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DIABETES AND ORAL HEALTH: AN OVERVIEW

Prashant Purohit*, Priyanka Mishra and Manish Suthar

Assistant Professor, Swami Keshvanand Institute of Pharmacy, Bikaner (Raj.)334001.

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***Corresponding Author**
Prof. Prashant Purohit
Assistant Professor, Swami Keshvanand Institute of Pharmacy, Bikaner (Raj.)334001.

ABSTRACT

Diabetes mellitus (DM) is a syndrome of abnormal carbohydrate, fat and protein metabolism that results in acute and chronic complications due to the absolute or relative lack of insulin. There are three general categories of diabetes: type 1, which results from an absolute insulin deficiency; type 2, which is the result of insulin resistance and an insulin secretary defect; and gestational, a condition of abnormal glucose tolerance during pregnancy. It is one of the most serious diseases of metabolism. Long-term consequences of hyperglycemia are very heterogeneous and affect partially all tissues and organs of the organism. A number of oral diseases and disorders have been associated with DM, and periodontitis has been identified as a possible risk factor for poor glycemic control and the development of other clinical complications of diabetes. In this review article, we discuss the relevant information about DM associated oral health conditions and role of dental practitioners to take the responsibility to develop programs to educate the public about the oral manifestations of diabetes and its complications on oral health in order to promote proper oral health and to reduce the risk of oral diseases.

KEYWORDS: Diabetes mellitus, insulin, glycosylated hemoglobin, Periodontal.

INTRODUCTION

Diabetes develops in people of all ages, although in greater frequency in African-Americans and Hispanics, and prevalences have increased dramatically over the past several decades. Diagnosis is made on the basis of a host of systemic and oral signs and symptoms, including gingivitis and periodontitis, recurrent oral fungal infections and impaired wound healing.

Approximately one-third of adults with diabetes in the United States are undiagnosed, and preventive care among patients with diabetes falls below national health objective standards.

Therefore, dental professionals can play an important role in diagnosing and managing patients with diabetes. Further more, because poorly controlled diabetes leads to significant morbidity and mortality, dentists can counsel their patients with diabetes about improving glucose regulation, maintaining oral and nutritional health, performing daily glucose monitoring tests and seeing medical professionals for routine care.

PREVALENCE AND INCIDENCE OF DIABETES

In 1999, the National Centers for Health Statistics reported that more than 10 million Americans were living with diabetes (distributed among white, black, Hispanic and other racial/ethnic groups3). In 1997, an estimated 124 million people worldwide were living with diabetes. By the year 2010, the number of people with diabetes worldwide is projected to reach 221 million, and in certain regions of the world (for example, Asia, Africa), diabetes rates could rise twofold or threefold. People with diabetes have a substantially higher risk of mortality and shorter life expectancy than do those without diabetes. Diabetes was the sixth most common cause of death in 2001, accounting for more than 71,000 deaths in the United States.

SYSTEMIC ASPECTS OF DIABETES

Signs and symptoms The onset of symptoms is rapid in type-1 diabetes, and includes the classic triad of polyphagia, polydipsia and polyuria, as well as weight loss, irritability, drowsiness and fatigue. Symptoms of type-2 diabetes develop more slowly, and frequently without the classic triad; rather, these patients may be obese and may have pruritus, peripheral neuropathy and blurred vision. Opportunistic infections, including oral and vaginal candidiasis, can be present. Adults with long-standing diabetes, especially those with poorly controlled hyperglycemia, may develop microvascular and macrovascular conditions that can produce irreversible damage to the eyes (retinopathy, cataracts), kidneys (nephropathy), nervous system (neuropathy and paresthesias), and heart (accelerated atherosclerosis), as well as recurrent infections and impaired wound healing.

It is less common to encounter a dental patient with acute signs and symptoms of hyperglycemia, although glucose control worsens in the presence of an uncontrolled infection. An insulin deficient patient with acute hyperglycemia often may have a “fruity” breath. Alternatively, hypoglycemia is more commonly observed owing to an imbalance of glucose intake and use of hypoglycemic agents. Weakness, sweating, mental confusion, in coordination and trembling occur when a person’s serum glucose level falls below 50 to 70

milligrams per deciliter, and symptoms become severe (loss of consciousness and convulsions) when levels fall below 40 mg/dL.

Diagnosis

The American Diabetes Association's diagnostic criteria for diabetes require a fasting blood glucose level of 126 mg/dL or greater. The measurement of glycosylated hemoglobin, or HbA1c, is a good measure of long term (6-12 weeks) glucose regulation. For people with diabetes, the goal is to maintain HbA1c levels below 7 percent (normal levels fall between 4 and 6 percent). HbA1c levels above 9 percent reflect poorly controlled diabetes, and indicate the need for aggressive diabetic control.

Treatment

Diabetes is not a curable disease, and therapy has four goals:

- To normalize blood glucose levels;
- To prevent acute complications and eliminate symptoms;
- To maintain ideal body weight;
- To prevent or minimize chronic complications

Diabetes and Oral Health Oral Complications of Diabetes

The most common oral health problems associated with diabetes are:

• Periodontal disease.

