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Association between Normative Oral Health Status and Self - Rated Oral Health among Type 2 Diabetes Mellitus Patients Attending a Teaching Dental Hospital

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Abstract: ***Background: Type 2 diabetes mellitus is a multisystem disorder and a life style disease which requires a multipronged approach for its management, where in patient awareness and self – care practices have an important role to play to reduce burden of disease and its complications. Self-rated oral health is a valid and useful summary indicator of overall oral health status and quality of life. However, few studies on perception of oral health have been conducted among adults. Objective: To determine the association between oral health status and self-rated oral health among type 2 diabetic mellitus patients. Methods: A purposive sampling method was adopted in a teaching dental hospital to meet the sample size of 250 patients. The data was collected among individuals above the age 35yrs through global self-rated oral health assessment tool[1] and the oral health status was assessed based on WHO criteria 2013. Results: 41.2% respondents reported their self - rated oral health status as good. Clinical data demonstrated that 47.2% had dental caries; periodontal pockets were seen in 91.2%, followed by gingival bleeding observed among 78.4% of the participants.20% of participants were denture wearers. Dental caries and edentulism were significantly associated with poor self - rated oral health. Conclusion: Self - rated oral health is consistent with objective health status and can serve as a global measure of health status in the general population. There was association seen between oral health status and self – rated oral health. However, the association was significant for some parameter like dental caries and edentulism. The evaluation of these parameters may be a useful approach in routine dental examination to improve self-rated oral health.***

Keywords: type 2 diabetes mellitus, oral health status, self-rated oral health

1. Introduction

India leads the world with largest number of diabetic patients earning the dubious distinction of being termed ‘diabetes capital of the world’. Diabetes mellitus (DM) is a common chronic metabolic disorder commonly categorized as insulin-dependent diabetes mellitus and noninsulin-dependent diabetes mellitus. Type 2 diabetes is noninsulin dependent. It is the most common type of diabetes and is often associated with obesity. It is characterized by slow onset of symptoms, usually after 40 years of the age. Other less prevalent forms of diabetes include gestational diabetes seen during pregnancy.2

According to a World Health Organization (WHO) 80 % of diabetes deaths occur in low and middle-income countries and projects that such deaths will double between 2016 and 2030. India has a challenge to face because increase is estimated to be 58% from 51 million people in 2010 to 87 million in 2030.3

Normative oral health is a traditional method used to measure oral health on the basis of clinical standards which are limited, as they do not consider the psychosocial and functional aspects of oral health. It has been recommended that these measures be supplemented by data obtained from patients, comprising their subjective perceptions regarding self – rated oral health.4
Diabetic patients despite being on non-cariogenic diet are liable to periodontal disease, odontogenic abscesses and soft tissue lesions of the tongue and mucosa compared to healthy people, due to improper oral hygiene, increased glucose level in blood, impaired functioning of salivary glands and ultimately resulting in dryness of mouth.5 The absence of copious saliva may result in minimizing buffer activity which promotes remineralization of tooth structures early in the caries process and resulting in substantial increase in the caries risk.6

Oral health is a component part of general health and essential for well-being. Poor oral health and oral diseases result in pain, difficulty in speaking, chewing and swallowing, physical discomfort and occasionally tooth loss. Self-reported oral health is a subjective measure of an individual’s perception of his or her oral health.7 A person’s beliefs, characteristics and behaviors will predict one’s perception of oral health. Patients’ perceived oral health is considered a useful measure of outcome in dentistry because of its relation to individual’s oral hygiene practices and oral health care seeking behavior, both of which are necessary for optimal oral health[8.] This becomes all more important in type – 2 diabetic patients where oral health will be compromised.

The aim of this study was to determine the association between oral health status and self-rated oral health among type 2 diabetic mellitus patients.

2. Methodology

The present cross – sectional study was conducted in May and October 2017for the period of 6 months**.** Ethical clearance was obtained by the review board. A written informed consent was obtained from the study subjects.

Inclusion criteria were subjects with type II diabetic mellitus who were ≥ 36 years because type 2diabetes occurs most often in middle-aged and older people.9 and those who have a minimum of 12 functional teeth in the oral cavity. We excluded patients who have other systemic diseases, patients

with intellectual impairments and immune-compromised patient. Sample size estimated by the following formula □= (Z a/2+ Z β) ^{2}p (1-p) / d^2; where p=0.09.1^0 Hence, the estimated sample size was 250. A purposive sampling technique was used to select the study subjects reporting to outpatient department. The data was collected by oral examinations and structured questionnaires.

A pilot study was conducted among 25 participants prior to the study in the same setting for assessing the feasibility of the questionnaire and to estimate the time required for oral examination and they were not included in the main study. A self-administered, structured questionnaire was designed both in English and Kannada, to record the demographic details, socioeconomic status and opinion of dental patients regarding self – rated oral health ("**How would you describe the state of your teeth and gums?"** and study participants responded on a 5 point likert scale ranging from excellent to poor). Following the questionnaire, oral examination was conducted in Department of Oral medicine and Radiology using mouth mirror and CPI probes according to WHO proforma – 2013.

