Recent Advances in Diabetes Treatment

Avid Science
Chapter 2

Oral Considerations in Diabetes Mellitus

Arati Panchbhai
Sharad Pawar Dental College & Hospital, DMIMSDU, Sawangi-Meghe, Wardha, India

*Corresponding Author: Arati Panchbhai, Sharad Pawar Dental College & Hospital, DMIMSDU, Sawangi-Meghe, Wardha, India, Email: aratipanch@gmail.com

First Published December 16, 2015

Copyright: © 2015 Arati Panchbhai.

This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source.

Background

Diabetes mellitus (DM) is a major health concern today; worldwide the great concern is being expressed on the rising burden of people suffering from diabetes mellitus. In spite of the enormous oral morbidity seen in diabetes mellitus, the associations between diabetes and oral health are not being given much consideration. It is a universal disease with concomitant oral manifestations; hence the oral healthcare professionals are likely to be exposed to many patients with diabetes mellitus [1-3].

Pathophysiology of Oral Involvement

There are many mechanisms by which DM can affect the oral cavity. Pathophysiology of complication of diabetes is complex with heterogeneous progression. The homeostasis of oral cavity and the health of oral tissues is a function of saliva, both the composition and flow of saliva may be changed in diabetes to increase the susceptibility to oral ailments [4-8]. importantly, the hyperglycemia leads to glycation of the lipids, proteins and nucleic acid. An accumulation of advanced glycation endproducts (AGEs) alters the structural and functional properties of the tissues to modify the functions of the multiple cell types, their extra cellular matrix and interaction between them [4,5,9]. Diabetic membranopathy affecting the permeability of salivary gland membrane results in enhanced percolation of some of the components like glucose to raise their levels in saliva. The fatty infiltrations of salivary glands may lead to
decrease salivary flow rate in diabetes [4,5].

**Oral Manifestations in Diabetes Mellitus**

The oral tissues primarily involved by DM are oral mucosa, tongue, gingiva and periodontium. The oral manifestations commonly seen in diabetes mellitus includes mainly oral candidiasis, dental caries, boughy gingiva, gingival abscess, attachment loss, pus discharge, dry mouth, and burning tongue, the elderly patients may show the temperomandibular joint dysfunction and greater tooth loss especially when affected by diabetic neuropathy.4-13 In addition, DM patients manifests mucositis, tongue anomalies, taste impairment, halitosis, altered wound healing, burning mouth syndrome, paresthesia, numbness of the oral mucous membrane, sialosis and the rarities such as lichen planus, and enamel hypoplasia in children born of diabetic mother [4,5,8,10,11,13-15].

The most common oral health problems associated with diabetes can be listed as [1-5,16,17]:

- Gingival/Periodontal disease
- Salivary gland dysfunction
- Fungal infections
- Dental caries
- Oral burning and taste impairment

- Oral mucosal diseases
- Traumatic ulcers and irritation fibroma

Oral features in diabetes mellitus have been described since 1862.10 "Diabetic Periodontoclasia" was the term given by Sir Williams, in 1928 for group of condition noted in diabetic youngsters in military practice.18

Overall, the studies showed higher prevalence of oral diseases in uncontrolled diabetic patients as compared to controlled and healthy subjects. The severity and the degree of oral involvement were exaggerated in uncontrolled diabetes than other study subjects. The higher number of patients with uncontrolled diabetes showed periodontal involvement and the decayed, missing and filled teeth as compare to other study subjects. Notably, the severity of periodontal manifestation was more in diabetes patients who were on insulin.10,13,17,19

The complaint of dry mouth and the taste impairment were seen in some of the patients with uncontrolled diabetes. The tongue anomalies reported were mostly the areas of depapillation with complete or partial bald tongue. Other tongue lesions noted were median rhomboid glossitis and the fissured tongue. The oral candidal lesions were mostly of psuedomembranous type, and one with erythematous candidiasis. The lichen planus was seen in two patients with uncontrolled diabetes and one healthy subject. Very few patients showed other lesions such as apthous stomatitis, leukoplakia and trauma-
matic ulcers [10,11,13,17,19-21].

