International Journal of Community Medicine and Public Health
Asarsa SK et al. Int J Community Med Public Health. 2024 Nov;11(11):4361-4366
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20243299

Original Research Article

Oral self-care practices, oral health status and treatment needs in diabetic and non-diabetic patients undergoing orthodontic treatment

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Received: 28 August 2024
Revised: 07 October 2024
Accepted: 08 October 2024

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disease characterized by hyperglycemia resulting either from defects in insulin secretion, action, or both, affecting almost all tissues in body, including those in oral cavity and hence the aim of this study is to assess oral self-care practices, oral health status and treatment needs of diabetic and non-diabetic patients undergoing orthodontic treatment.
Methods: A cross-sectional descriptive study was conducted among 120 each diabetic and non-diabetic patients ranging from 14-35 years undergoing orthodontic treatment. Data was collected using pre tested questionnaire for oral self-care practices and WHO proforma (1997) was used for assessing oral health status and treatment needs. Data was analyzed using SPSS version 17.
Results: The present study revealed that there was not much difference in the oral hygiene practices among both groups. Percentage of oral mucosal lesions, Pocket formation, Loss of Attachment and mean DMFT was high among diabetic group when compared to non-diabetics.
Conclusions: Since the prevalence of periodontitis is more among diabetic, the oral hygiene practices have to be improved. The oral complications of diabetes can be prevented by combined effect of dentist and the Physician by emphasizing the patients for periodic review to dentist for improving the oral health.

Keywords: Oral self-care practices, Diabetes mellitus, WHO oral health assessment proforma, Periodontal status, Orthodontic treatment

INTRODUCTION

Health is an invaluable asset. An understanding of health is the basis of all health care.[1] Presently chronic diseases are the largest cause of death in the world. In 2002, the leading chronic diseases cardiovascular disease, cancer, chronic respiratory disease, and diabetes caused 29 million deaths worldwide. Worldwide annual mortality due to chronic disease is expected to increase in real numbers as well as relative to deaths from injuries and diseases traditionally understood to be infectious such as polio, rubella, tuberculosis, etc.[2] Diabetes mellitus is one such chronic metabolic disease. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the beta-cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action.[3] The basis of the abnormalities in carbohydrate, fat, and protein metabolism in diabetes is lack of insulin or deficient action of insulin on target tissues. There are broadly three general categories of diabetes, type 1,

which results from an absolute insulin deficiency, Type 2, which is the result of insulin resistance and an insulin secretary defect. Gestational, a condition of abnormal glucose tolerance during pregnancy.[4,5]

Diabetes affects almost all tissues in the body, including those in the oral cavity.[10] Periodontal disease is considered as the sixth common complication of diabetes. Other oral complications of diabetes include xerostomia, opportunistic infections, greater accumulation of plaque, delayed wound healing, oral paresthesia, and altered taste.[11] Studies suggest a bidirectional adverse relationship between diabetes and periodontal disease; diabetes can aggravate periodontitis, and periodontitis can negatively affect control of diabetes.[12,13] Diabetics are said to exhibit poorer oral health than non-diabetics. Oral self-care is a part of general health and health care comprises wide spectrum of activities ranging from self-treatment, prevention and diagnosis to seeking lay or professional care. The concept of oral self-care includes prevention of common oral diseases, caries and periodontal diseases.

Although a number of oral findings have been associated with diabetes mellitus, there are not many studies conducted to assess the oral self-care practices, oral health status and treatment needs of the diabetic patients. So, the present study was aimed at evaluating the oral self-care practices, oral health status and treatment needs among the diabetic and compare the same with a non-diabetic population in patients undergoing orthodontic treatment.

METHODS

Study design

The present study was contemplated to assess the oral self-care practices, oral health status and treatment needs of diabetes mellitus patients undergoing orthodontic treatment attending various diabetic centers in Ahmedabad and to compare their findings with that of a similar age and sex matched control population.

Study place

Ethical clearance to conduct the study was obtained from the Institution Review Board of Combined (P.G.) Institute of Medical Science and Research, Dehradun.

Further, permission to conduct the study was also obtained from concerned authorities of the diabetic centers and local dental clinics. Individual patient consent was obtained from the cases and control who participated in this study.

Study duration

This study was conducted between August 2023 to January 2024.

