

TYPE 2 DIABETES MELLITUS;

Dental caries in patients.

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ABSTRACT... Objective: To determine the frequency and pattern of dental carries in patients with type 2 diabetes mellitus. **Design:** Cross sectional descriptive study. **Patients and methods:** Patients with history of type 2 diabetes mellitus for ≥ 02 years duration with ≥ 35 years of age and of either gender with dental pain visit at medical and dental outpatient department (OPD) of Liaquat University Hospital Hyderabad. The detail history was taken and the blood samples were taken for haemoglobin A1c (HbA1c) to assess the glycemic status. The existence of dental carries and its pattern was diagnosed through dental examination by consultant dentist had clinical experience ≥ 05 years. The data was collected on pre-designed proforma, entered and analyzed in SPSS version 11.00. **Results:** A total of 137 type 2 diabetic patients were selected for this study, out of these 82 were males and 55 females. The dental carries was found in 98 (71.5%) patients. Out of these ninety eight, 53 (54.08%) were males and 45 (45.92%) were female. Upper molar teeth involvement was present in 46 patients and lower molar teeth were involved in 52 patients. Dentine carries was seen in 35 patients, enamel carries in 19, white spot carries in 20 patients, pulpitis in 16 patients, and pulp capping in 8 patients. Involvement of individual teeth was also assessed, the upper molar involvement was present in 32 patients, premolar involvement was present in 11, incisor involvement in 03 patients. The lower molars were involved in 28 patients, lower pre molar in 21 and lower incisors in 03 patients. Dental carries was present in 43 (43.9%) patients in patients whose duration of diabetes was between 5-10 years, whereas those patients having duration > 10 years had 31.6% frequency of dental carries, while regarding duration of < 5 years only 24 (24.5%) patients had dental carries. **Conclusions:** The diabetic patients are more prone to acquire dental caries.

Key words: Diabetes mellitus, Dental carries, type 2 diabetes mellitus

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INTRODUCTION

Diabetes is a chronic disease, which occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces¹. There are an estimated 23.6 million people in the U.S. (7.8% of the population) with diabetes and 17.9 million being diagnosed,² 90% of whom are type 2³. With prevalence rates doubling between 1990 and 2005, CDC has characterized the increase as an epidemic⁴. Pakistan is estimated to have 7 million people with diabetes. Currently it is 8th in the world according to WHO estimation of prevalence of diabetes and by the year 2025 is expected to be 4th with 15 million people with diabetes, representing a 2 fold increase in caseload⁵. It is also one of the most common chronic diseases affecting children with about 200 children world-wide develop type 1 diabetes every day⁶. Diabetes is a leading cause of morbidity and mortality in Pakistan. Shera et al have shown prevalence of

diabetes in the urban versus the rural areas was 6.0% in men and 3.5% in women against 6.9% in men and 2.5% in women, respectively. Newly diagnosed diabetes was 5.1% in men and 6.8% in women in urban areas and 5.0% in men and 4.8% in women in rural areas⁷.

Changed oral environment may cause increase in pathogenic bacteria and cause destruction of hard and soft tissues of mouth leading to cariogenic and gingival lesions⁸. Other common oral problems associated with diabetes include xerostomia, salivary gland dysfunction, increased susceptibility to bacterial, viral and fungal infection, periapical abscesses, loss of teeth, taste impairment, lichen planus, burning mouth syndrome and altered orthodontic tooth movements. These findings are associated with excessive loss of fluids due to polyuria, altered response to infection, altered

connective tissue metabolism, micro vascular changes and impaired saliva⁹. When the normal environment of the oral cavity is altered because of a decrease in salivary flow or alteration in salivary composition, a healthy mouth can become susceptible to dental caries and tooth deterioration. An increase in the rate of dental caries has been reported in young patients with diabetes and may relate to salivary dysfunction¹⁰. Nonetheless, an association existed between older adults with diabetes and active caries and tooth loss; this was even more significant in patients with diabetes having poor glycemic control¹¹. This study was conducted in type 2 diabetic population visit to dental OPD at tertiary care teaching hospital. Early evaluation and appropriate treatment can save the patient to acquire various complications.