• Gum disease.

• Salivary gland dysfunction.

• Fungal infections.

• Oral burning and taste impairment.

• Oral mucosal diseases including lichen planus and recurrent aphthous stomatitis.

• Dental caries.

• Traumatic ulcers and irritation fibroma.

Periodontal disease

Periodontitis has been referred to as the sixth complication of diabetes. Diabetes is believed to promote periodontitis through an exaggerated inflammatory response to the periodontal microflora. The subgingival microflora in patients with periodontitis who have DM generally is equivalent to that observed in patients with periodontitis who do not have a diagnosis of diabetes Understanding the pathway to periodontitis is essential because it enables clinicians,

researchers, and patients to consider the possible mechanisms by which oral–systemic connections occur. It is a microbial challenge to the host or person with poor oral hygiene that initiates the cascade of events that can result in periodontal breakdown. The presence of bacterial endotoxins, antigens, and other virulence factors stimulate the host immunoinflammatory response. Neutrophils are recruited to the site of the infection to address the pathogenicmicrobes, which then invoke an antibody response. In more resistant individuals, these events lead to the development of localized reversible inflammation, known as gingivitis. In more susceptible individuals, very high levels of proinflammatory mediators — known as cytokines, prostanoids, and matrix metalloproteinases — will be produced by the host, leading to connective tissue breakdown and bone metabolism changes associated with the bone loss that is pathognomonic to periodontitis. In the clinical setting, This cascade of events presents as the signs of disease: Increases in probing depth, loss of clinical attachment, and radiographic evidence of bone loss. Genetics plays a significant role in who may be susceptible. Studies have shown that at least 50% of all cases of periodontal disease have some genetic component. In addition, there are a number of environmental and acquired risk factors that put patients at greater risk. Various risk factors for periodontal disease include hereditary, smoking, poor oral hygiene, diabetes, and certain medications like calcium channel blockers, dilantin, and cyclosporin. Risk assessment is important because it has been recognized that the more risk factors a patient has, the more likely he or she is to develop the disease. There is often more than an additive effect; there is a synergistic effect between these risk factors. Identification and consideration of these risk factors is critical to successful periodontal treatment because they can affect the onset, the rate of progression, and the severity of periodontal disease. In addition, these risk factors may determine treatment strategies and explain variability in the therapeutic responses of patients. Risk factor assessments can alter the way patients are viewed by the practitioner, leading to a decision process based on risk. The primary goal of the practitioner would be risk reduction.

A number of studies found a higher prevalence of periodontal disease among diabetic patients than among healthy controls.

Gum disease

This is a chronic bacterial infection that affects the gum tissue and bone that supports the teeth. If left untreated, gum disease can result in abscesses or the complete destruction of the tooth’s supporting tissues and, ultimately, tooth loss. Gum disease tends to be more severe among people who have diabetes because the disease lowers the ability to fight infection and

slows healing. An infection causes blood sugar level to rise, which makes diabetes more difficult to control. Preventing and treating gum disease can help improve blood sugar control. The principles of treatment of periodontitis in diabetic patients are the same as those for non diabetic patients and are consistent with our approach to all high-risk patients who already have periodontal disease.

Salivary gland dysfunction

Dry mouth, or xerostomia, has been reported in 40–80% of diabetic patients. Salivary dysfunction, however, can be difficult to diagnose. Salivary flow may be affected by a variety of conditions, including the use of prescription medications and increasing age, and it appears to be affected by the degree of neuropathy and subjective feelings of mouth dryness that may accompany thirst. 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. A symptomaticbilateral enlargement of the parotid glands has been reported in 24-48% of patients with DM, and patients with uncontrolled DM have exhibited a greater propensity for enlargement. Uncontrolled diabetes can decrease the saliva flow and cause dry mouth. A lack of saliva in the mouth allows bacteria to accumulate. This increases the risk of developing halitosis (bad breath), tooth decay, and gum diseases. The most common complications of dry mouth or xerostomia include difficulty in chewing, speaking, swallowing, and the ability to taste. To help relieve dry mouth, sip water throughout the day, chew sugarless gum or suck on sugarless mints, or use a mouth moisturizer available over the counter.

Fungal infections

Several authors have reported that diabetic patient have increased predisposition to manifestation of oral candidiasis, including median rhomboid glossitis, denture stomatitis and angular cheilitis. Candidiasis has been found to be associated with poor glycemic control and use of dentures. Mucormycosis is a rare but serious systemic fungal infection that may occur in patients with uncontrolled DM which appears as palatal ulceration or necrosis. Treatment usually includes systemic antifungal therapy. Oral fungal infections are treated with special mouthwashes and antifungal medication and by controlling blood sugar levels.

