NARRATIVE REVIEW

Non Periodontal Oral Manifestations of Diabetes Mellitus: An Overview

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ABSTRACT: Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The oral complications of uncontrolled diabetes mellitus are devastating which includes gingivitis and periodontal disease, xerostomia and salivary gland dysfunction, disorders of oral mucosa and various soft tissue lesions, impaired healing, increased susceptibility to infections, caries and periapical abscesses, loss of teeth, taste impairment, neurosensory disorders and burning mouth syndrome. Changes that are seen in other oral soft tissues, in addition to the periodontal tissues, can be helpful in the diagnosis of diabetes in undiagnosed patients and may aid in the diagnosis of diabetes in dental office.

Keywords: *Diabetes mellitus, non periodontal manifestations, oral mucosal disorders.*

Diabetes mellitus (DM) significantly affects the oral tissues and is strongly supported by the data in an increasing number of publications.^[1,2,3,4] Over the past 50 years, researchers have explored the relationship between periodontal disease and DM.^[2] Loe in 1993, proposed periodontal disease to be the sixth complication of diabetes.^[3] The other five complications are retinopathy, neuropathy, nephropathy, cardiovascular disease and peripheral vascular disease.^[4]

Taylor and Borgnakke in 2008 identified periodontal disease as a possible risk factor for poor metabolic control in people with diabetes. This bidirectional relationship

between periodontal disease and DM makes diabetes a disorder of importance to dentist.^[5] Additionally reproductive hormonal changes during pregnancy may significantly affect the periodontal health in women with pre-existing diabetes and gestational diabetes. But minimal data are available on the effects of gestational diabetes on periodontal health.^[1] Although periodontal disease remains a well-recognized and documented complication of DM, diabetes causes changes in other soft tissues of

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oral cavity as well.

ORAL MANIFESTATIONS OF DIABETES MELLITUS

A number of devastating oral mucosal disorders including periodontal disease (**Figure 1**) are associated with diabetes mellitus. This article focuses only on the non-periodontal oral manifestations associated with DM and the identification of which can be helpful in the diagnosis of diabetes in undiagnosed patients.

Salivary gland dysfunction and xerostomia

The oral manifestations of DM in the salivary glands include sialadenosis or non-

inflammatory, non-neoplastic enlargement of the parotid salivary glands^[6,7], decreased salivary flow rates^[8] and changes in salivary composition.^[9,10] Bilateral enlargement of the parotid salivary glands has been reported to occur in 10–48% of diabetic patients.^[11,12]

The enlargements are caused by gradual accumulation of fat in the glands, hypertrophy of the acini or secreting units, and, eventually, impaired glandular secretion. These structural changes may be the result of alteration in autonomic neuroregulation of the glands and atrophy of the myoepithelial cells that facilitate secretion.^[13]

Flow Chart 1

infection commonly associated with hyperglycemia and is thus a frequent complication of marginally controlled or uncontrolled diabetes.^[20] Oral lesions associated with candidiasis include atrophic glossitis, denture stomatitis, pseudomembranous candidiasis (thrush) **(Figure 2)** and angular cheilitis **(Figure 3)**. Salivary dysfunction, compromised immune function and salivary hyperglycemia that provides a potential substrate for fungal growth are the major contributing factors for oral candidiasis in patients with diabetes.^[21,22]

The combination of low salivary flow rate and immune dysfunction greatly increases the risk of oral candidiasis, which is supported by significantly higher rates of candida carriage and decreased antifungal immunoglobulins in saliva in patients with diabetes compared to control subjects. Angular cheilitis also occurs significantly more frequently in diabetic than in non-diabetic patients.^[18,19]

In type I diabetic patients, elevated HbA1C was shown to be significantly associated with

the presence of denture stomatitis or the presence of *Candida pseudohyphae* in oral swabs. Edentulous individuals with Type 2 DM were also found to have denture stomatitis.^[23]

Lichen planus and lichenoid drug reactions

Lichen planus is a relatively common, chronic mucocutaneous disease of unknown cause. Though the etiology of lichen planus is not known, the presence of this has been frequently associated with diabetes.^[24] However, similar mucosal changes called lichenoid drug reactions occur as an adverse side effect to antihyperglycemic medications, that are commonly prescribed to the diabetic patients.^[25] **(Figure 4)**

The association between diabetes mellitus and oral lichen planus have been documented in various studies^[25,26] and hence, it remains as a subject of research due to the common autoimmune background of both the diseases. There appears to be no relationship between lichen planus and either hypertension or diabetes mellitus (Grinspan's syndrome) as previously proposed. But it remains as a rare

Fig– 4: Diabetic patient showing oral lichenoid drug reactions in buccal mucosa

Fig– 5: Diabetic patient with deep fungal infection of the palate

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Fig– 4: Diabetic patient showing oral lichenoid drug reactions in buccal mucosa

