

# A study on Oral Manifestations in type II diabetes mellitus patients

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**ABSTRACT**--Diabetes, a heterogeneous group of chronic metabolic disorders, is characterized by abnormal high levels of blood glucose, resulting either due to deficiency of insulin secretion or due to resistance to the action of insulin, or both. Chronic hyperglycemia can result in a wide variety of complications, including oral complications. To assess the type and frequency of oral lesions occurring in patients with type 2 diabetes and correlate them with the control of diabetes. The present study included a total of 161 known diabetic patients attending the clinics of private practitioners in the past two years. A clinical data performa was designed to obtain demographic data, medical and dental history. Data on the duration of disease, type of diabetes, HbA1C values, any major complications, were retrieved from the medical records. An accurate examination of the mouth, analysis of the salivary, dental, periodontal conditions and of the prosthesis used was performed. All the data obtained was analyzed using descriptive analysis. The study comprised of 92 females and 69 males with age ranging from 25 to 86 years. Majority of the patients showed periodontal manifestations followed by tooth loss, dental caries and xerostomia. Most of the patients showing severe periodontal manifestations and evidence of candidiasis had HbA1C values  $\geq 8.5\%$  i.e. poorly controlled diabetes level. Prevalence of oral complications was significantly higher in diabetic patients, which can have a negative influence on their oral health, thus affecting their quality of life.

**Key words** --Diabetes mellitus, Hyperglycemia, Oral manifestations, Periodontal diseases.

## I. INTRODUCTION

Diabetes is a heterogeneous group of chronic metabolic disorders, characterized by abnormal high levels of blood glucose i.e hyperglycemia, resulting either due to deficiency of insulin secretion as a result of pancreatic  $\beta$ -cell dysfunction or due to resistance to the action of insulin in liver and muscles, or both.<sup>1,2</sup> The incidence of type II mellitus is expeditiously on the rise, with the WHO estimating the number of adults with diabetes to increase from 171 million in 2000 to 366 million by 2030 worldwide.<sup>3</sup> India with 41 million cases of diabetes i.e one-fifth of all the cases worldwide, has been called “the diabetes capital of the world”.<sup>4</sup>

Chronic hyperglycemia can result in a wide variety of complications, which can be broadly divided into two categories, microvascular complications like neuropathy, nephropathy, retinopathy and macrovascular complications like cardiovascular diseases, stroke, peripheral artery disease.<sup>5</sup> In addition, complications of diabetes

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also include conditions like dental diseases, reduced resistance to infections, and birth complications among women with gestational diabetes, which cannot be categorized in the two aforesaid categories.<sup>6</sup>

Diabetes can show a myriad of oral complications like xerostomia, tooth decay (including root caries), gingivitis, periodontal diseases, oral candidiasis, burning mouth, altered taste, geographic tongue, coated and fissured tongue, oral lichen planus, recurrent aphthous stomatitis, increased susceptibility to infections and defective wound healing.<sup>7-12</sup> Studies have shown that the intensity of diabetic complications is usually proportional to the degree and duration of hyperglycemia, and these complications have been found to be more prevalent in individuals with uncontrolled diabetes.<sup>9,13</sup> Impaired neutrophil function, increased collagenase activity, reduction in collagen synthesis, microangiopathy, and neuropathy are the possible mechanisms that have been associated with oral complications of diabetes.<sup>14</sup>

Literary evidence suggests that diabetes frequently predisposes an individual to oral health complications, which can have a direct adverse effect on the quality of life.<sup>15</sup> The present study was thus carried out to assess the type and frequency of oral lesions occurring in patients with type 2 diabetes and correlate them with the control of diabetes.

## II. MATERIALS AND METHODS

The present study included a total of 161 known diabetic patients attending the clinics of private practitioners in the past two years. The patients were explained about the study and their consent obtained. Patients with type 1 or gestational diabetes, immunocompromised patients were excluded from the study. Patients with no other severe health problem and willing to participate were included in the study. A clinical data performa was designed to obtain demographic data, medical and dental history with special reference to symptoms. Clinical data obtained by the physician or endocrinologist was also recorded. Data on the duration of disease, type of diabetes, HbA1C (glycosylated hemoglobin) values, any major complications, and type of diabetes therapy were retrieved from the medical records.

An accurate examination of the mouth, analysis of the salivary, dental, periodontal conditions and of the prosthesis used was performed by a single examiner to avoid inter-examiner variability. All the data obtained was analyzed using descriptive analysis.

## III. RESULTS

A total of 161 cases of diabetes mellitus with oral manifestations were analyzed. Most of the patients were on oral hypoglycemic drugs and diet modification. The study subjects comprised of 92 females and 69 males with age ranging from 25 to 86 years. The HbA1C levels of all the patients were  $\geq 6.5\%$ . A female predominance (57.14%) was seen. Table 1 shows the age and gender distribution of patients. Of the entire patient pool, 56 patients i.e. 34.7% wore dental prosthesis including fixed or removable, partial or complete dentures.

Majority of the patients showed periodontal manifestations (46.58%) followed by tooth loss (40.99%), dental caries (38.50%) and xerostomia (36.64%). Other complications seen were hyposalivation, taste alterations, burning mouth sensation, halitosis, oral mucosal ulcerations, oral candidiasis, hyperpigmentation, lichen planus and fissured tongue (Table 2). 2 patients also showed evidence of neoplasm (one pyogenic granuloma and one

irritational fibroma). Most of the patients showing severe periodontal manifestations and evidence of candidiasis had HbA1C values  $\geq 8.5\%$  (poorly controlled diabetes level).