The microvascular changes, diuresis, altered immune response and elevated blood glucose levels observed especially in poorly controlled diabetes increase their risk for oral diseases [5,10,17,22].

In most of the previous studies, out of the conditions identified in the oral cavity, the swollen/boughy gingivae, gingival recession, mobility of teeth, and the decayed and missing teeth are most prevalent in the diabetic study population. While for dental conditions, the differences were significant for decayed, missing and filled teeth between study and control healthy group. For most of the comparisons between uncontrolled and healthy group, the differences were highly significant. No association of the incidence of oral diseases with gender and the age of the patient or duration of the diabetes could be identified [11,22-25].

**Diabetes Mellitus and Periodontium**

Periodontal diseases are considered as 6th complication of DM. Periodontal disease is a very well-documented complication of diabetes, it was found to be more common in insulin dependant diabetes mellitus (IDDM) and in long standing diabetes [5,10,13,19,25]. It was observed that attachment loss was more in older patients, while bleeding on probing and calculus being constant across the various age categories [26]. In 45 years old patients with family history and periodontitis, probabilities of occurrence ranged from 53-27%, with age probabilities increased. Periodontal disease may begin as gum disease with classic manifestations of boughy gingiva and abscesses which if untreated may lead to gradual destruction of the tooth's supporting tissues and, ultimately, tooth loss in patients with poor resistance [27-29].

Diabetes is believed to enhance the periodontitis through an exaggerated inflammatory response to the periodontal microflora. The presence of bacterial endotoxins, antigens, and other virulence factors stimulate the host immunoinflammatory response. In response to pathogenic microbes, neutrophils migrate to the site of the infection to invoke an antibody response. In more resistant individuals, these leads to gingivitis while in susceptible individuals, it leads to connective tissue breakdown and changes in bone metabolism due to very high levels of released cytokines, prostanoids, and matrix metalloproteinases [2,5,9,13,21,27,30]. There is an associated increase in probing depth, loss of clinical attachment, and radiographic evidence of bone loss. Poor oral hygiene, smoking, hereditary and certain medications (calcium channel blockers, dilantin, and cyclosporine) act as a risk factors for periodontal diseases in DM. The smoking per se increases the risk of periodontal disease by nearly 10 times in diabetic patients [1-5,9].
Figure 1a, 1b: Intraoral photograph showing multiple periodontal abscesses seen in an uncontrolled diabetes mellitus patient.

Figure 2a, 2b: Intraoral photograph showing boughy gingival with loose teeth.
Figure 3: Orthopantomogram of diabetic patient showing bone loss in mandibular posterior region bilaterally.

Out of the various oral conditions identified, the swollen gingivae, gingival recession, mobility of teeth, and the decayed and missing teeth were most prevalent. When groups with uncontrolled and controlled diabetes were compared with healthy group for the incidence of periodontal conditions, the significant differences were found between them except for bleeding on probing [1-5,9,12,13,27,30].

The treatment of periodontitis in diabetic patients is essentially the same as that for nondiabetic patients. It may be essential to ask the habit history of patient for smoking. It is strongly recommended for the patients to contact dentist immediately if they observe any warning signs of periodontal disease such as red swollen tender gums, or gums that bleed easily or are pulling away from teeth, chronic bad breath, and teeth are loose or separating, and pus discharge [2,27-29].

**Diabetes Mellitus and Oral Candidiasis**

Many earlier studies reported increased incidence of oral candidiasis in diabetic patients. It has found to be associated with poor glycemic control. The various reasons for increased occurrence could be increased salivary glucose levels or immune dysregulation or xerostomia or use of denture. It may be in the form of denture stomatitis, median rhomboid glossitis or angular cheilitis. It was observed that patients who were colonized with candida had significantly high median salivary glucose concentration. The neutrophil dysfunction with decreased killing capacity and phagocytosis could be an additional risk factor to candidal growth [5,11,16,21,30].

