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A Study on Oral Health Behaviour, Knowledge and Its Complications in Diabetic Population

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ABSTRACT

Objective: To investigate the impact of oral health behavior, knowledge and its complications in diabetic population. **Methods:** A prospective study was conducted in 2014 for a period of six months among the diabetic population at KMCH, Coimbatore, where a total of 250 patients with diabetes mellitus were enrolled in this study of which only 175 patients were available for review.This survey comprised a self-administered questionnaire to assess oral health behavior, oral health awareness, and oral health problems. **Findings:** Of all the patients, 2.80% brushed twice daily, which was improved to 12% on review. The study classified diabetes patients based on HbA_1C into good, moderate and poor control. 21.6% reported of having visited a clinician within the past 12 months when they had severe symptoms. Questionnaire study showed that only a few participants knew before hand that diabetes affects their periodontal status and oral health. **Conclusion:** A large majority of the population remain unaware of the association between oral health and diabetes. So the health care professionals should focus more on improving the awareness of the importance of maintaining a good oral health and in organizing programs which can provide education as well as encouragement.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder that affects more than 200 million people worldwide as per WHO estimation[1]. This number is likely to be double by the year 2030. In India, there are nearly 50 million diabetic patients according to the statistics of the International Diabetes Federation.

The term Diabetes Mellitus describes a group of disorders characterized by elevated levels of glucose in the blood and abnormalities of carbohydrate, fat and protein metabolism[2].

Based on etiology, diabetes mellitus has been classified as Type 1 diabetes, Type 2 diabetes, gestational diabetes and other specific types. Long-term complications occur in both type 1 and type 2 diabetes. Macrovascular complications of diabetes mellitus include coronary artery disease, cerebrovascular disease, and peripheral vascular disease while the microvascular complications are retinopathy, nephropathy, and neuropathy. Retinopathy may lead to blindness whereas progressive renal disease can lead to kidney failure. Peripheral neuropathy may lead to loss of limbs and dysesthesias(burning sensations).[3]The most common oral complication of diabetes mellitus is a periodontal disease which is the sixth leading complication of diabetes mellitus, where the patient experiences delayed wound healing and xerostomia, as well as an increased susceptibility to periodontal disease.[4]

People with diabetes, especially those with poorly controlled or uncontrolled diabetes, have an increased susceptibility to chronic infection and inflammation of oral tissues, including periodontal disease (chronic gingivitis and periodontitis), dental caries[5],[6], and oral candidiasis[6],[7], which contribute to substantial oral functional disability.[8]Because of the established link between diabetes mellitus and periodontal diseases, daily oral self-care and frequent dentist visits are necessary for diabetic patients.

Hence, the study was designed with the objective to assess the oral health behavior, knowledge, and its complications in regard to diabetes-related factors among adults with diabetes mellitus.

MATERIALS AND METHODS

A prospective interventional study which was undertaken to assess the periodontal disease experience among diabetes patients in Coimbatore city at KMCH, where a total of 250 patients

with diabetes were enrolled in this study, of which only 175 patients were available for review. Of the 250 subjects, 59.6% (N=149) were male and 40.4% (N=101) were female and the results were tabulated and statistically analyzed. The mean age of subjects was found to be 57.43 ± 11.65. This study included diabetic patients willing to participate in the study and excluded the diabetic patients with oral cancer. Data were collected over a period of 3 months by means of a self-administered structured questionnaire. The questionnaire consisting of 15 questions was broadly divided into 3 sections: Oral health behavior, oral health awareness, and oral health problems. This study was approved by KMCH ethics committee, at Kovai medical center and hospital limited.

The data obtained were analyzed using IBM SPSS statistics version 20. The paired-t-test was used to analyze the effectiveness of awareness comparing the values of blood sugar indices and questionnaire score before and after providing awareness on the increased need for oral hygiene in diabetes patients.

RESULTS

A prospective study enrolling 250 subjects was carried out in the time period of March 2014 to August 2014. Of the 250 subjects, 59.6% (N=149) were male and 40.4% (N=101) were female. The age of the subjects ranged from8 to 87 years with the mean age of subjects being 57.43± 11.65.

Out of the 250 patients, only 3 had Type 1 diabetes while the rest had Type 2 diabetes.42.4% had positive family history of diabetes and 57.6% did not have any family history of diabetes.

Treatment options reported were insulin alone (N=82), oral hypoglycemic agents alone (N=124), both insulin and oral hypoglycemic agents (N=33) and no therapy (N=9). Almost 188 patients have known cases of diabetes while 12 patients were newly diagnosed. The most frequent duration of diabetes was in those who were diagnosed in the past 1 to 5 years (N=117) while recently diagnosed (less than 1 year) were only 7 subjects.