**Table 1:** Shows the age and gender distribution of patients

Age range (years)	Male	Female
20-30	1	4
30-40	4	13
40-50	14	17
50-60	22	23
>60	28	35
<b>Total</b>	<b>69 (42.85%)</b>	<b>92 (57.14%)</b>

**Table 2:** Distribution of oral manifestations in cases of type II diabetes

Oral manifestations	Number of cases	Percentage
Periodontal diseases	75	46.58%
Xerostomia	59	36.64%
Taste alterations	31	19.25%
Burning mouth sensation	12	7.45%
Dental caries	62	38.50%
Tooth loss	66	40.99%
Halitosis	34	21.11%
Oral mucosal ulcerations	35	21.73%
Oral candidiasis	28	17.39%
Hyperpigmentation	19	11.80%
Fissured tongue	25	15.52%
Oral Lichen Planus	12	7.45%
Neoplasm	2	1.24%

#### IV. DISCUSSION

The present study showed an increased prevalence of oral lesions in patients with type 2 diabetes, which highlights the importance of monitoring their oral health. Majority of the patients in our study showed evidence of periodontal diseases, which usually results in teeth loss if not intervened at the appropriate time. Several authors have reported an increased prevalence of periodontal diseases among patients with diabetes.<sup>16-20</sup> This increased destruction of periodontium could be attributed to a variety of factors like alterations in the host immune inflammatory response, alteration in the function of immune cells, altered sub gingival flora, increased plasma glucose levels in gingival crevicular fluid (GCF) and formation of advanced glycation end products (AGE's).<sup>21</sup>

The adherence, chemotaxis and phagocytosis properties of neutrophils are diminished in diabetic patients, which hinders killing bacteria in the periodontal pocket, thus significantly increasing periodontal destruction.<sup>22</sup> Chronic hyperglycemia results in inhibition of osteoblastic cell proliferation and collagen

production, which results in decreased and inferior quality bone formation.<sup>23</sup> Increased GCF glucose levels inhibits the attachment and spreading of fibroblasts which are pivotal for wound healing and normal tissue turnover, thus directly hindering the wound-healing capacity of periodontium.<sup>21</sup> AGE's are formed in chronic hyperglycemia conditions by combination of proteins with glucose molecules which then undergo glycation, and these AGE's modify collagen. In hyperglycemia, fibroblasts produce decreased amounts of collagen and glycosaminoglycans. Moreover, this inferior quality collagen gets degraded by collagenase enzyme, which is active in diabetic individuals, thus affecting the normal healing process.<sup>24</sup> These AGE modified collagen also accumulates in the basement membrane of endothelial cells, arterial walls and bone thus, influencing the cellular structural, and functional characteristics.<sup>25</sup> Periodontal diseases have been designated as the "sixth complication of diabetes mellitus" due to its increased prevalence and severity typically seen in patients with diabetes with poor metabolic control.<sup>26</sup>

Xerostomia was the second most common symptom observed in our study, which was in accordance with several other studies.<sup>13,20,27-29</sup> This hyposalivation could be related to polyuria, autonomic neuropathies, microvascular changes, alterations in the basement membranes of salivary glands and substitution of functioning tissue by adipose tissue in major salivary glands.<sup>8,14,30,31</sup> These alterations would reduce saliva production qualitatively and quantitatively.<sup>29</sup> Factors like reduced salivary secretion, reduced cleansing and buffering capacity of saliva, increased carbohydrate content in saliva and increased levels of microorganisms like *Streptococcus mutans* and *Lactobacilli* can lead to an increase in the incidence of tooth decay, which was clearly evident in our study.<sup>32</sup> Similar increased evidence of dental caries have also been reported by Sandberg et al, Fernandes et al.<sup>16,33</sup> Dental caries could eventually result in tooth loss if not intervened. Moreover, few studies have shown that chronic hyperglycemia may cause irreversible pulpitis resulting in pulpal necrosis.<sup>7-9</sup>

In our study, taste alterations and burning sensation of mouth was also seen in patients. These taste alterations have been attributed to neuropathy and sensory dysfunction. Moreover, the deteriorated salivary functions can also result in altered taste perceptions and increase in the perception threshold.<sup>7,32</sup> Other mucosal alterations like mucosal ulcerations, fissured tongue, hyperpigmentation, oral lichen planus were also seen in our study. The vulnerability of diabetic patients to these oral cavity changes is still contentious, but factors like uncontrolled diabetes, immunological alteration, microcirculatory changes with decline of blood supply, xerostomia and alteration in salivary flow and composition have been implied.<sup>7</sup> In addition, patients with diabetes are more susceptible to a myriad of oral infections including candidiasis due to several factors like impaired defence mechanism, poor metabolic control, altered salivary flow and its anti-microbial properties.<sup>7,32</sup> Moreover, diabetics have propensity for predisposed local factors that cause damage to microvascularization, thus resulting in reduced blood supply, which can act as a predisposing factor for candidiasis.<sup>29</sup> Studies have also found that increase of glucose in saliva promotes greater adherence of fungi to epithelial cells, which also interfere with the defence mechanisms of neutrophils, thereby facilitating possible candidiasis in the presence of local predisposing factors.<sup>34-</sup>

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## V. CONCLUSION

Majority of the patients showed periodontal manifestations followed by tooth loss, dental caries and xerostomia. Other complications noted were hyposalivation, taste alterations, burning mouth sensation, halitosis,

oral mucosal ulcerations, oral candidiasis, hyperpigmentation, lichen planus and fissured tongue. Thus, prevalence of oral complications was significantly higher in diabetic patients, which can have a negative influence on their oral health, thus affecting their quality of life. Thus, patient education about the side effects and prevention along with management from the oral healthcare giver are necessitated to improve the oral health of diabetic patients.

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