. **Results:** The results show, 250 patients, with different age groups of 45–54 years (34.0%), 55–64 years (24.0%), 35–44 years (20.0%), 65–75 years (14.0%), and >75 years (8.0%) with high prevalence of male as compared to female. Among patients with good or moderate control of diabetes, women were significantly more likely than men to brush twice daily ($P < 0.001$). **Conclusion**: Improvement in oral hygiene plays an efficient role in preventing and treating periodontal infections among patients with diabetes. In diabetes care, the common risk factors approach can be implemented to promote oral health as well as control of the diabetic condition.

Keywords: Diabetes mellitus, Oral health, Patients systemic disease.

Introduction

Diabetes mellitus (DM) describes a group of disorders characterized by elevated levels of blood glucose and leads to variety of abnormalities of carbohydrate fat and protein metabolism. DM has two major types – Type 1 and Type 2.[1]

Type 1 diabetes is a chronic condition in which pancreas produces no insulin or little. Type 2 diabetes is a disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. It leads to complications such as microangiopathy, retinopathy, nephropathy, microvascular disease, and delayed wound healing. Individuals with poorly controlled diabetes have also been found to be more susceptible to oral infections including periodontitis. It has been reported that subjects with diabetes have a greater prevalence and severity of periodontal disease compared with subjects without diabetes in all age groups. In these subjects, diabetes also increases the progression of bone loss and attachment loss over time.[2]

Access this article online

Website: www.jrad.co.in

DOI: https://doi.org/10.53064/jrad.2022.13.3.167

DM and periodontal disease are two common chronic diseases that have long been considered to be biologically linked. Diabetes is an important chronic disease globally as reflected in the World Health Organization (WHO) declaring the rate of increase in diabetes prevalence is an epidemic. The WHO estimated that there were 30 million people who had diabetes worldwide in 1985. This number increased to 135 million by 1995 and reached 217 million in 2005. By 2030, the WHO predicts this number to increase to at least 366 million. This growth in diabetes prevalence, driven principally by increasing prevalence of type 2 diabetes, is occurring in both the developing and developed countries. The two countries with the largest predicted increases are India and China and the US ranked third.[3]

Address for correspondence: Dr. Gyanendra Pandey, Department of Oral and Maxillofacial Pathology, Purvanchal Dental College, Badgahan, Uttar Pradesh, India. Email: gyanendrapandey@gmail.com

Received: Jan. 10, 2020; **Accepted:** Feb. 10, 2022; **Published:** Mar. 10, 2022

How to cite this article: Pandey G, Vivek R, Kumari M, Shankar B, Neeraj LK, Kumar S. Oral Health Status in Type 2113 Diabetes Patients: A Questionnaire-Based Study. J Res Adv Dent 2022;13(3):109-113.

Oral self-care, which is part of general health self-care, comprises a wide spectrum of activities ranging from self-treatment, prevention, and diagnosis to seeking lay or professional care. Among dentate adults, regular dental visits are an opportunity for professional assistance in prevention, early detection, and treatment of periodontal diseases. Certain groups of individuals, such as people with diabetes, have a high risk for developing these diseases. Periodontal disease has been called the sixth complication of diabetes. Because of these relationships, prevention and care of periodontitis which involve consistent daily oral care at home and regular dental visits are particularly important for diabetic patients. People with poor control of diabetes also have relatively high plaque levels.[4,5,6]

The long-term consequences of diabetes have been widely studied in recent years, and this has led to improvements in the prevention and therapy, thus giving diabetic patients a better quality of life. To date, there are not many records on oral health behavior, oral hygiene, and HbA1c level among Indians with type 2 diabetes which needs an extensive search.[3]

Hence, the present study was conducted to assess the oral health status in type-2 diabetes patients in Bareilly population, Uttar Pradesh, India.

Materials and Methods

The study participants were 250 consecutive patients with type 2 diabetes who sought treatment at the Department of Oral Medicine and Radiology, Institute of Dental Sciences, Bareilly, Uttar Pradesh. Informed consent was obtained from the subjects. The study was approved by ethical committee (Ethical Clearance Number-BIU/0003/2019), Institute of Dental Sciences, Bareilly (UP).

Inclusion criteria

The following criteria were included in the study:

1. Patients with type 2 diabetes of age >35 years.
2. Patients with the presence of >1 tooth in the oral cavity.

Exclusion criteria

The following criteria were excluded from the study:

1. Patients with other systemic diseases.
2. Totally edentulous patients.

The participants completed a self-report questionnaire as they awaited their appointment at the outpatient clinic. The participants received oral and written instructions on questionnaire completion, and assurances of confidentiality. Completed questionnaires were collected from the participants as they left the clinic.

