

Oral manifestations in type-2 diabetes and related complications

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ABSTRACT

Background: Knowledge of the wide spectrum of the oral markers of diabetes is imperative as one frequently encounters individuals with undetected, untreated or poorly controlled diabetes. **Objectives:** The objective was to study the oral manifestations in type 2 diabetes mellitus (DM) and to establish an association between oral manifestations and associated microvascular and macrovascular complications. **Materials and Methods:** 50 cases of DM were selected who had oral complications. The control group comprised 50 age- and sex-matched diabetic patients without any oral complications. **Results:** Oral manifestations in DM included periodontal disease in 34%, oral candidiasis in 24%, tooth loss in 24%, oral mucosal ulcers in 22%, taste impairment in 20%, xerostomia and salivary gland hypofunction in 14%, dental caries in 24%, and burning mouth sensation in 10% cases. Fasting [(FBG) ($P = 0.003$)] and postprandial blood glucose [(PPBG) ($P = 0.0003$)] levels were significantly higher among cases. The P values for neuropathy, retinopathy, nephropathy, cardiovascular disease, dyslipidemia, and sepsis were 0.0156, 0.0241, 0.68, 0.4047, 0.0278, and 0.3149, respectively, which were significant for neuropathy, retinopathy, and dyslipidemia. **Conclusions:** Several oral complications are seen among diabetics. Association of oral markers in DM and microvascular complications suggests that there is a significant association between the two.

Key words: Diabetes mellitus, dyslipidemia, neuropathy, oral complications, retinopathy

INTRODUCTION

Diabetes is a common disease with concomitant oral manifestations that impact dental care. Of greater concern is the ability of oral infections to profoundly affect metabolic control of the diabetic state.^[1] There is a need for all healthcare providers to know various manifestations in which diabetes mellitus (DM) can manifest orally so that they may detect and treat them as well as take positive steps to control the glycemic status of such patients.^[2] Oral manifestations of DM may be broadly categorized into two types: those affecting the hard tissues and those afflicting the soft tissues of the oral cavity.^[3]

MATERIALS AND METHODS

The present study included 50 cases of DM selected as per American Diabetes Association criteria who had oral manifestations. The control group comprised 50 age- and sex-matched diabetic patients without any oral complications. Nondiabetics, diabetic patients with carcinoma of oral cavity, and those taking tobacco were excluded from the study.

A detailed medical history was taken and general examination was done. The patients were then subjected to the following investigations: complete hemogram, complete urine examination, serum urea and creatinine FBS/PPBS, fasting serum lipid profile, S.G.P.T, Micral test, X-ray chest P.A. view, 12 lead E.C.G, fundus examination, 2D echocardiography, and blood culture with special reference to detection of oral manifestations, cardiovascular manifestations, and detection of microvascular and macrovascular complications of diabetes was carried out in both cases and controls.

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Data were analyzed with appropriate statistical methods. The chisquare test and two sample proportion test were used to calculate the *P* value.

RESULTS

A total of 50 cases of DM with oral manifestations were analyzed; the majority were observed to have periodontal disease- 34%, followed by oral candidiasis in 24%, tooth loss in 24%, and dental caries in 24%. Other complications included oral mucosal ulcers in 22%, taste impairment in 20%, halitosis in 16%, xerostomia and salivary gland hypofunction in 14%, and burning mouth sensation in 10% as shown in Table 1.

On comparison of blood glucose status, it was observed that the FBG as well as PPBG levels were raised in subjects compared to controls. A significant difference was observed between FBG ($P = 0.0031$) and PPBG values ($P = 0.0003$) among diabetics with and without oral manifestations [Table 2].

Cases having complications of diabetes like diabetic neuropathy, diabetic retinopathy, diabetic nephropathy, cardiovascular diseases, dyslipidemia, and sepsis were 68%, 50%, 46%, 40%, 62%, and 10%, respectively [Figure 1]. The *P* values for neuropathy, retinopathy, and dyslipidemia were 0.0156, 0.0241, and 0.0278, respectively which were found to be significant. The *P* value for nephropathy was 0.68, cardiovascular disease 0.4047, and sepsis 0.3149; hence no significant association was seen between these complications and oral manifestations of diabetes. Complications of diabetes were most commonly associated with periodontal disease.

DISCUSSION

In the present study oral manifestation was significantly higher among diabetics. Microvascular and macrovascular complication was higher among diabetics with oral complication compared to DM without oral complication. These manifestations were significantly associated with higher FBG and PPBG levels.