PATIENTS AND METHODS

This cross sectional descriptive study was conducted in medical and dental outpatient department at Liaquat University Hospital Hyderabad from August 2011 to January 2011 on the patients with history of diabetes mellitus for ≥ 2 years duration attending the medical OPD as follow up visit. The inclusion criteria for the study were patient ≥ 35 years of age, known cases of diabetes mellitus (type2) present with dental pain, of either gender or patients who were agree and ready to give consent for participation in the study. The patients with improper history about missed tooth due to any cause, having habits of chewing pan, betel leaves, gutka or any other habits like these and patients with any inflammatory or febrile illness were considered in exclusion criteria.

A written consent was taken from all patients for participation in the study and all such patients who met the inclusion criteria were further had oral cavity examination by dental surgeon had clinical experience of ≥ 05 years duration. The examination was done with the assistance of dental surgeon under the good light and with all necessary instruments like dental probe and dental mirror etc. The diagnosis of dental caries

was made through a comprehensive assessment of all patient information by a visual examination of tooth surfaces. A dental probe or explorer was used to provide tactile information¹²⁻¹⁴. Caries in between adjacent teeth were visualized using bitewing radiographs or using light sources via transillumination. Caries diagnosis is based principally on clinical examination and review of radiographs¹⁴. The caries was considered to be present when any lesion had a detectable softened floor, undermined enamel and softened walls. The lesion must be clearly visible and probe point must have entered into the lesion with certainty. Regarding ethical justification, all the expenses of the study were paid by the cooperation of whole research team. The frequency and percentage was calculated for dental caries in diabetes mellitus type 2 as well as for gender distribution. The chi-square test was applied between categorical variables at 95% confidence interval and the p-value ≤ 0.05 was considered as statistically significant.

RESULTS

A total of 137 type 2 diabetic patients were selected for this study, out of these 82 were males and 55 females. The mean age \pm SD of patients was 42.63 ± 5.73 . The dental caries was found in 98 (71.5%) patients shown in Table 0I. Out of these 98 a total of 53 (54.08%) were males and 45 (45.92%) were female. Upper molar teeth involvement was present in 46 patients (30 male and 16 female) and lower molar teeth were involved in 52 patients (23 males and 29 females) respectively shown in Table II. We also assessed the stages of dental caries in all patients, dental caries was seen in 35 patients, enamel caries in 19, white spot caries in 20 patients, pulpitis in 16 patients, and pulp capping in 08 patients shown in Table-III.

Involvement of individual teeth was also assessed, the upper molar involvement was present in 32 patients (25 male and 07 female), pre molar involvement was present in 11 (03 males and 08 females) and upper

incisor involvement in 03 (01 female and 02 males) shown in Table-IV. The lower molars were involved in 28 (8 male and 20 females) patients, lower pre molar in 21 (13 male and 08 females) and lower incisors in 3 (02 male and 01 female) shown in Table-V. We also assessed the relationship between the presence of dental carries and duration of diabetes mellitus. Dental carries was present in 43 (43.9%) patients in patients whose duration of diabetes was between 5-10 years, whereas those patients having duration >10 years had 31.6% frequency of dental carries while the duration of <5 years, only 24 (24.5%) patients had dental carries shown in Table-VI. The HbA1c was raised in 79 patients, of which 29(36.7%) had duration of diabetes for less than 05 years, forty two (53.2%) patients had duration of diabetes for 05-10 years and 08(10.1%) had duration of diabetes for >10 years as shown in Table-VII. The relationship between dental carries and HbA1c is shown in Table-VIII.

	Gender		Total	P-value
	Male	Female		
Dental caries				
Yes	53(64.9%)	45(81.8%)	98(71.5%)	0.02*
No	29(35.4%)	10(18.2%)	39(28.5%)	
Total	82(100%)	55(100%)	137(100%)	

Table-I. Frequency of dental caries in diabetes mellitus
*P-value statistically significant.

