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Oral manifestations and complications of diabetes mellitus: A review

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Abstract
Oral health is an integral part of systemic health and plays a significant role in maintenance of general health status. Several factors affect oral health including metabolic disorders such as Diabetes Mellitus. Diabetes Mellitus has become a global epidemic and presents many complications usually proportional to the degree and duration of hyperglycemia. The purpose of this review is to highlight various studies concerning Diabetes Mellitus and its potential effects on oral health. This article aims to review and increase the awareness of oral manifestations and complications of Diabetes Mellitus.

Keywords: diabetes mellitus; oral; complications; periodontitis; taste; fungal; wound healing; oral lesions; oral hygiene; dental caries

Introduction

Historical Background

Diabetes is a Greek word that means siphon; it was named and described by Aretaeus of Cappadocia. He described diabetes as 'a great flow of wonderfully sweet urine'. The cardinal symptoms of the disease i.e., polyuria, polydipsia, polyphagia and loss of weight were described by Celsus. It was noticed that ants were attracted by the sweetness of urine. Another scientist, Thomas Willis, described the urine of diabetics as a wondrous sweet, as if imbued with honey. William Dobson realised that the serum of diabetics was also sweet. The word mellitus, which means honey, was added to the word diabetes by Cullen. More recently, Diabetes Mellitus has been described as a chronic, progressive metabolic disorder characterised by hyperglycemia resulting from defects in insulin secretion, action or both.

Prevalence

Diabetes Mellitus affects more than140 million people worldwide and presently considered as one of the most frequent chronic disease. According to World Health Organisation estimates, the number of adults with diabetes worldwide will increase from 171 million in 2000 to 366 million by 2030. India has called as 'the diabetes capital of the world' because of its high diabetes rates; 41 million Indians have diabetes, accounting for one-fifth of all diabetes cases worldwide. A study by Williams and Mahan involving 2,273 people with diabetes found a 60% prevalence of periodontal disease; the incidence being two- to fourfold higher.

Oral Manifestations and Complications of Diabetes Mellitus

The effects of diabetes on oral health have been studied extensively. Diminished salivary flow is the commonest oral feature of diabetes, which in turn leads to an increased risk of dental caries. Several soft tissue abnormalities have been reported to be associated with Diabetes Mellitus in the oral cavity. These complications include periodontal diseases (periodontitis and gingivitis); salivary gland dysfunction leading to reduced salivary flow and change in saliva composition, and taste dysfunction. There is also an increased susceptibility to oral bacterial and fungal infections, particularly candidal infection. Oral mucosal lesions in the form of geographic tongue, stomatitis, fissured tongue, lichen planus, angular cheilitis have been reported. In addition, delayed wound healing, mucosal neuro-sensory disorders and tooth loss has been reported in patients with diabetes.

Periodontal diseases

Pathophysiology of Periodontitis

Periodontitis is one of the most widespread disease affecting oral cavity. Periodontitis is a chronic progressive disease affecting the gingivae and the periodontal tissues initiated by bacteria. The microflora in the dental plaque initiates the inflammatory process. The toxins liberated by bacteria cause gingival inflammation and consequently form periodontal pocket. As the disease worsens, the pocket will get deeper and leads to the destruction of alveolar bone and periodontal attachment.

Association between Periodontitis and Diabetes Mellitus

The link between Diabetes Mellitus and periodontitis is not well recognised. Periodontal disease has been reported with increased incidence and prevalence in patients with Type 1 & Type 2 diabetes. The mechanism by which hyperglycemia causes periodontal destruction is not yet fully understood. The level of glycaemic control is of key importance in determining increased risk. The importance of diabetes as a major risk factor for periodontitis became apparent in 1990s in a number of cross-sectional and longitudinal studies investigating the Pima Indian population. The prevalence and incidence of periodontitis were greater in Pima Indians who had type 2diabetes.