Oral burning and taste disturbances

Clinician should consider DM in the diagnosis of problems like burning mouth or tongue. The burning may be due to peripheral neuropathy, xerostomia, or candidiasis. Good glycemic

control may alleviate burning sensation. Reports have indicated that clonazepam may be beneficial in some patients with complain of oral burning sensation. Taste disturbances have been reported in patients with DM, but all investigators have not observed this finding. Perros and colleagues reported that some diabetic patients have a mild impairment of the sweet taste sensation. This may be related to xerostomia or disordered glucose receptors.

Oral mucosal diseases

A number of types of oral mucosal lesions, including lichen planus and recurrent aphthous stomatitis, have been reported in people with DM. Not all study results have showed this association, and these are relatively common disorders that often are observed in patients who do not have diabetes. Petrou-Amerikanou and colleagues reported that the prevalence of oral lichen planus is significantly higher in patients with type-1 DM and slightly higher in patients with type-2 DM than in control subjects. However, this may be side effect of oral hypoglycemic agents or antihypertensive medicines.

Dental caries

Some studies have demonstrated that diabetic patients have more active dental caries than control subjects. Furthermore, a reduction in salivary flow has been reported in people with diabetes who have neuropathy, and diminished salivary flow is a risk factor for dental caries. The literature presents no consistent pattern regarding the relationship of dental caries and diabetes. However, low carbohydrate diabetic diets should theoretically reduce caries prevalence.

Dental Management Consideration

To minimize the risk of intraoperative emergency, clinicians need to consider a number of management issues before initiating dental treatment.

Medical history

Prior to dental treatment, the dentist must obtain a good medical history which indicates the type of diabetes suffered and frequency of hypoglycemic episodes or complications. Antidiabetic medications, dosages times of administration, and status of diabetes control should be determined. According to the recent consensus of the American Diabetes Association, glycosylated hemoglobin, that is, HbA1c ≥6.5%, a preprandial glycemia of ≥126 mg/ dl and a postprandial glycemia ≥200 mg/dl are suggestive diagnostic values of diabetes.

Scheduling of visits

In general, morning appointments are advisable since endogenous cortisol levels are generally higher at this time. 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.

Diet

It is important for clinicians to ensure that the patients has eaten normally and taken medications as usual. If the patient skips breakfast owing to the dental appointment but stills takes the normal dose of insulin, the risk of a hypoglycemic episode is increased. For certain procedures (e. g., conscious sedation), the dentist may request that the patients alter his or her normal diet before the procedure. In such cases, the medication dose may need to be modified in consultation with patient's physician.

Blood glucose monitoring

Depending on the patient's medical history, medication regimen and procedure to be performed, dentists may need to measure the blood glucose level before beginning a procedure. This can be done using commercially available electronic blood glucose monitors, which are relatively inexpensive and have a high degree of accuracy. 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. Clinician should refer patients with significantly elevated blood glucose levels for medical consultation before performing elective dental procedures.

Noninvasive dental procedures

Well-controlled patients can be treated similarly to non-diabetic individuals. Be aware of the increased susceptibility of these patients to infections and delayed wound healing. In poorly controlled patients, delay the dental treatment if possible until they have achieved good metabolic control.

Invasive dental procedures

Patients should ask their doctor for instructions concerning their medication (normally, if they have metabolic stability, they should take half their daily dose of insulin the morning of the treatment; then, after the intervention, the whole dose should be taken with a supplement of rapid-acting insulin). Blood glucose should be measured preoperatively. If it is between

100 and 200 mg/dl, the invasive dental procedure can be performed. If blood glucose is >200 mg/dl, an intravenous infusion of 10% dextrose in half-normal saline is initiated, and rapid-acting insulin is administered subcutaneously. If the treatment lasts more than 1 hr, blood glucose should be measured hourly. If blood glucose is >200 mg/dl, rapidacting insulin should be administered subcutaneously. Type-1 DM is considered a risk factor with regard to suffering infection. For that reason, when invasive dental procedures are going to be performed (as intraligamentous anesthesia, teeth extractions, biopsies, etc.), the usual guidelines for the antibiotic prophylaxis should be followed.

CONCLUSION

DM is a disease of which the general public and practicing dentists and dental hygienists should be aware. On the basis of the available data, we can conclude that practicing dentists and dental hygienists can have a significant, positive effect on the oral and general health of patients with DM. It is important for the dentist to be aware with the medical management of the patients with DM, and to recognize the signs and symptoms of the undiagnosed or poorly controlled disease. By taking an active role in the diagnosis and treatment of oral conditions associated with DM, dentist may also contribute to the maintenance of optimal health in patients with this disease. Periodontal disease is the main oral clinical manifestation in diabetic patients. Periodontal treatment may eventually be covered by medical insurance, which could include consultations, diagnostics, and therapeutics. These patients should be aware of their increased susceptibility to infections and delayed wound healing. Well-controlled diabetics can be treated in the dental office similarly to nondiabetic patients, but morning appointments are preferable, and patients should be instructed not to fast, in order to reduce the risk of the occurrence of hypoglycemia.

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