Of all the dental problems reported by the subjects, dental carries (25.54 %) was the most common with missing tooth (19.02 %), bleeding during brushing (17.12 %), gum disease (10.05 %), halitosis (5.16 %), stained teeth (2.99%), dry mouth sensation (2.99%), taste alteration (1.63

%), burning mouth sensation (1.36 %), other problems (10.05 %) and no problems (7.61%) as the other options.

However of the 250 patients, only 175 patients were available for follow-up. Among this 54.2 % (N=95) were male subjects while the other 45.71% (N=80) were female. Regarding education, 54.28% (N=95) did not have even school education.The study possessed maximum subjects in the age group of 50 to 60 years while no patients in the age group of 10 to 20 years were enrolled.

The study classified glycemic control based on HbA_1C into good control (HbA_1C values less than and equal to 6%), moderate control (HbA_1C ranging from 7 to 8%) and poor glycemic control (HbA_1C of more than 8%). As per this categorization of the 175 patients available for review, the values of (HbA_1C) changed from good (4.5 % of subjects), moderate (40.5% of subjects) and poor (54.8%) before awareness to good (14.8 % of subjects), moderate (39.4% of subjects) and poor (45.7% of subjects) on post awareness (i.e., follow-up consultation). Hence, statistically, significant change was found ($p<0.05$) in the HbA_1C value after providing awareness to the subject of the need for oral hygiene in diabetes mellitus. There was a significant improvement in levels of fasting blood sugar and random blood sugar also. The mean FBS improved from 178.99 ± 66.49 to 149.55 ± 50.34 and RBS from 220.79 ± 91.42 to 179.78 ± 68.31. Both FBS and RBS had a *p*-value less than 0.05 indicating statistically significant change after awareness.

Reasons for not visiting dentist were mainly no awareness of oral hygiene being related to diabetes, no presenting problems, the cost of a dental visit, subject's work schedule and unpleasantness of a dental visit. There was a deep dip in the percentage of subjects without awareness of the need for a regular dental visit from 31.14% to 1.14% after counseling on the same. Scoring done on oral health behavior indicated a significant improvement in awareness. There was an increase in mean score from 2.71 ± 1.18 to 3.03 ± 1.169 and a *p*-value less than 0.05. So did the oral health awareness score increased from 1.87 ± 1.20 to 2.85 ± 0.97 with the similar *p*-value less than 0.05.

A significant change was seen in tooth brushing frequency with an increase in twice daily brushing on follow up after counseling. The use of mouthwash and interdental cleaning aids were also found to have a significant rise on follow-up.