Some theories propose that advanced glycation end products, changes in collagen framework, and altered immune function that causes impaired neutrophil function which may facilitate bacterial persistence in the tissue, may be the factors resulting from prolonged hyperglycemia. The increase in collagenase

activity together with reduction in collagen synthesis will adversely affect collagen metabolism. This would result in compromised wound healing as well as periodontal destruction.

Numerous risk factors have been reported that make diabetics more susceptible to periodontal disease, especially those with poor oral hygiene, poor metabolic control, longer duration of diabetes and those who are smokers.

Fig 1: Clinical photograph showing periodontal abscess in a poorly controlled diabetic

Salivary and Taste Dysfunction

Salivary dysfunction manifesting as reduced salivary flow rate and xerostomia has been reported in patients with diabetes. It has been shown that poorly controlled type 2 diabetics have a lower stimulated parotid gland flow rate compared to well-controlled patients and patients without diabetes. An increase in salivary pathogens was also reported in these patients. Patients with diabetes usually complain of xerostomia and need to drink very often. The constant drying of the mouth irritates the soft tissues of oral cavity, resulting in inflammation and pain.

Taste dysfunction has also been reported in patients with poorly controlled diabetes. Taste disturbance has also been reported to lead to poor glycaemic control by inhibiting the ability to maintain a good diet.

Oral Infections

Fungal infections

Oral candidiasis is an opportunistic infection frequently caused by *Candida albicans* species. Candidal infection is more prevalent in patients with diabetes especially in those who smoke, wear dentures, have poor glycaemic control and use steroids and broad spectrum antibiotics. Salivary dysfunction in diabetics can also contribute to higher risk of oral candidal infection.

Bacterial infections

Oral bacterial infections are more likely to develop in patients with diabetes. Diabetics with diabetic complications and 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. A prospective study conducted by Rao *et al*. concluded that submandibular space was more commonly involved in bacterial infection followed by buccal space.

Poor Oral Wound Healing

Poor soft tissue regeneration and delayed osseous healing in patients with diabetes are known complications during oral surgery. Therefore, the management of patients with diabetes undergoing oral surgical procedures is more difficult.

Non-Candidal Oral Soft Tissue Lesions

Fissured tongue, irritation fibroma and traumatic ulcer have been reported in patients with diabetes. Altered or delayed wound healing may play a role in traumatic ulcer.

Oral Mucosal Diseases

Lichen planus and recurrent apthous stomatitis have been reported to occur in diabetics. Oral lichen planus is reported to occur more frequently in patients with type 1 diabetes compared to type 2 diabetes.

Dental Caries

It is known that patients with Diabetes Mellitus are susceptible to periodontal and salivary disorders (dry mouth), which could increase their risk of developing new and recurrent dental caries. Decreased salivary secretion, increase of carbohydrate in parotid gland saliva, growth of oral yeasts, increased count of Mutans streptococci and lactobacilli are some of the factors implicated to be responsible to predispose diabetics to higher incidence of dental caries.

Neuro-Sensory Oral Disorder

Oral dysesthesia or burning mouth syndrome (BMS) is a painful condition affecting the oral cavity. Tingling, numbness, dryness or sore mouth may also be seen. Diabetic neuropathy could be the underlying cause of BMS in patients with diabetes.

Conclusion

Diabetes Mellitus is a chronic, non-communicable and endemic disease. Type 2 diabetes is more common worldwide. Oral manifestations and complications of this disease have been recognised recently as a major complication.

There are several clinical implications from this review. These include; 1) a lack of awareness of oral complications among both diabetics and health providers; 2) an understanding of the way diabetes affects oral health is necessary for both patients and clinicians, therefore, research in this field should be encouraged; 3) need for regular follow-up of diabetics; 4) the major role that dentists should play in recognising signs and symptoms of diabetes and their oral complications; 5) advice and counselling for diabetic smokers regarding smoke cessation; & 6) vigorous treatment of oral infection.

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