Data collection

Data was collected from a cross-sectional survey, using a survey proforma which comprised of a Questionnaire and Clinical examination. A pilot study was undertaken to determine the feasibility for conducting the study and also to determine the sample size. Questionnaire was used to assess the demographic status, status and condition of diabetes, tobacco usage and alcohol consumption, oral hygiene practices, utilization of dental services and knowledge about oral health related problems due to diabetes mellitus. WHO oral health assessment proforma 1997 was used to assess the oral health status and treatment needs. It took an average of 15-20 minutes to complete the proforma and questionnaire. Necessary modifications were done in the questionnaire, which was used for conducting the survey.

An intra-oral examination was carried out by a single examiner to assess the oral health status and treatment needs using WHO oral health surveys – basic methods proforma (1997). The boxes 166 to 176 of the assessment form dealing with dentofacial anomalies were also excluded as the study subjects where above 20 years as these finding was not important for this population.

According to ADA specification, type III Examination were conducted under bright natural light, by positioning the subject as to receive sufficient daylight. The subjects were made to sit on a chair with comfortable arm rest facing the light in an upright position with sufficient head rest. The examiner examined by standing to the right of the subject.

The trained data recorder was seated on the left side of the patient, so that data recorder was able to hear the examiner's instructions and codes and also the examiner was able to see the data being entered. Examination was carried out with the help of the, mouth mirrors, CPI probe, cotton rolls, kidney trays, sterilizing solution, cotton holder, disposable gloves and masks (Figure 1).

During data collection, chemical method of disinfection and sterilization using Korsolex (Glutaraldehyde- 7gms; Polymethyl urea derivatives-11.6 gms; 1,6 dihydroxy 2,5 droxyhexane - 8.2gm) diluted by adding water was used. Used instruments were washed and placed in the disinfectant solution (for 30 minutes), then re-washed and drained well. After each day of examination, the entire set of instruments was autoclaved.

The questionnaire was filled by the study participants and clinical examination were done for 15 minutes by the examiner. Around 25 study participants were examined per day. After the oral examination, a brief oral health education about how to maintain their oral health was conducted for the study participants in local language (Gujarati). Those participants requiring treatment were referred to respective dental centers for dental treatment.

Statistical analysis

The data recorded were transferred and tabulated to the computer-windows Microsoft excel (2007)-for the purpose of the data analysis. SPSS 15 was used for statistical analysis. The alpha error (type I error) was assumed to be 0.05. 95% confidence limit was set for the above analysis. Chi- square test was used for comparison between diabetic and non-diabetic patients**.**

RESULTS

Figure 2 shows that the diabetic group comprised of 120 subjects, of whom, 65 (51.0%) were males and 55 (49.0%) were females. In non-diabetic group out of 120, 60 (50.0%) were males and 60 (50.0%) were females. There was no statistically significant difference exist among the study participants based on sex. χ^2=0.280; p=0.221 (non-significant).

Figure 1: Armamentarium.

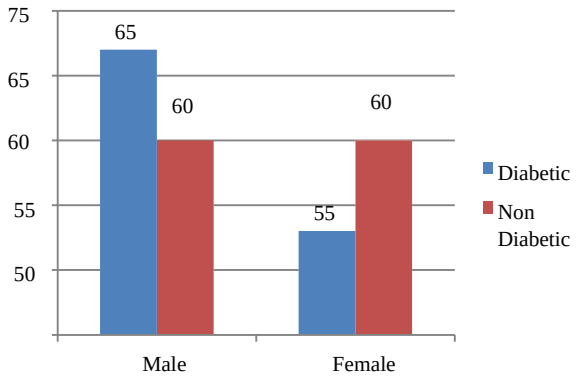

Figure 2: Distribution of study population based on sex.

Table 1 shows the distribution of study population based on the number of times they brushed their teeth per day. In diabetic group, 300 (85.7%) patients cleaned their teeth once in a day, 44 (12.6%) cleaned their teeth twice daily and 6 (1.7%) of them cleaned thrice or more times in a day.

In non-diabetic group, 321 (91.7%) subjects cleaned their teeth once in a day, 26 (7.4%) twice in a day and 3 (0.9%) cleaned thrice in a day. Statistical analysis showed significant association between diabetic and non-diabetic group based upon the frequency of brushing in a day (χ^2=6.339; p=0.042).