Statistical analysis:
Data collected during the survey was entered into excel sheet and was subjected to statistical analysis. The results were analysed using SPSS 22 (SPSS Inc. Chicago, IL, USA) in frequencies and percentage described as basic information and chi square test was also performed to find association between clinical parameters with self – rated oral health status question. $P < 0.05$ was considered as the level of significance.

3. Results

Among study participants, 113 (45.2%) belonged to 46-55 years, 62 (24.8%) to 56-65 years and 21 (8.4%) to 36-45 age group. With regard to gender, female were 52.4% and males were 47.6% [Table 1]. It was found that, 69 (27.6%) were uneducated, 46 (18.4%) had primary education, 36 (14.4%) had high school education, 19 (7.6%) were graduate & post graduate and 15 (6%) had professional education. In the present sample, 35 (14.0%) were skilled workers, 17 (6.8%) were professionals and 60 (24%) were retired/unemployed. Out of 250 study participants, 35 (14.0%) had income 10, 357-15, 535 per month, 38 (15.2%) had 6214-10356 per month and 17 (6.8%) had income >41, 440 per month according to revised kuppuswamy scale 2016 [Table 2].

56 (22.4%) of diabetic mellitus patients in the current study rated their oral health as excellent, 103 (41.2) rated their oral health as good, 52 (20.8%) rated their oral health as average, 27 (10.8%) as poor, 12 (4.8%) as don't know [Table no 3].

Table – 4 illustrates association between clinical parameters and self – rated oral health.78.4% participants had gingival bleeding, 91.2% had periodontal pockets, 86% had loss of attachment, 47.2% had DMFT score ≥1, 7.2% had fluorosis, 7.2% had trauma, 2.8% had erosion and 20% were denture wearers. DMFT score ≥1 and partial edentulousim were two parameters which were significantly associated with good, average or poor self – rated oral health and majority of the subjects who rated their oral health as excellent showed DMFT score zero. Gingival bleeding, periodontal pocket and loss of attachment were significantly associated with good self – rated oral health.

Table 1: Distribution of study population according to their age and gender

Age group	Frequency	Percentage
36-45	21	8.4
46-55	113	45.2
56-65	62	24.8
66-75	53	21.2
Gender		
Male	119	47.68
Female	131	52.4

Table 2: Distribution of study participants based on education, occupation, income

Category		Frequency	Percentage
Education	Illiterate	69	27.6
	Primary school	46	18.4
	Middle school	37	14.8
	High school	36	14.4
	Intermediate/post high school diploma	28	11.2
	Graduate/Post-graduate	19	7.6
	Profession/honours	15	6.0
Occupation	Unemployed	60	24.0
	Unskilled	50	20.0
	Semiskilled	37	14.8
	Skilled worker	35	14.0
	Clerical, shop owner, farmer	27	10.8
	Semi professional	24	9.6
	Professional	17	6.8
Income /month	<2092	2	0.8
	2092-6213	46	18.4
	6214-10356	38	15.2
	10357-15535	35	14.0
	15536-20714	28	11.2
	20715-41429	24	9.6
	>41430	17	6.8

Table 3: Distribution of study population according to Self – Rated Oral Health

	Frequency	Percentage
Excellent	56	22.4
Good	103	41.2
Average	52	20.8
Poor	27	10.8
Don't Know	12	4.8

Table 4: Distribution of clinical parameters based self – rated oral health of study participants

Clinical Parameter		Excellent	Good	Average	Poor	Don't Know	P-value#
Bleeding	Present	51	84	34	17	10	<0.05*
	Absent	5	19	18	10	2	
Periodontal Pocket	Present	57	83	52	25	11	<0.05*
	Absent	4	10	5	1	2	
Loss of attachment	Present	49	91	43	23	9	0.686
	Absent	7	12	9	4	3	
DMFT	0	43	46	15	4	12	<0.05*
	≥ 1	14	39	36	23	6	
Fluorosis	Present	2	2	8	5	1	<0.05*
	Absent	55	93	47	25	12	
Trauma	Present	3	8	4	1	2	0.354
	Absent	53	92	50	25	12	
Erosion	Present	1	1	2	2	1	0.29
	Absent	61	94	51	27	10	
Oral mucosal lesions	Present	2	4	3	2	2	0.50
	Absent	54	97	49	24	12	
Edentulous	Present	2	13	13	20	2	<0.05*
	Absent	54	90	37	14	5	

4. Discussion

Evidence points to a vicious cycle of diabetes and oral health status exacerbating each other, which ultimately brings the diabetics to the attention of oral health practitioners.1[1] Furthermore, the management of diabetic mellitus is largely dependent on patients' ability of self-care in their daily lives, which is often better when the patient is aware regarding the importance of oral health. Therefore, patient awareness regarding their oral health status is always considered as an essential element. Hence patient awareness was assessed using a tool such as self rated oral health in the present study.

