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Original Research Paper

Dentistry

DIABETES MELLITUS A MAJOR RISK FACTOR OF ORAL HEALTH PROBLEMS: A REVIEW

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ABSTRACT Diabetes mellitus (DM) is a complex and insidious group of metabolic abnormalities that characterized by hyperglycemia, abnormal lipid and protein, that result from defects in insulin secretion, insulin action or both. The prevalence of the disease has been increasing steady world-wide.

A number of oral disorders have been associated with diabetes mellitus. The diabetologist and the dentist should work together for optimal care.

Evidence suggests that periodontal changes are the first clinical manifestation of diabetes. Researches showed that there is an increased prevalence of gum diseases among those with diabetes. Therefore, diabetes mellitus is a major risk factor for oral health problems. In this review, the various aspects of the oral complications of diabetes mellitus are highlighted.

KEYWORDS : Diabetes mellitus, oral health, risk, periodontal problems, manifestation.

Diabetes mellitus (DM) is a complex and insidious group of metabolic abnormalities that characterized by hyperglycemia, abnormal lipid and protein, that result from defects in insulin secretion, insulin action or both. The prevalence of the disease has been increasing steadily world-wide (1-5).

Diabetes Mellitus is considered a major risk factor for oral health. Therefore, the diabetologist should collaborate with the dentist and dental hygienist to minimize the sequela.

Diagnosis

The American Diabetes Association's expert committee on the diagnosis and classification of diabetes mellitus has recently approved new criteria for the diagnosis of DM. This diagnostic criteria for diabetes are based on venous blood samples and laboratory methods (6). A fasting plasma glucose (FPG) level of 7.0 mmol/L correlate most closely with a 2 hours plasma glucose (2h PG) value of 11.1 mmol/L in a 75g oral glucose tolerance test (OGTT). The normal fasting plasma glucose level in recently defined as less then 110 mg/dL (6.1 mmol/L). However, in patients with classic symptoms, measurement of random plasma glucose is sufficient to diagnose diabetes mellitus type 1 (DM-1).

The use of hemoglobin A1c (HbA1c) may identify more people as having diabetes. However, HbA1c must be measured using a validated assay standardized to the National Glucohemoglobin Standardization Program Diabetes Control and Complications Trail reference. However, it is important to note that HbA1c may be misleading in individuals with various hemoglobinopathy, haemolytic or iron deficiency anemia, Grave's disease, severe hepatic and renal diseases. The diagnostic cut-of-value of 6.5% (48 mmol/mol) should be considered (1-5,7-11). Table 1, shows the criteria for diabetes diagnosis.

Classification

Diabetes can be classified into the following general categories:

1- Type-1 diabetes (due to autoimmune B-cell destruction, usually leading to absolute insulin deficiency. This form is usually prone to ketoacidosis.
2- Type-2 diabetes (due to a progressive loss of B-cell insulin secretion or function, frequently on the background of insulin resistance). Ketosis in not as common.
3- Gestational diabetes mellitus (GDM); (diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation).
4- Other specific types include a wide variety of relatively uncommon conditions, primarily specific genetically defined forms of diabetes such as neonatal, maturity-onset diabetes of the young (MODY) or diabetes associated with other diseases such as cystic-fibrosis or drugs consumption.

The classification of diabetes is shown in table 2.

The majority can be broadly classified into two categories, type 1 and type 2 diabetes, although some cases are difficult to classify. Gestational diabetes (GDM) refers to glucose intolerance with onset of first recognition during pregnancy. Monogenic diabetes is a rare disorder caused by genetic defects of beta cell function that typically presents in young age (1-5,12-23).

Diabetes Mellitus and oral health

The oral health is influenced by systemic health, and one of the most common diseases is diabetes mellitus. (24-25) A number of oral disorders have been associated with diabetes mellitus, Table 3. Ship listed periodontal disease, dental caries, salivary dysfunction, oral mucosal diseases, oral infections such as candidiasis, taste and other neurosensory diseases. (26-37)

* **Periodontal disease** (figure 1) is the most common dental disease affecting those living with diabetes mellitus, affecting almost more than 20% of those diagnosed. Especially with increasing age, poor blood glucose control increasing the risk

of oral problems such as dental caries, gingivitis and periodontal abscess.

Taylor and Borgnakke (38) identified periodontal disease as a possible risk factor for poor metabolic control in people with diabetes mellitus. Leo (39) proposed that periodontal disease was the sixth complication of diabetes. Gossi et al (40) have suggested that effective control of periodontal infection in diabetic patients reduce the level of advanced glycation end products (AGEs) in the serum. The oral manifestation of diabetes mellitus involve the polyol pathway which converts glucose into sorbitol hyaldose reductase that cause tissue damage and the formation of advanced glucosylation end products (AGEs), due to the binding of glucose to proteins, lipids and nucleic acids, which results in the alternation of structures and functions, in addition to its deposition in specific organs that cause various complications. Also, several mechanisms have been proposed to explain the increasing susceptibility to periodontal disorders, including alternations in host response, subgingival microflora, collage metabolism, vascularity, gingival crevicular fluid and heredity patterns. Evidence supports the observation that periodontal infections contribute to problem with glycemic control (41,42) Therefore, with increasing evidence of effects of poor glycemic control on periodontal condition, the diabetologist and the dentist should work in close liaison to give a proper and comprehensive management plan to diabetic patients. (43-51)

Dental caries, gingivitis and tooth loss

It is well known that patients with diabetes mellitus are prone to oral infections, in general, that usually lead to dental caries (figure 2), and tooth loss (figure 3). Salivary dysfunction, xerostomia, periodontal and sensory disorders are important predisposing factors. The relationship between diabetes and dental caries has been investigated, but no clear association has been clarified. It is important to note that multiple factors play together to increase the susceptibility of recurrent dental caries. It is well known that the cleansing and buffering capacity of the saliva is diminished in patients with diabetes mellitus resulting increasing incidence of dental caries, especially in those who suffer from xerostomia. (52-58)