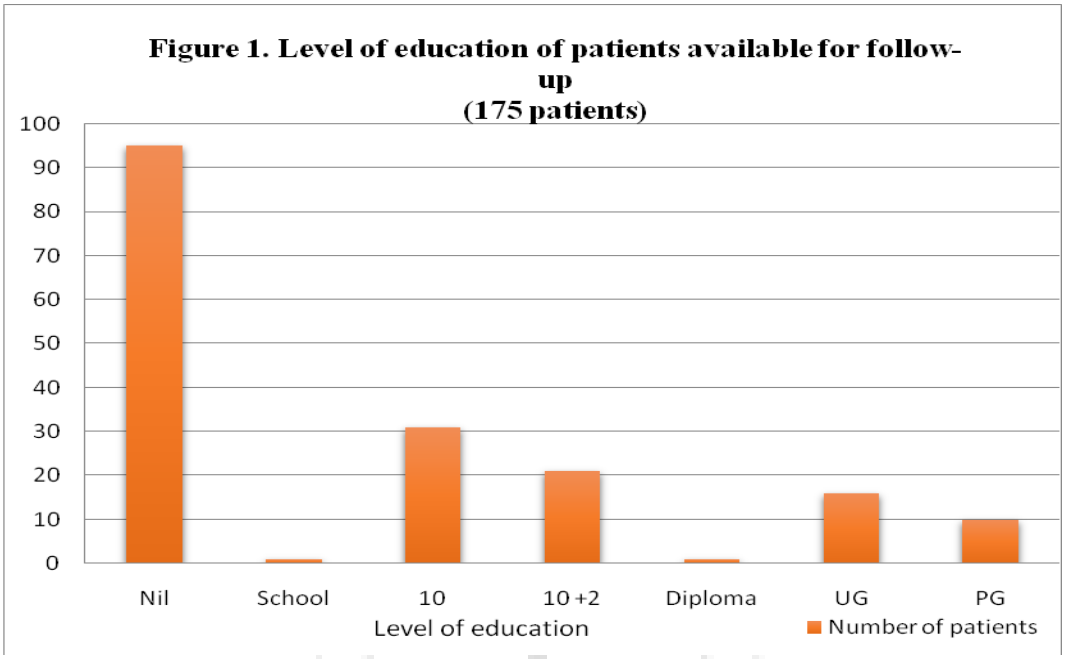

Table 1. Dental problems observed in 250 patients

Dental Problems	Number of patients	Percentage
Dental Caries	94	25.54
Missing tooth	70	19.02
Bleeding during brushing	63	17.11
Others	37	10.05
Nil	28	7.61
Gum disease	24	6.52
Halitosis	19	5.16
Stained teeth	11	2.99
Dry mouth sensation	11	2.99
Taste alteration	6	1.63
Burning mouth sensation	5	1.36
Total	368	100

Table 2. HbA_1C values before and after counseling

Range of HbA_1C	Pre-counseling HbA_1C		Post-counseling HbA_1C	
	Total no. of patients	Percentage	Total no. of patients	Percentage
Less than 6%	8	4.57	26	14.86
6 to 8 %	75	42.86	74	42.29
More than 8 %	92	52.57	75	42.86
Total	175	100.00	175	100.00

Table 3. Statistical data analysis

Parameter	Mean	Std. Deviation	t	df†	Sig. (2-tailed)‡
PreHbA_1C	2.38	8.91	8.60	174	0.0003
PostHbA_1C	2.15	8.26			
PreFBS	66.87	179.77	11.27	174	0.0001
PostFBS	51.13	150.42			
PreRBS	92.48	221.77	12.69	174	0.000
PostRBS	69.49	180.75			
Oral behavior score (Pre)	2.71	1.18	-8.41	174	0.0003
Oral behavior score (Post)	3.03	1.17			
Oral health awareness score (Pre)	1.87	1.20	-23.32	174	.0002
Oral health awareness (Post)	2.85	0.97			
Twice daily brushing frequency (Pre)	1.33	0.55	-5.38	174	.0001
Twice daily brushing frequency (Post)	1.55	0.70			
Use of mouthwash (Pre)	1.85	0.36	6.95	174	0.0002
Use of mouthwash (Post)	1.63	0.48			
Use of interdental cleaning aids (Pre)	1.82	0.39	3.25	174	0.001
Use of interdental cleaning aids (Post)	1.76	0.43			

df† : Degrees of freedom

Sig. (2-tailed)‡ : Significance *p*-value of a 2 tailed student t-test

DISCUSSION

Oral diseases are considered as a behavioral illness. There is an established relationship between diabetes and periodontal diseases which call for the prevention and treatment of periodontitis involving consistent daily oral self-care and regular dental visits. Periodontitis usually occurs due to lack of awareness and inadequate glycemic control.Oral self-care and use of dental services were poor among participants.

Diabetic treatment consists of diet, oral hypoglycemic agents, insulin or combination of any two or three. In this study, 24.8% were under insulin therapy, 40.4% of oral hypoglycemic agents and 11.2% are on a combination of both.

This study was undertaken to assess the periodontal disease experience among diabetes patients in Coimbatore city where a total of 250 patients with diabetes were enrolled in this study, of which only 175 patients were available for review. Of the 250 subjects, 59.6% (N=149) were male and 40.4% (N=101) were female and the results were tabulated and statistically analyzed. The mean age of subjects was found to be 57.43 ± 11.65.

Type 2 DM (NIDDM) is the most common form of diabetes observed in any population, (98.8%) when compared to Type 1 (IDDM) which accounted for 1.2% of all enrolled cases.

The proportion of those who brushed more than twice daily was 2.80% which improved on review(12%).The rate of twice daily brushing was 23.60% which had increased profoundly after reviewing to 31.4%. 74.6% patients used to brush once daily which after the review was noted to be 56.6%. The association between diabetes control and toothbrushing frequency suggests that the dental health education is important, especially in diabetic patients with poor control. Hence, it is important to improve the tooth-brushing frequency in this population which essentially depends on compliance with diabetes self-care practices. These results obtained in our study was similar to the results obtained in the study conducted by Ashish Aggarwal and Sunil R Panat[9]in which a total of 500 patients were included and, out of which 49% reported brushing once daily, as compared with 22% that brushed twice daily and 11.4% that brushed more than twice daily.