Table 2 shows population based on past dental visit. Among 700 study subjects 525 (75.0%) had visited a dentist earlier of which 274 (78.3%) were diabetic patients and 251 (71.7%) were non diabetic control subjects. 175 (25.0%) had no previous dental visits of which 76 (21.7%) were diabetic patients and 99 (28.3%) were non diabetic control subjects.

Table 1: Distribution of study population based on frequency of teeth cleaning.

Frequency of tooth brushing	Diabetic (%)	Non-diabetic (%)	Total (%)
Once daily	96 (85.7)	101 (91.7)	197 (88.7)
Twice daily	22 (12.6)	18 (7.4)	40 (10.0)
Thrice or more daily	2 (1.7)	1 (0.9)	3 (1.3)
Total	120 (100)	120 (100)	240 (100)

Figure 3, shows the distribution of study population based on highest Loss of attachment. Among the study population 416 (59.4%) subjects had 0–3 mm attachment loss of which 188 (53.7%) were diabetic and 228 (65.1%) were non diabetic. 200 (28.6%) subjects had 4–5 mm attachment loss, of which 116 (33.1%) were diabetic and 84 (24.0%) were non diabetic. 75 (10.7%) subjects had 6-8 mm attachment loss of which 40 (11.4%) were diabetic and 35 (10.0%) were non diabetic, 9 (1.3%) subjects had 9–11 mm attachment loss of which 6 (1.7%) were diabetic and 3 (0.9%) were non diabetic.

Statistical test showed a significant association between past dental visits and the two groups (diabetic and non-diabetic groups) (χ2=4.030; p=0.045 (Significant).

Table 2: Distribution of study population based on past dental visit.

Pastental visit	Diabetic (%)	Non-diabetic (%)	Total (%)
Yes	95 (78.3)	86 (71.7)	181 (75.0)
No	25 (21.7)	34 (28.3)	59 (25.0)
Total	120 (100)	120 (100)	240 (100)

Statistical analysis showed a significant association between loss of attachment and two groups, Diabetic and non-diabetic (χ2=10.299; p=0.016).

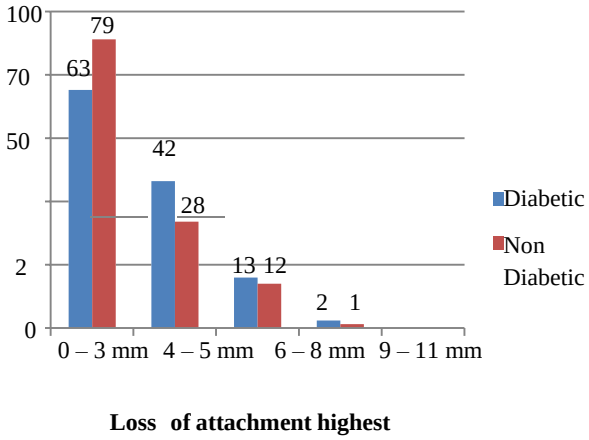

Figure 3: Distribution of study population based on loss of attachment code.

DISCUSSION

The findings of the current study were as among diabetic's majority (30.6%) of them were in the age group of 51-60, 26.6% were in the age group of 41-50. 173 (49.4%) of patients gave a history of diabetes less than five years, 85 (24.3%) from five to ten years and remaining 92 (26.3%) gave a history of more than ten years. There was not much difference in the oral hygiene practices among diabetic and non-diabetic. 94.7% participants brushed their teeth using tooth brush and tooth paste. 88.7% participants cleaned their teeth once in a day and 10.0% cleaned their teeth twice daily. Only 23(3.3%) of participants used interdental cleansing aids like flossing.

Around 525 (75.0%) had visited a dentist earlier of which 274 (78.3%) were diabetic patients and 251 (71.7%) were non diabetic control subject's majority of study population i.e., 167 (31.8%) visited the dentist for extraction of which 97 (35.4%) were diabetic and 70 (27.9%) were non diabetic. 133 (25.3%) participants had visited a dentist due to tooth ache of which 56 (20.4%) were diabetic and 77 (30.7%) were non diabetic. Among 350 diabetics only 25 (7.1%) participants had been referred by physicians and the remaining 325(92.9%) was not referred to dentist.