Xerostomia and salivary glands disfunction

Xerostomia is defined as the subjective complication of dry mouth. The increased prevalence of dry mouth (xerostomia) has been reported in diabetic patients due to poor glycemic control. The mechanism of reducing salivary flow is thought to be the result of autonomic dysfunction and microvascular changes that affect the ability of salivary glands to respond to neural and hormonal stimulation. It remains an unresolved common complaint reported in 40-80% of patients. The most frequent causes of reduced salivary flow is the use of anti-depressants, anti-hypertensions, levo-thyroxins, multivitamins and non-steroidal anti-inflammatory drugs. Lack of adequate saliva leads to an increased risk of infections, hence dental caries rates and difficulty in maintaining oral hygiene. Among other consequences of the neurosensory disorders is burning mouth syndrome which affect up to 10%, impaired taste perception and dysphagia (59-64)

Oral mucosal lesions

Diabetic patients are at increased risk of developing certain oral mucosal disorders. There are reports of greater prevalence of lichen planus (figure 4); recurrent aphthous stomatitis, geographic tongue (figure 5), benign migratory glossitis, and fissured tongue as well as oral bacterial and fungal infections. While these lesions have not been found, constituently in all diabetic patients, they may be due to chronic immunosuppression and require continued follow up by health care practitioner. Oral infection (candidiasis (figure 6) and bacterial infection such as streptococcal infection). Infections of the oral mucosal surfaces is more commonly found in adults with diabetes. Moreover, complications such as neuro-sensory disorders, and delayed mucosal wound healing are common in diabetic. Diabetic patients are also more predisposed to cancer transformation. Salivary hypofunction, smoking and poor glycemic control have been associated significantly with its prevalence. Oral mucosal disorders represent an opportunity to coordinate the care between diabetologist, dentist, and dental hygienist. (27,65-68)

Dental management of diabetic patients:

The dentist and oral hygienist should collaborate with the diabetologist in sharing the management in accordance with the standard medical care in diabetes. As with any patient, the dentist should review the patient's medical history, take vital signs, and evaluate for oral signs and symptoms of inadequately controlled diabetes which may be common. Oral manifestations of uncontrolled diabetes can include xerostomia, burning sensation in the mouth, impaired or delayed wound healing, increased incidence and severity of infections, secondary infections with candidiasis, parotid salivary gland enlargement, gingivitis and periodontitis. A glucometer should be used to test patients' blood glucose level which should not exceed 200 mg/dL (11.1 mmol/L).

However, certain medically compromised patients should only be treated in a hospital setting where emergency care can be provided. (69-84)

CONCLUSION

Diabetes mellitus is a chronic, non-communicable disease affecting all age groups with increasing incidence world-wide. It is considered as a major leading cause for mortality and morbidity. A number of oral disorders have been associated with diabetes mellitus. The association of diabetes mellitus and periodontitis has received the greatest attention. Current data suggest that periodontal disease may increase the risk of experiencing poor metabolic control. Prevention and management of oral complications, especially periodontal disease in patients with diabetes mellitus is important due to their possible adverse effects on glycemic control. Promotion of a healthy oral cavity is of great importance. Although many aspects of this new component of dental care needs to be developed.

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Table 1 Criteria for diagnosis of diabetes mellitus.

FPG 126 mg/dL (7.0 mmol/L) * 2hPG 200 mg/dL (11.1 mmol/L During OGTT
HbA1c 6.5% (48 mmol/mol)
In patients with classic symptoms of polyuria, polydipsia and weight loss, a random glucose of 200 mg/dL (11.1 mmol/L)

FPG- Fasting blood glucose.
OGTT- Oral glucose tolerance test.

*Recently, fasting plasma glucose level is defined as less than

110 mg/dL (6.1 mmol/L)

Table 2 Classification of diabetes mellitus.

• Type 1 diabetes mellitus (DM-1) • B-cell destruction (auto-immune, infections)
• Type 2 diabetes mellitus (DM-2) • Insulin-resistance
• Gestational diabetes mellitus (GD)
• Other specific types • Monogenic diabetes (such as neonatal diabetes) • Diseases involving pancreatic exocrine deficiency (cystic fibroma) • Drug induced (glucocorticoid) • Genetic defects of insulin action

Table 3 Oral manifestations of diabetes mellitus.

• Periodontal disorders • Oral mucosal diseases • Aphthous stomatitis • Lichen planus • Dental caries • Dental loss • Xerostomia • Salivary dysfunction • Taste disturbance • Neurosensory disorders • Oral infections • Candidiasis • Mucormycosis • Aspergilosis • Streptococcus

Figure 1 Periodontal disease in a patient with diabetes mellitus.



Figure 2 Multiple dental caries in a patient with type 2 diabetes mellitus.



Figure 3 Dentition loss in a 49-year-old patient with poorly controlled diabetes mellitus.

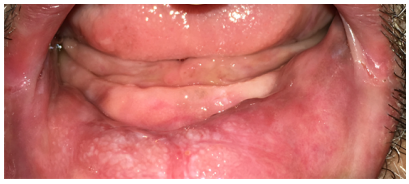


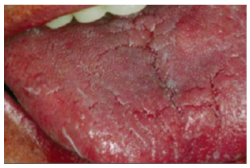
Figure 4 Oral lichan planus in diabetic patient



Figure 5 Geographic tongue in diabetic patient.



Figure 6 Oral thrush (candidiasis) in a poorly controlled diabetic patient.





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