A self-administered questionnaire was used to assess the main outcomes of the study. Questionnaire items were carefully selected from relevant published reports in international journals.

The data were entered into a Microsoft Excel spreadsheet and imported into Statistical Package for the Social Sciences (SPSS) version 17 (SPSS Inc., Chicago, IL, USA) for statistical analysis. Frequency distribution tables were produced, and the Chi-square test was used to assess the associations of variables with the level of diabetes control. P <0.05 was considered statistically significant.

Results

Table 1 shows, out of 250 patients, different age groups 45–54 years (34.0%), 55–64 years (24.0%), 35–44 years (20.0%), 65–75 years (14.0%), and >75 years (8.0%) with high prevalence of male as compared to female. Maximum patients were non-smoker 150 (60.0%), followed by smoker patients 70 (28.0%), with least percentage in ex-smoker 30 (12.0%), whereas 135 (54.0%) were non-drinker and drinker patients 115 (46.0%). Majority of the patients have 1 time tooth brushing frequency 120 (48.0%), followed by 2 times 55 (22.0%) and <1 time 50 (20.0%) with less patients more than 2 times 25 (10.0%). Patients using fluoridated toothpaste 225 (90.0%), while minimum patients are using non-fluorinated toothpaste 25 (10.0%). Patients have dental visit <6 months 135 (54.0%), between 6 and 12 months 55 (22%), whereas 1–2 years and more than 2 years have equal visit 30 (12%), respectively.

Table 2, among patients with good or moderate control of diabetes, women were significantly more likely than men to brush twice daily (P < 0.001). In the age group of 35–44 years,

Table 1: Demographic details of variables

Age group (in years)	No. (n=250)	Percentage
35–44	50	20.0
45–54	85	34.0
55–64	60	24.0
65–75	35	14.0
>75	20	8.0
Gender	**No. (n=250)**	**Percentage**
Male	150	60.0
Female	100	40.0
Smoker	70	28.0
Non-drinker	135	54.0
Drinker	115	46.0
Tooth brushing frequency (times per day)	**No. (N=250)**	**Percentages**
<1	50	20.0
1	120	48.0
2	55	22.0
>2	25	10.0
Use of fluoridated toothpaste	**No. (n=250)**	**Percentages**
Yes	225	90.0
No	25	10.0
Most recent dental visit	**No. (n=250)**	**Percentage**
<6 months before	135	54
6–12 months before	55	22
1–2 years before	30	12
>2 years before	30	12

Table 2: Rate (%) of twice-daily tooth brushing according to the level of diabetes control

	Diabetes control					
Variables	**Good**	**%**	**Moderate**	**%**	**Poor**	**%**
Sex						
Male	84	32.6	38	10.2	28	9.8
Female	51	55.2	32	32.8	17	22.3
P-value	<0.001*		0.001*		0.106	
Age (y)						
35–44	33	66.2	10	33.5	7	7.4
45–54	51	44.8	21	56.2	13	32.8
55–64	31	44.2	20	5.2	9	13.1
65–75	14	5.2	10	0	11	0
>75	6	0	9	4.5	5	16.2
P-value	<0.001*		<0.001*		0.052	
Level of education						
Low	32	18.1	32	10.9	16	4.9
Medium	73	32.8	26	11.1	21	11.8
High	30	94.6	12	72.9	8	65.8
P-value	<0.001*			<0.001*		<0.001*
Duration of disease (y)						
<2	30	46.2	20	36.2	5	6.1
2–5	82	61.9	28	18.6	15	23.9
6–10	18	33.8	20	18.9	22	22.8
>10	5	10.8	2	13.4	3	0
P-value	<0.001*			0.165		0.072
Complications						
Yes	75	0	82	1.1	51	0
No	204	50.9	59	53.5	29	40.8
P-value	<0.001*			<0.001*		<0.001*

*Statistically significant

the proportion of individuals brushing twice daily was highest (66.2%) among diabetics with good control ($P < 0.001$), whereas in the age group of 45–54 years, the proportion of individuals brushing twice daily was highest (44.8%) among diabetics with moderate control ($P < 0.001$). Patients with a high education level were significantly more likely to brush twice daily than those with a moderate or low level of education ($P < 0.001$). Patients with a diabetes duration of 2–5 years and good diabetes control had a higher rate of twice-daily brushing (61.9%) than any other group ($P < 0.001$). Patients without diabetes complications had a higher rate of twice-daily brushing than did those with complications ($P < 0.001$).