The present study consisted of females 52.4% and males 47.6%. This may be because the study was done in a hospital and females have higher utilization rate. Study done by Fukai K et al revealed that females more frequently utilize dental care services than males and are more likely to show compliance behaviour than males.1[2]

The age of the study population ranged from 35 to 79 years, and most of the subjects in the present study were in the age group of 46–55 years. This may be because middle-aged and older adults are at the highest risk for developing type 2 diabetes.1[3]

In the present survey, majority of the study subjects were literate (72.4%). Majority of participants in the study were employed (76%). Better education may contribute to better understanding of the nature of the disease, better coping with the disease, and eventually better diabetes care overall.1[4] However, diabetes and many other chronic diseases show a higher prevalence among groups of low socioeconomic status (SES).1[5]

Self-assessed oral health helps in identifying the importance of the regular dental check-up, assists the dentists in assessing the routine diagnostic procedures to determine required treatment needs and is helpful in collecting the information related to oral health.1[6] In the present study self-rated oral health was assessed by a single-item questionnaire. According to study results 41.2% rated their oral health status as good and fewer numbers of participants rated as poor. i. e., 10.8%. These findings are in consistent with results of the Kojima A[17]et al and Ohara Y[18] et al where 46.2% and 44.8% rated their oral health status as good respectively.

In the present survey, on oral examination it was found that gingival bleeding was present in 78.4 % and these findings are accordance with Hintao J et al (72%). The reason could be for an increased risk of developing gum disease because of uncontrolled blood sugar levels which can creates a breeding ground for bacteria, increasing the risk of gum diseases.1[9] However, all these 135 patients out of 192 considered their oral health excellent/good in spite of having gingival bleeding.

Periodontal disease has been recognized as the sixth complication of diabetes.2[0] Inthe present study 91% had periodontal pocket and 86% participants had loss of attachment respectively. According to Shenoy et al[21] 87.6% of the subjects had periodontal pocket. The risk of severe periodontal destruction increases by threefold in type 2 diabetic mellitus because of abnormal polymorph nuclear leukocyte function, angiopathy, altered microbial flora, abnormal collagen metabolism, alterations in salivary flow and composition.2[2] However, not all these patients consider their oral health as poor in spite of having periodontal pockets and loss of attachment. Hence, it becomes important to eliminate local risk factors in these subjects to prevent periodontal disease. Anian[23] shows that the risk of periodontitis in diabetics can be reduced to 72.6% by minimizing plaque and calculus under professional care.

Dental caries is much less investigated and the results have been notably inconsistent compared to periodontal disease in subjects with diabetes. In the present study, the prevalence of dental caries among diabetics was found to be 47.6%. This was not in agreement with the studies of Gupta et al[24] where 76% had carious lesion. In a study by Moin M et al[25] it was suggested that 89% were at high level of risk for dental caries development. Consumption of more frequent meals in diabetic patients than normal patients and repeated intakes of even small amount of carbohydrates may be

cariogenic when coupled with elevated blood glucose level and hypo salivation.2[6] Dental caries had an association with poor self-rated oral health.

In present study, denture wearers were 20%. Edentulism is prevalent among older people all over the world.2[7]

In developing countries limited access to oral health services often results in tooth extraction because of pain or discomfort, or because of lack of materials for dental treatment. Removable dentures are particularly frequent among the older people.2[8] In India; prevalence of edentulousness of elderly has been reported as 19 % in the age group of 65–74 years.2[9] Other studies, Moore P. et al., have investigated the effects of Type 2 diabetes and its correlation with tooth loss and have summarize that the duration of Type 2 diabetes is associated with greater tooth loss.3[0] Tooth loss is an inevitable result of periodontal disease.3[1] Edentulousness is also significantly associated with poor self-rated oral health.

In this study, it was found that in spite of having gingival bleeding, periodontal pockets and loss of attachment, patients rated their oral health status as good but only edentulousness and dental caries had affected their self-rated oral health. This clearly demonstrates that participants lack knowledge that gingival bleeding is the first sign for the onset of periodontitis that eventually leads to formation of pockets and tooth loss.

Thus the result of the study implies that oral health education and preventive care should be incorporated in treatment plan of patients diagnosed with type 2 diabetes mellitus. Education regarding, oral complications related to diabetes and measures that can be taken to prevent these, such as avoiding tobacco use, importance of proper oral hygiene and receiving regular professional dental care.3[2]

Results of the study may not be generalized as the survey was done in a single hospital dental setting. There is possibility of social desirability bias as there werequestions related to socio-economic status. A prospective cohort or intervention study may provide information beyond what is presented here. There is an absolute necessity for adopting preventive dental health care programs among diabetics so as to minimize the prevalence of periodontal disease.

5. Conclusion

Self – rated oral health is consistent with objective health status and can serve as a global measure of health status in the general population. There was association seen between oral health status and self – rated oral health. However, this study demonstrated that dental caries, gingival bleeding, periodontal disease and edentulousness are common in Type 2 diabetics and the association was significant. Dental caries and edentulousness were associated with poor self – rated oral health. The evaluation of these parameters may be a useful approach in routine dental examination to improve self-rated oral health.

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