	Gender		Total	P-value
	Male	Female		
Teeth				
Upper	30(56.6%)	16(35.6%)	35(35.7%)	0.03*
Lower	23(43.4%)	29(64.4%)	52(53.1%)	
Total	53(100%)	45(100%)	98(100%)	

Table-II. Distribution of teethes in relation to gender
*P-value is statistically significant

	Gender		Total	P-value
	Male	Female		
Stage				
Dentine carries	23 (43.4%)	12 (26.7%)	35 (35.7%)	0.03*
Enamel carries	05 (9.4%)	14 (31.1%)	19 (19.4%)	
White spot carries	09 (17%)	11 (24.4%)	20 (20.4%)	
Pulpitis	11 (20.8%)	05 (11.1%)	16 (16.3%)	
Pulp capping	05 (9.4%)	03 (6.7%)	08 (8.2%)	
Total	53 (100%)	45 (100%)	98 (100%)	

Table-III. Stages of caries in relation to gender
*P-value is statistically significant

	Gender		Total	P-value
	Male	Female		
Upper teeth caries				
Molar	25 (83.3%)	07 (43.8%)	32 (69.6%)	<0.01*
Premolar	03 (10%)	08 (50%)	11 (23.9%)	
Incisor	02 (6.7%)	01 (6.3%)	03 (6.5%)	
Total	30 (100%)	16 (100%)	46 (100%)	

Table-IV. Pattern of upper tooth caries in relation to gender
*P-value is statistically significant

	Gender		Total	P-value
	Male	Female		
Lower tooth caries				
Molar	08 (34.8%)	20 (69.0%)	28 (53.8%)	0.04*
Premolar	13 (56.5%)	08 (27.6%)	21 (40.4%)	
Incisor	02 (8.7%)	01 (3.4%)	03 (5.8%)	
Total	23 (100%)	29 (100%)	52 (100%)	

Table-V. Pattern of lower teethe caries in relation to gender

**P-value is statistically significant*

	HbA1c		Total	P-value
	Raised	Normal		
Duration (yrs)				
<05	29 (36.7%)	18 (31.0%)	47 (34.3%)	<0.01*
5-10	42 (53.2%)	11 (19.0%)	53 (38.7%)	
>10	08 (10.1%)	29 (50.0%)	37 (27.0%)	
Total	79 (100%)	58 (100%)	137 (100%)	

Table-VII. The relationship between duration of diabetes and hba1c in patients with type 2 diabetes mellitus

**P-value is statistically significant*

	Dental carries		Total	P-value
	Yes	No		
Duration (yrs)				
<05	24 (24.5%)	23 (59.0%)	47 (34.3%)	<0.01*
5-10	43 (43.9%)	10 (25.6%)	53 (38.7%)	
>10	31 (31.6%)	06 (15.4%)	37 (27.0%)	
Total	98 (100%)	39 (100%)	137 (100%)	

Table-VI. The dental caries in relation to duration of diabetes

**P-value is statistically significant*

	HbA1c		Total	P-value
	Raised	Normal		
Dental carries				
Yes	64 (81.0%)	34 (58.6%)	98 (71.5%)	<0.04*
No	15 (19.0%)	24 (41.4%)	39 (28.5%)	
Total	79 (100%)	58 (100%)	137 (100%)	

Table-VIII. The dental caries in relation to HbA1c

**P-value is statistically significant*

DISCUSSION

Dental caries and salivary factors have attracted less interest, and the results are divergent as to whether caries risk is different or salivary factors are affected in diabetic patients. Equal caries rates in diabetic patients and controls have been reported in many studies,^{5,16} a

higher caries risk among diabetic patients than healthy controls has also been demonstrated^{17,18}.