Among the total study population 19 (5.4%) diabetic and 12 (3.4%) non diabetic subjects reported of TMJ symptoms, 22 (6.3%) diabetic and 16 (4.6%) non diabetic had clicking, 9 (2.6%) diabetics had tenderness on palpation, 7 (2.0%) diabetics had reduced jaw mobility. There were cases of 47 (6.7%) leukoplakia, of which 28 (8%) were diabetic and 19 (5.4%) were non diabetic. 8 (1.1%) ulcers, 4 (0.5%) Candidiasis and 8 (1.1%) of study participants were affected by oral submucous fibrosis.

Also 224 (32.0%) study participants of which 124 (35.4%) diabetic and 100 (28.6%) non diabetic had pocket depth of 4-5 mm. 37 (5.3%) participants had pocket depth of 6mm or more of which 31 (8.9%) were diabetic and 6 (1.7%) were non diabetic. Moreover 92 (13.1%) study participants had one sextant excluded of which 44 (12.6%) were diabetic and 48 (13.7%) were non diabetic. 28 (4.0%) study participants had two sextants excluded of which 24 (6.9%) were diabetic and 4 (1.1%) were non diabetic. Around 200 (28.6%) subjects had 4–5 mm attachment loss, of which 116 (33.1%) were diabetic and 84 (24.0%) were non diabetic. 75 (10.7%) subjects had 6–8 mm attachment loss of which 40 (11.4%) were diabetic and 35 (10.0%) were non diabetic, 9 (1.3%) subjects had 9–11 mm attachment loss of which 6 (1.7%) were diabetic and 3 (0.9%) were non diabetic

Diabetic and non-diabetic had a mean DMFT Value of 4.014 and 3.020 respectively. The mean decayed teeth (DT) were low in diabetic group (1.89) and high among (2.04) non diabetic. The mean missing teeth (MT) was 1.67 more among diabetic and less in non-diabetic (0.91). The mean filled teeth (FT) was low (0.44) among diabetic and then non diabetic (0.54). Caries treatment was the reason for the visit in a study conducted by Karikoski A et al in Finland.[22] In a study done by Orlando VA et al, in Colorado majority of them visited the dentist for regular dental checkup and preventive treatment.[32] All this results clearly demonstrates that the study participants visit dentist in emergency or only when there is pain, preventive treatments were not given importance by them. But in a study conducted by Karikoski A et al in Finland almost 16% had received physician referral for dental care because some individuals with diabetes were not regular dental visitors and, in a study, conducted by Orlando VA et al, in Colorado 77% were referred by health care providers which shows that the complications of oral health were known by other health professionals also which should be improved in our country.[22,32]

Comparison for dentition status and periodontal status depending upon the diabetic status of the patient had not been done in the present study as the evaluation of blood sugar level was not done. Age span of the study participants and the cross-sectional study design does not allow us to draw the temporal association of diabetes Mellitus on dental health.

Confounding factors like age distribution, diabetic control also would have influenced the study result. Thus, Patients with advanced stage of diabetes where oral lesions are present, preventive and non-invasive treatment has to be done. Orthodontic treatment needs to be avoided in patient with grade 2 mobility, pockets, loss of attachment.

CONCLUSION

The following conclusions can be drawn from the study.

To diabetic patients

Brush twice daily with small headed soft bristle toothbrush which must be changed once in four months

and floss once a day. Complete or partial dentures, should be cleaned daily and should be removed each night before sleep. Visit dentist at least once in every six months to prevent minor problems becoming major ones. Dentist should be informed about the diabetes in every visit. Blood glucose levels should be within recommended targets. Smoking should be stopped due to increase in resorption of bone and increases periodontal diseases along with diabetes.

To dentist

Dental practitioners should educate the diabetic patients about the oral complications of diabetes and proper oral health behaviours that limit the risks of tooth loss, periodontal disease and oral soft-tissue pathologies. After that assess for Orthodontic treatment. Dental professionals need to have comprehensive knowledge of their patients about: periodontal status, duration of diabetes and its influence with respect to oral diseases and dental treatment particularly among patients with diabetes. The diabetic patients should be recalled and reviewed twice a year. However, the short-term response to periodontal treatment was equally favourable in all the subjects.

To physicians

All diabetic patients should be referred to dentist for preventing oral health complications due to diabetes.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Asarsa SK, Gopal, Bisht S. Oral self-care practices, oral health status and treatment needs in diabetic and non-diabetic patients undergoing orthodontic treatment. Int J Community Med Public Health 2024;11:4361-6.