Previously, it is also observed that the oral candidiasis was more prevalent in IDDM with decreased salivary function than healthy control. In a study, the commoner oral manifestations of oral candidiasis were median rhomboid glossitis, diffuse atrophy of tongue papillae, denture stomatitis and angular cheilitis [11,16]. Apart from candida albicans that is commonly seen, Candida dubliniensis could also be isolated from few patients of diabetes mellitus. The other fungal infections such as mucormycosis
and zycomycosis may occur in diabetics especially when uncontrolled and may manifests as palatal ulcerations or necrosis [5,11,21].

![Image](a)

![Image](b)

![Image](c)

**Figure 4a, 4b, 4c**: Intraoral photograph showing candidiasis on right cheek mucosa, under surface of tongue and angular cheilitis in diabetic patients.

Treatment usually includes topical or systemic antifungal therapy depending on the severity and spread of infection. In addition, use of mouthwashes and control of blood sugar levels are needed. It was concluded that blood sugar levels should be examined in patients with oral candidiasis and severe odontogenic infections [11,21].

**Diabetes Mellitus and Oral Mucosal Diseases**

A number of studies reported the occurrence of oral mucosal lesions such as lichen planus and recurrent aphthous stomatitis in diabetic patients. Studies also mentioned about the increased prevalence of oral lichen planus...
in patients with type I DM and slightly higher in patients with type 2 DM than in control subjects. Although, this association was not a consistent finding in the literature [5,11-13,16,17,21]. This may be related as a side effect of oral hypoglycemic agents or antihypertensive medicines [1-3].

Taste disturbances and burning mouth are observed to be the common symptoms in patients with diabetes. The impairment of sweet taste sensation is reported in some studies, these impairments may be attributed to disordered glucose receptors or xerostomia. The diabetic patients on hemodialysis have been reported to have altered taste [17]. In cases of burning mouth, oral professionals should consider DM in the diagnosis. The burning may be due to peripheral neuropathy, xerostomia, or candidiasis. Good glycemic control may alleviate burning sensation. Patients may benefit from intake of clonazepam when complain of oral burning sensation [31].

People with type 1 diabetes have reported to have a higher prevalence of oral traumatic ulcers and irritation fibromas than do nondiabetic control subject which may be related to altered wound healing patterns in these patients [11,14,18,24]

Diabetes Mellitus and Dental Caries

Earlier studies have demonstrated that diabetic patients have more active dental caries than control subjects. Increased levels of glucose in saliva and gingival crevicular fluid may increase susceptibility towards dental caries. The diminished salivary flow is may be an additional risk factor for dental caries [4,5,8,13,26].

The study found the higher caries incidence and number of fillings in IDDM than NIDDM and higher number of extracted teeth in NIDDM than IDDM, although, no consistent relationship has been demonstrated in the literature. The low carbohydrate diabetic diets should theoretically reduce caries prevalence [11,23,24].

Diabetes Mellitus and Salivary Dysfunction

Previously, it was mentioned that about 40-80% of diabetic patients report of salivary dysfunction [1-3,5]. Salivary dysfunction leads to dry mouth which may favor the accumulation of plaque, dental caries, mucositis, periodontal infections, malodor, ulcers, inflamed depapillated tongue, impaired ability to wear denture and inability to chew and swallow the food and taste dysfunction. Diabetic patients with poorly controlled disease have been found to have lower stimulated parotid flow rates than people with well-controlled DM and nondiabetic control subjects [5,17,20,28]. The salivary dysfunction may be attributed to degree of neuropathy, salivary gland enlargement, use of prescription medications and increasing age, or subjective feelings of mouth dryness that may accompany thirst [32]. Asymptomatic bilateral enlargement of the parotid glands has been reported in 24-48% of patients with DM,
especially in uncontrolled diabetics. The use of sugarless gums or mints, mouth wetting agent and continuous seepage of water may give the symptomatic relief to the patients [1-5,32].