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entity as little research has been performed in this area.^[27]

Other oral soft tissue lesions

Tongue abnormalities such as fissuring (**Figure 2**) and complete or patchy atrophy of tongue papilla resulting in bald appearance are commonly seen in diabetes.^[20,25] Type 1 DM patients have a higher prevalence of oral traumatic ulcers and irritation fibromas than nondiabetic control subjects.^[20] Ulcers like recurrent aphthous stomatitis have been observed in Type 1 DM patients.^[28] In diabetic patients, progressive atrophy of oral mucosa occurs due to a decreased rate of salivary secretion and low salivary pH, increasing the possibility of lesions, such as glossitis and cheilitis. Loss of the normal protective barrier can increase the permeability of the oral mucosa to carcinogens. Many studies suggest a trend in increased prevalence of premalignant lesions, such as leukoplakia, in diabetic patients.^[29-32] (**Figure 3**)

Impaired healing

Poor soft tissue regeneration and delayed osseous healing in patients with diabetes are known complications during oral surgery. It is reported that delayed vascularization, reduced blood flow, a decline in innate immunity, decreased growth factor production, and psychological stress may be involved in the protracted wound healing of the oral cavity mucosa in patients with diabetes.^[33]

Dental caries & periapical pathologies

The relationship between diabetes and dental caries has been investigated, but no clear association has been clarified.^[2] Diabetic patients have been said to be more caries prone than the general population. It is well known that the cleansing and buffering capacity of the saliva is diminished in patients with diabetes mellitus resulting in increased incidence of dental caries, especially in those patients who suffer from xerostomia.^[34-36] These caries can in turn lead to periapical pathologies like periapical abscess.^[37,38] It should be treated immediately, otherwise will lead to complications like space infections & cellulitis.^[39]

Increased risk of infection

DM is a predisposing condition for odontogenic infections. There is increased prevalence of dry socket and osteomyelitis.^[40] Diabetics with poor metabolic control are more prone to spreading and recurrent bacterial infection. Several studies have reported that patients with diabetes are more prone to deep neck bacterial infections compared to patients without diabetes. Deep fungal infections like mucormycosis can also occur in poorly controlled diabetic patients and usually appears as palatal ulceration and necrosis.^[41] (**Figure 5**)

Neurosensory disorders

Patients with diabetes have reported increased complaints of glossodynia and stomatopyrosis. A poorly understood orofacial neurosensory disorder called burning mouth syndrome has been allied with diabetes mellitus. Long lasting oral dysesthesias experienced by patient could adversely affect oral hygiene maintenance.^[42]

Burning mouth syndrome (BMS)

In diabetes, the factors that can be attributed to BMS include salivary dysfunction, candidiasis and neurological abnormalities such as depression. Autonomic and sensory motor neuropathies are part of the diabetes syndrome. Similarities between BMS and DM peripheral neuropathy suggest that a neuropathic process may be an underlying source of BMS in some patients who have no apparent oral abnormality.^[42] Neuropathy may lead to oral symptoms of paresthesia, tingling, numbness, burning or pain caused by pathological changes involving the nerves in the oral region. Improvement in glycemic control has a major role in reducing the occurrence of complications resolution of the symptoms associated with burning mouth syndrome in the patient with diabetes.^[6]

Taste disturbances

Taste is a critical component of oral health that is affected adversely in patients with diabetes.^[2] Taste sensation abnormalities could be due to xerostomia or disordered glucose receptors. Hypogeusia or diminished

taste perception could result in hyperphagia and obesity, inability to maintain a proper diet which further leads to poor glycemic regulation.^[37]

Halitosis

Halitosis is primarily caused by bacterial putrefaction and the generation of volatile sulfur compounds. Diabetic patient may also present with halitosis because of the xerostomia in controlled diabetics and acetonc breath in the uncontrolled diabetics. Halitosis in such patients can be controlled and treated with proper guidelines given by oral health practitioners.^[36,37]

Bone density

The lower bone mineral density of the mandible affected in patients with insulin dependent diabetes mellitus is probably due to more rapid bone loss after the onset of the DM^[43] and it does not seem to be affected in patients with Type 2 DM.^[44]

Diabetes in children

Children with diabetes exhibit accelerated tooth eruption.^[45]

CONCLUSION

Dentist may be the first healthcare professional to detect, screen and diagnose diabetes in dental office based on the oral manifestations. Dentist can give dietary advice, health education and referral to the physician or diabetologist. Dentist, not only

treat the oral lesions, but also provide emergency care for conditions like cellulitis associated with DM. Basic knowledge about the disease, its general and oral manifestations, the treatment options and the health considerations are necessary for the better management of DM.

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