Unfortunately, our study participants visited their dentists only when they had a severe symptom which agreed to the findings of other authors. This study found that the patients with irregular

dental visits had more oral complications like bleeding, dental caries etc. Thus good plaque control and regular dental visits are important in preventing and treating periodontal diseases. 36% of participants visited dentists more than 12 months ago. Only 21.6% of our patients had visited the dentist for a regular dental check-up, which is lower than the proportion reported by Swathi Kejriwal, Rahul Bhandary *et al.*[10](27%).

In our study, only 86.8% of patients reported using fluorinated toothpaste as this study was conducted in an urban setting, where most patients were aware of the importance and advantage of brushing with toothpaste.

In our study, 16.4% of patients only reported the used of interdental cleaning agents which agree with the findings of Soheila Bakhshandeh, Heikki Murtomma *et al.*[11]and Ashish Aggarwal and Sunil R. Panat *et al.*[9]As brushing cannot reach proximal and interdental areas, use of interdental cleaning agents should be encouraged in order to reduce dental caries and periodontal diseases. Lack of information and financial difficulties can contribute to inadequate oral hygiene. Hence, the use of interdental cleaning agents must be promoted in diabetic patients, in particular, to establish healthy habits, thereby preventing periodontitis.

Cigarette smoking and alcohol consumption is known to affect the oral microflora adversely. However, smoking is an established risk factor for periodontitis in both healthy and diabetic patients and can be reduced by various health promotion programs. In our study, it was found that 18.8% of patients were smokers and 21.2% of patients were alcoholic and this result was consistent with the findings obtained by Paul A. Moore, Trevor Orchard*et al.*[12]which reported the prevalence of smoking among diabetes as 19%.

The present study showed that a large majority of the participants had never been informed of the association between diabetes and oral health: almost 12.8% believed that diabetes had no influence on their oral health. Only a few participants knew beforehand that diabetes affects their periodontal status and causes dry mouth. In addition, 56% of participants reported that their dentist wasn't aware of their diabetes diagnosis and this was in accordance with a study carried out by Paul A. Moore, Trevor Orchard *et al.*[12]. This can be due to improper collection of patient history or because of patient reluctance to disclose a diabetes diagnosis while visiting the dentist. This reluctance is because the patients feel that there is no need for the dental professionals to

know about their diabetic status, which is plausible as most patients believed that there was no association between diabetes and oral health.

Oral hygiene was considered to be poor among the study participants. Dental caries and periodontal disease are the major factors which cause tooth loss. Diabetes can also be a cause of tooth loss even without caries because of the insufficient blood supply of gingival and disturbance of gingival health.

When diabetes is not under control, high levels of glucose in saliva may help bacteria thrive causing repeated acid attacks which can lead to dental caries. In our study, it was found that dental caries are the most commonly faced dental problem and so the most effective method for the prevention of dental caries, periodontal disease, and any other oral complications is to brush regularly.

Dry mouth known as xerostomia, is an unpleasant symptom and has a negative impact on the general quality of life and is a most common oral manifestation of diabetes. Dry mouth causes bad breath, burning sensation of the tongue, difficulty in speaking, eating and swallowing, dry lips, taste alterations, increased caries formation. In our study many patients had dry mouth sensation which meant that they were under risk of developing caries.

The most frequent reason for the recent dental visit in our study was pain and emergency, followed by tooth extraction which was in accordance with the study carried out by Thorstensson *et al.*[13] which stated that many diabetic patients fail to visit their clinician annually and that they require more emergency treatment than non-diabetic patients. Hence, a physician referral is an important factor for having a dental visit within the past 12 months. So, oral self-care and awareness of the need for regular dental checkups are necessary to cope with the increased risk of periodontal diseases.

There is a close relationship between oral complications and diabetic age. For this reason, educating newly diagnosed diabetic patients about oral health is important in reducing the risks of oral complications. 4% of the diabetics had diabetes for less than 1 year, 44% had diabetes for 1-5 years and rest had diabetes for more than 5 years.

The present study has many limitations like response bias which can influence individuals to over-report dental visits, brushing and flossing behaviors. The patients who appeared for the review session were few as they were reluctant to do so. No objective clinical data were available or collected to support the results obtained from the self-report questionnaire. Both inpatients and outpatients details were collected and outpatients were not that co-operative in responding to our questionnaire as most of them appeared busy. We had recruited patients with diabetes mellitus and hence, there were also patients without oral health complications. As the study was short duration, it cannot be used as strong evidence in dealing with HbA_1C and oral complications.

It is essential for the dialecticians to raise awareness among diabetic patients about the oral disease and also educate them about the importance and necessity of early detection and treatment of tooth caries, periodontal disease, and other oral diseases.

Our study has made an attempt to determine the association between type 2 DM and periodontal disease and it can be said that periodontal disease was more prevalent and severe in type 2 DM.

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