Diabetes Mellitus and Pedodontic Consideration

The children are the sufferers of insulin dependent diabetes. If patient is on insulin, dentist must be aware of his or her schedule for insulin intake and the last dose taken [8,26]. It is strongly advised to stop smoking habit if a patient has. There were significant differences in periodontal diseases between diabetic and nondiabetic children while no significant differences were seen in caries incidence in them. Owing to variable growth and level of daily physical activities, the diabetic control is complex during childhood [8,9,19,22,26].

Dental Management Considerations

It is essential that oral or dental treatment should be undertaken when diabetes is well controlled to prevent the subsequent complications or emergencies.

It is a mandate that a good medical history be taken in regards to the duration of diabetes, status of glycemic control over a period, medication regimens, or history of hypoglycemic episodes or complications and diet history of patients. Chair side blood glucose measurement can be done prior to beginning of dental procedure. Patients with low plasma glucose levels (<70 mg/dl for most people) should be given an oral carbohydrate before treatment to minimize the risk of a hypoglycemic event, it may be wise to consult patients’ physician [1-3,10,29].

It is important for clinicians to ensure that the patients has eaten normally and taken medications as usual. In general, it is advisable to give morning appointments. For patients receiving insulin therapy, appointments should be scheduled so that they do not coincide with peaks of insulin activity since that is the period of maximal risk of developing hypoglycemia. Any modification in patients’ meal or dose timing should be done in consultation with his physician [1-3,11,20,25].

Dentists need to be aware of susceptibility of diabetic patients to infections and delayed wound healing. The invasive dental procedures need to be performed under the antibiotic prophylaxis and in consultations of physician irrespective of type of diabetes to reduce perioperative morbidities. The physician monitoring may be needed.

In poorly-controlled patients, it is wise to delay the dental treatment if possible until they have achieved good metabolic control. Suppression of neutrophil function in diabetes must be taken into consideration in the treatment of oral and odontogenic infections. People with uncontrolled diabetes are at higher risk for oral surgery or local anesthetic complications, and even simple tooth cleaning.
Dentist’s Role and Recommendations

It is to be noted that the prevalence of diabetes increases with age, the ensuing retinopathy & peripheral neuropathy may also affect the ability to perform oral hygiene procedures. The poor oral conditions may also influence the social and psychological well-being of individuals; and may influence the quality of life of the person.

Dental clinic could be a setting that can help diagnose the previously undiagnosed diabetes mellitus. A person who visits the dentist may show oral signs and symptoms such as periodontal disease, severe odontogenic infections, oral mucosal pain and burning without any cause or clinical signs should alert the dentist of this undiagnosed condition. At the same time, while history taking, the patient may talk about weight changes, frequent urination, blurred vision, lethargy, or changes in mood, that may suggest screening for diabetes mellitus [1-5,8,10,11,20,25].

Dentist role is crucial in early identification and management of oral diseases. Most of these patients are unaware of the oral health complications of diabetes. There is need to educate the patients regarding the clinical implications of diabetes, and importance of glycemic control. There is need to explain the necessity of maintaining good oral hygiene, regular denture cleaning, and to motivate them for self-care, higher emphasis on preventive measures are warranted. Dentist must be familiar with the effective techniques to diagnose, treat and prevent oral disorders in diabetic patients, aggressive treatment for oral infection, regular dental examination and prophylaxis could be the strategy to treat. Means by which the patients are keeping their oral hygiene needs to be explored. Dental hygienists can be involved in diabetes care [1-3,11,20,25].

To summarize, the twenty first century is facing dramatic change in demographics with huge number of people with diabetes mellitus in the population. Studies mentioned about the greater prevalence of the oral diseases patients with diabetes. In spite of this, the most patients with DM are unaware of oral health complications of their disease. This warrants that dentists be highly vigilant with this aspect of care, their role being crucial in patient education, and in earlier identification and prudent management of oral ailments in people with diabetes mellitus.

References


18. Williams RC Jr, Mahan CJ. Periodontal disease