The present study revealed that glucose levels was higher in diabetic patients with dental carries and their HbA1c was also raised given an evidence of persistent raised blood sugar level, the finding is consistent with the study by Iqbal, et al¹⁹. The differences in oral health between patients with diabetes and non diabetic subjects have been intensively studied. Widespread

agreement exist about the increased risk for dental caries among patients with diabetes, although this view has not been supported unanimously, some authors have estimated that the risk of dental caries is about 3 folds in patients with diabetes compared to non diabetics, but these results have been obtained from type 2 study populations and may not be generalized,²⁰ the same observation is also appeared in the present study.

In our study, the dental caries was predominant in molar tooth in both upper (69.6%) and lower (53.8%) teethes of patients with diabetes mellitus, the observation is consistent with the study published in 2008²¹. Few studies have documented that the difference between diabetic and control subjects with respect to dental caries may not be evident until the age of 30 to 40 years^{22,23}.

In current series the mean age of population was 42.63 ± 5.73 whereas Karjalainen, et al compared the diabetic patients with controls in ten years age subgroups between 40 and 70 years and was reported that dental caries began earlier in diabetics than in control and that the difference were most obvious in the age group or 40 to 49 years²⁴. The role of diabetes as a predisposing or modifying factor with respect to the intensity of the host response initiated by local etiology has been confirmed, it was found that the accumulation of plaque was faster and its microbiological composition was different in diabetic then control. Diabetic patients have more microorganism colonies in their periodontal pockets. Poor glycemic control is strongly associated with dental caries. As it was show by a group of subjects with HbA1c >8.5 , the presence of dental caries was more distinctly associated with higher level of streptococcus mutans and lactobacilli than the group of subjects with HbA1c <8.5 ²⁵. The reducing effect of glucose on collagen synthesis by odontoblasts was established in vitro in a tissue culture system²⁶. Glucose was observed to reduce the rate of collagen

synthesis, which effect was independent of the insulin concentration in the culture medium²⁶. Sugar reduced dentine formation in diabetic animals because of delayed wound healing and impaired collagen synthesis²⁷. Hyperglycemia, may reduce dentine opposition and aggravating caries progression, the preventive role of fluoride is that it inhibits sugar up take by microorganism²⁸. Regarding staging, the majority of patients in present study had dentine (35.7%) and enamels (19.4%) caries. The process occurring inside the caries lesion in dentine is much more complicated than those occurring in the decalcified portion of the caries lesion in enamel. Papas, et al found that, in older adults, frequent consumption sugar was associated with the presence of more root surface caries, and that older adults with more root surface caries also reported to have higher total sugar and sticky sugar intake²⁹. However, the relation between sugars and dental caries prevalence is dynamic, and there are other factors that may influence caries risk, such as fluoride exposure and eating patterns, among others, which may interact and affect caries development. We were unable to account for these factors in our study. In addition, dental caries is a chronic disease that may take years to develop.

Therefore, it is important to identify patients who may be at particularly high risk of dental caries. Diabetes mellitus, a significant public health problem in its own right, may increase one's susceptibility to dental caries. In addition, people with diabetes are also more prone to infections, including dental abscesses that result from progressive dental caries. Unfortunately, there is sparse longitudinal population-based data that would allow a temporal evaluation of the association between diabetes diagnosis and subsequent risk of dental caries. However, cross-sectional data may provide information regarding this relationship that may prove valuable for clinical practitioners to identify subpopulations at high risk of suboptimal oral health, such as a greater prevalence of severe dental caries among diabetic patients.

CONCLUSIONS

Poor glycemic control and significantly increase value of HbA1c in diabetic patient is associated with more number of carious teeth. There is a need for frequent and periodic dental examination among the patients with type 2 diabetes mellitus with poor glycemic control. Regular dental check-ups for preventive measures such as fluoride therapy, fissure sealant, regular medical follow-ups for proper control of metabolic abnormalities to decrease the occurrence of xerostomia, omission of carcinogenic substances from the dietary regimen, fluorination of the drinking water, and individual and group education of diabetic patients regarding proper dental hygiene are strongly recommended.

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