Chandna *et al.*^[4] also showed periodontitis to be a recognized complication of diabetes and it was more common in individuals with elevated glucose levels. Shrimali *et al.*^[5] observed hyposalivation as the most common oral manifestation, seen in 68%, followed by halitosis in 52%, periodontitis in 32%, burning mouth sensation in 32%, candidiasis, and taste alteration in 28% of cases with controlled DM. In the same study, subjects with uncontrolled DM also presented with these manifestations,

Table 1: Distribution of oral manifestations in cases of diabetes mellitus

Oral manifestations	Number of cases (%)
Periodontaldisease	17 (34)
Oral candidiasis	12 (24)
Tooth loss	12 (24)
Oral mucosal ulcer	11 (22)
Taste impairment	10 (20)
Halitosis	8 (16)
Xerostomia and Salivary gland hypofunction	7 (14)
Dental caries	12 (24)
Burning mouth sensation	5 (10)

Table 2: Comparison of blood glucose status in cases and controls

FBS (mg/dl)	Cases (n = 50)	Controls (n = 50)	<i>P</i> = 0.0031
Mean	168.25	137.46	
SD	52.24	49.23	
PPBS (mg/dl)	Cases (n = 50)	Control (n = 50)	<i>P</i> = 0.0003
Mean	215	177	
SD	55.74	43.99	

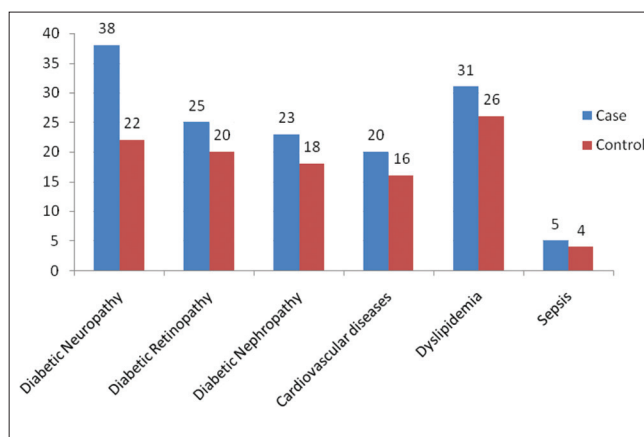


Figure 1: Comparison of complications of diabetes mellitus in cases versus controls

with hyposalivation seen in 84%, followed by halitosis in 76%, periodontitis in 48%, taste alteration in 44%, candidiasis in 36%, and burning mouth sensation in 24%. Hence these manifestations were more in uncontrolled diabetics. Maiké *et al.*^[6] suggest that the incidence and severity of periodontitis are influenced by the presence or absence of DM, as well as the severity of hyperglycemia. These studies also indicate that the existence of severe periodontitis may adversely influence the control of DM.

In a study by Brian *et al.*^[7] among 2273 diabetics, the prevalence of periodontal disease was found to be 60%; the incidence of periodontitis being 2-6 fold higher. Tsai *et al.*^[8] reported that among 4343 diabetics aged 45-90 years, individuals with poorly controlled diabetes had a significantly higher prevalence of severe periodontitis

than those without diabetes and its related complications. Ashraf *et al.*^[9] studied a total of 284 patients with diabetes, out of whom 68% cases had increased prevalence of periodontal diseases.

The present study showed significant association between cases and neuropathy, retinopathy and dyslipidemia. In the study by Ashraf *et al.*,^[9] increased prevalence of diabetes-related complications like cardiovascular disease, retinopathy, nephropathy, peripheral, and autonomic neuropathy was observed during a 2 year follow-up period. Retinopathy was significantly more common in patients with diabetes along with oral complications (40%) while microalbuminuria (28%) and hypertension (36%) were significantly less common in the study by Maiké *et al.*^[6] Rates of peripheral and autonomic neuropathy were 57% in DM. In the present study retinopathy, nephropathy, and hypertension were found to be more prevalent most probably due to the longer median diabetes duration of 7.6 years as compared to 6.8% in the study by Maiké *et al.*

Numerous contributing factors are responsible for increased susceptibility of diabetics to periodontal diseases. Compromised polymorphonuclear leukocyte function resulting from impaired neutrophil adherence, chemotaxis, and phagocytosis prevent destruction of bacteria in the periodontal pocket and markedly enhance periodontal destruction^[10] Abnormalities of collagen metabolism, impaired proliferation of osteoblasts, and weakened mechanical properties of newly formed bone have been documented in hyperglycemic patients.^[3,11,12] Formation of advanced glycation end-products (AGE) is relatively common in sustained diabetes. AGE-modified arterial collagen immobilizes circulating low-density lipoprotein leading to atheroma formation. Production of AGE also leads to greater basement membrane thickness of the microvasculature hampering normal homeostatic transport across the membrane and result in higher production of vascular endothelial growth factor, either which add to microvascular complications of diabetes. Binding of AGE to macrophage and monocytes receptors (RAGE: Receptor for AGE), results in increased production of interleukin-1 and tumor necrosis factor- α that enhances vulnerability to tissue destruction.^[10,11] High levels of glucose in the gingival crevicular fluid diminish wound-healing capacity

of fibroblasts in the periodontium by hindering their attachment and spreading.^[10]

CONCLUSIONS

Significant oral complications were found in patients of DM. FBG and PPBG were significantly higher among diabetics with oral manifestations compared to those without. Microvascular and macrovascular complications of DM were found to be significantly higher among diabetics with oral diseases. The presence of oral manifestations in patients of DM indicates poorly controlled glycemic status and requires evaluation to detect long-term complications. Knowledge of oral comorbidity among people with diabetes is generally poor and suggests the need for appropriate health education and health promotion to improve the oral health of diabetic patients.

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