Table 3, when the level of diabetes control was assessed in relation to the proportion of patients reporting a dental visit within the past 12 months, there was no statistically significant difference between men and women. Intergroup comparison showed that patients aged 35–44 years with moderate diabetes control ($P < 0.001$) and those aged 45–54 years with poor diabetes control were most likely to have had a dental visit during the past 12 months ($P < 0.027$). Patients with a high level of education and moderate diabetes control were most likely to have had a dental visit during the past 12 months ($P < 0.001$). The proportions of patients reporting a dental visit within the past 12 months significantly differed in relation to diabetes duration in the good, moderate, and poor control groups ($P < 0.015$, $P < 0.011$, and $P < 0.036$, respectively). Patients with moderate control and no diabetes complications had a significantly higher rate of dental visits in the past 12 months than did patients with diabetes complications ($P < 0.001$).

Discussion

Oral diseases are increasingly regarded as behavioral illnesses. Adoption of healthy habits, including sufficient oral self-care and regular dental visits, is essential to control such diseases. Prevention and treatment of oral diseases and diabetes require persistent daily self-care. It is a condition primarily defined by the level of hyperglycemia giving rise to risk of micro vascular damage (retinopathy, nephropathy, and neuropathy). It is associated with reduced life expectancy, significant morbidity due to specific diabetes-related microvascular complications, increased risk of macrovascular complications (ischemic heart disease, stroke, and peripheral vascular disease), and diminished quality of life.[7]

The present study was conducted, in which out of 250 DM type 2 patients, 150 (60%) were male and rest 100 (40%) were female, showing male predominance. Similar results have been observed in studies conducted by Nordin *et al.*,[4]

Table 3: Proportions of participants reporting a dental visit within the past 12 months according to the level of diabetes control

	Diabetes control					
Variables	**Good**	**%**	**Moderate**	**%**	**Poor**	**%**
Sex						
Male	84	92.4	38	61.8	28	21.8
Female	51	95.8	32	66.6	17	36.2
P-value	0.291			0.542		0.152
Age (y)						
35–44	33	98.0	10	98	7	15.9
45–54	51	64.1	21	77.8	13	43.6
55–64	31	90.8	20	50.8	9	47.4
65–75	14	90.6	10	4.6	11	5.1
>75	6	87.2	9	90.2	5	2.2
P-value	0.086			<0.001*		0.025*
Level of education						
Low	32	92.8	32	51.8	16	29.8
Medium	73	93.4	26	62.5	21	19.2
High	30	96.1	12	99.2	8	45.2
P-value	0.657			<0.001*		0.254
Duration of disease (y)						
<2	30	98.8	20	84.8	5	18.2
2–5	82	99.2	28	55.2	15	26.8
6–10	18	89.1	20	63.8	22	53.1
>10	5	90.8	2	49.8	3	10.9
P-value	0.014*			0.012*		0.034*
Complications						
Yes	75	91.2	82	49.2	51	5.2
No	204	95.8	59	87.5	29	64.9
P-value	0.078			<0.001*		<0.001*

*Statistically significant

where he observed that male subjects (28.6%) were more likely to have advanced periodontal disease compared to female subjects ($P < 0.05$). Paul ender *et al.* (2004) described similar gender differences between diabetic subjects with and without periodontitis. Men have been shown to exhibit worse periodontal health than women and this difference has been documented in different populations, Albandar *et al.*, 2002.[8] It has been traditionally thought to be a reflection of better oral hygiene practices and/or more utilization of oral health-care services among women, Dunlop *et al.*, 2002.[9] In the present study comprising 250 patients, the age range was 35–81 years. There were 50 (20%) patients in between 35 and 44 years of age, 60 (24%) in 55–64 years of age, 35 (14%) in 65–75 years of age, and 20 (8%) more than 75 years of age. The maximum number of patients were seen in the age group of 45–54 years. The relatively small proportion of the present participants who brushed more than once daily is noteworthy in light of the Indian Dental Association recommendation of twice-daily brushing. The rate of twice-daily brushing was lowest among those with poor control, which is in accordance with the results of Bakhshandeh *et al.*[10] The association between poor diabetes control and infrequent tooth brushing suggests that dental health education is important, especially in diabetic patients with poor control. Therefore, it seems particularly important to enhance tooth brushing self- efficacy in this population, which, in turn, essentially depends on compliance with diabetes self-care practices.[11]

In our study, 90.0% of patients reported using fluoridated toothpaste. Such a higher rate of the response may be due to the fact that the present study was conducted in an urban setting, where most patients were aware of the advantages of using toothpaste while brushing. In the present study, 28% of patients had a smoking habit, and 46% regularly consumed alcohol. There was no significant difference in oral hygiene practices between smokers and non-smokers. In the study by Bakhshandeh *et al.*,[7] twice-daily brushing was more frequent among smokers than among non-smokers. Cigarette smoking is an established risk factor for periodontal disease in healthy and diabetic patients and can be prevented through oral health promotion programs. Thus, diabetics should be made aware of the health hazards of smoking and alcohol consumption and encouraged to act accordingly.

In our study, only 54% and 22% of patients reported a dental visit within the previous 6 months and previous 6–12 months, respectively, which was higher than the rate in the study done by Murtomaa *et al.* (53%).[10] It seems that the present patients were never informed of the importance of regular

dental examinations. In addition, patients with diabetes complications and poor diabetes control had the lowest rate of dental visits. A dental visit within the previous 12 months was more frequently reported by patients who brushed twice daily, which conforms with the findings of Spangler and Konen *et al.*[12] They noted that people with type 2 diabetes and good oral hygiene habits were more likely to use dental services annually. The proportions of patients reporting a dental visit within the past 12 months significantly differed in relation to diabetes duration in the good, moderate, and poor control groups ($P < 0.015$, $P < 0.011$, and $P < 0.036$, respectively). Patients with moderate control and no diabetes complications had a significantly higher rate of dental visits in the past 12 months than did patients with diabetes complications ($P < 0.001$) which is in accordance with the results of Bakhshandeh *et al.*[10]

Further longitudinal studies are to be carried out to further evaluate the oral health behavior with regard to diabetes related factors among adults with type 2 DM patients. Dental practitioners should play an educational role, both in clinical practice and at an organizational level, with closer integration between dental and diabetes professions, so at to raise awareness of oral health issues in the diabetic population.

Conclusion

Type II diabetes (formerly called non-insulin-dependent or adult-onset diabetes) is caused by the body's ineffective use of insulin. It often results from excess body weight and physical inactivity. Diabetic patients appear to lack important knowledge about the oral health complications of their disease and need for proper preventive care. They were eager to get information about oral health and diabetes. Efforts should be taken to improve diabetic patients' knowledge and attitude regarding DM oral complications. Improvement in oral hygiene plays an efficient role in preventing and treating periodontal infections among patients with diabetes. In diabetes care, the common risk factors approach can be implemented to promote oral health as well as control of the diabetic condition.

References

1. Anjana RM, Ali MK, Pradeepa R, Datta M, Unnikrishnan R, Rema M, *et al.* The need for obtaining accurate nationwide estimates of diabetes prevalence in India-rationale for a national study on diabetes. Indian J Med Res 2011;133:369-80.
2. Ravindran R, Deepa MG, Sruthi AK, Edward J, Roopesh G. Evaluation of oral health in Type II diabetes mellitus patients. Oral Maxillofac Pathol J 2015;16:525-31.
3. Aggarwal A, Panat SR. Oral health behavior and HbA1c in Indian adults with Type 2 diabetes. J Oral Sci 2012;54:293-301.
4. Nordin MM, Rahman SA, Raman RP, Vaithilingam RD. Periodontal status and oral health knowledge among a selected population of Malaysian Type 2 diabetics. Sains Malaysiana 2014;43:1157-63.
5. Axelsson P, Lindhe J. Effect of controlled oral hygiene procedures on caries and periodontal disease in adults: Results after 6 years. J Clin Periodontol 1981;8:239-48.
6. Axelsson P, Nyström B, Lindhe J. The long-term effect of a plaque control program on tooth mortality, caries and periodontal disease in adults: Results after 30 years of maintenance. J Clin Periodontol 2004;31:749-57.
7. Bakhshandeh S, Murtomaa H, Mofid R, Vehkalahti MM, Suomalainen K. Periodontal treatment needs of diabetic adults. J Clin Periodontol 2007;34:53-7.
8. Axelsson P, Albandar JM, Rams TE. Prevention and control of periodontal diseases in developing and industrialized nations. Periodontol 2000 2002;29:235-46.
9. Dunlop PD, Telford AD, Morrison DL. Not too little, but not too much: The perceived desirability of responses to personality items. J Res Pers 2012;46:8-18.
10. Bakhshandeh S, Murtomaa H, Vehkalahti MM, Mofid R, Suomalainen K. Oral self-care and use of dental services among adults with diabetes mellitus. J Clin Periodontol 2008;6:279-86.
11. Carwile E, Wagner AK, Crago E, Alexander SA. Estrogen and stroke: A review of the current literature. J Neurosci Nurs 2009;41:18-25.
12. Könönen E, Paju S, Pussinen PJ, Hyvönen M, Di Tella P, Suominen-Taipale L, *et al.* Population-based study of salivary carriage of periodontal pathogens in adults. J Clin Microbiol 2007;45:2446-51.