

Diabetes and Oral Health

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Abstracts: As clinicians who diagnose and treat oral conditions associated with systemic diseases and prescribe the medications used to treat these diseases, we should be well aware of the oral changes that are observed in patients with diabetes. Periodontal disease and dental caries are the most common oral diseases, and both are modified when diabetes is present. Indeed, periodontitis has been reported as the sixth complication of this disease; also periodontal disease can adversely affect glycemic control. Root caries also is more prevalent in patients with diabetes. They can lead to sequelae of infection, pain, tooth loss, and reduced masticatory function. Thus, it is important for the patient as well as the care provider to be aware of the inter-relation of the two. [kamla B NJIRM 2016; 7(6):110-113]

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Introduction: Diabetes mellitus (DM) is a multisystemic metabolic disorder characterized by abnormal carbohydrate, protein, and lipid 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 secretory defect; and gestational, a condition of abnormal glucose tolerance during pregnancy. The cardinal biochemical feature of this disease is hyperglycemia, resulting from either a defect in insulin secretion from the pancreas, a change in insulin action, or both. Chronic hyperglycemia results in widespread multisystem damage including retinopathy, neuropathy, nephropathy, macrovascular disease, and delayed wound healing¹.

In 1997, an estimated 24 million people worldwide were living with diabetes. By the year 2020, the number of people with diabetes worldwide is projected to reach 221 million, and in certain regions of the world (for eg. 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. The burden of diabetes on the health care system is remarkable. During the past two decades, the prevalence of diabetes has increased 30 to 40 percent and the burden of diabetes and its complications are likely to increase as the population grows older. Obesity is a major risk factor in the development of

diabetes at any age, and the number of overweight children and adolescents has increased substantially in the past two decades. In summary, diabetes represents a growing medical disorder, with concomitant morbidity and mortality that can affect people of all ages.

The oral cavity can be dramatically affected by diabetes. There are a wide range of oral manifestations that have been reported in patients with diabetes including increased extent and severity of periodontal disease, changes in the prevalence of dental caries, burning mouth syndrome, Candida infection, xerostomia, altered taste sensation, altered tooth eruption, and hypertrophy of the parotid glands⁶. Dental professionals must be familiar with the range of oral disorders observed in patients with diabetes, and how these problems should be managed in patients with the disease.

Relationship Of Diabetes To Various Oral Conditions:

Diabetes and periodontitis: Periodontitis refers to inflammation of the tissues that surround and support the teeth. It is the most common chronic oral infection and often the major cause of tooth loss. Diabetes, particularly type 2 diabetes, is considered a risk factor for periodontitis. Periodontitis has been reported as the sixth complication of diabetes⁷.

Taylor and Borgnakke reported that more than 75 % of studies (13 of 17) published from 1960 to 2007 that examined periodontal disease as a complication of diabetes found that periodontitis was more severe when diabetes was present⁸. Fifty-five percent of the

cross-sectional studies demonstrated significantly greater clinical periodontal disease when diabetes was present. Three of four longitudinal studies demonstrated that periodontitis progressed more rapidly in patients with diabetes⁹.

The proposed mechanisms that explain the biological association between these diseases include, (1) microvascular alterations, (2) changes in components of gingival crevicular fluid, (3) changes in collagen metabolism, (4) altered host response, (5) altered subgingival flora, (6) genetic predisposition, and (7) non-enzymatic glycation¹⁰.

The relationship between diabetes and periodontitis has been shown to be bidirectional. Not only does diabetes affect the periodontium, but evidence also suggests that periodontal infection may adversely affect the glycemic control of diabetes. Periodontitis has been linked to an increase in insulin resistance, even in people without diabetes. Adverse outcomes in diabetes (including the increased risks of heart disease, stroke and early mortality) are more likely in the presence of periodontitis¹¹⁻¹⁴.

Periodontal therapy has shown reasonable improvement in glycemic control in diabetic patients with periodontitis. This provides a clear rationale for all patients with newly diagnosed or poorly controlled diabetes to have an oral evaluation that includes a periodontal examination. If periodontitis is present, periodontal therapy is indicated. This will improve the health of the supporting structures of the teeth, halt or slow the progression of periodontal disease (and thereby maintain masticatory function), and may improve glycemic control^{15,16}.

Diabetes, Dental caries and Endodontics: Dental caries is the indirect result of the metabolism of fermentable carbohydrates by specific oral bacteria (*Streptococcus mutans*, *Lactobacillus* species), with the by-product of that metabolism (lactic acid) acting on a mineralized substrate (the dentition). The result is the demineralization of the teeth, ultimately leading to frank cavitation.

As reported in the literature, the relationship of dental caries to diabetes is controversial. Increased caries, no differences and decreased caries have been reported¹⁷⁻¹⁹. The available evidence suggests that coronal caries (involving the crown portion of the

teeth normally visible in the mouth), does not differ between individuals with diabetes and those without the disease; but those patients with diabetes did demonstrate an increased rate of root caries. The increase in root caries may be secondary to the increased prevalence of periodontitis in patients with diabetes²⁰. With loss of bone and periodontal ligament about the teeth, the gingival tissues recedes, exposing the previously covered root surfaces. The root surface, which is covered by cementum, is more susceptible to demineralization than the enamel that covers the crowns of the teeth. An important consideration when examining caries development is salivary flow.

In case of endodontic therapies, a multivariate analysis revealed that in cases with preoperative periradicular lesions, the successful treatment outcome was significantly reduced in non-surgical endodontic therapy²¹.

Diabetes and xerostomia: Xerostomia is a patient's subjective feeling of oral dryness. Both type 1 and type 2 diabetic patients have been reported to have xerostomia and salivary gland hypofunction²². Factors that contribute to altered salivary function in diabetes include, hormonal, microvascular, and neuronal changes, caused by metabolic dysregulation, dehydration, or due to changes in the basement membrane of the salivary gland²³. Persistent xerostomia compromises of the washing, buffering and protective function of saliva, thereby increasing the susceptibility to dental caries, oral mucosal soreness, and altered taste.

Several changes to the salivary glands may occur in association with diabetes. Besides xerostomia, findings may include gland enlargement, and an increased risk for developing salivary duct stones and gland infection.

Diabetes and oral infections: Fungal infections of oral mucosal surfaces and removable prostheses are more common in adults with diabetes. Oral Candidiasis is the most common opportunistic fungal infection in diabetes, followed by zygomycosis and aspergillosis. Studies have shown increased oral *Candida* carriage in diabetics compared to non-diabetics^{24,25}. This could be attributed to increased salivary glucose levels, decreased salivary flow rate, or decreased candidacidal activity of the neutrophils.

Diabetes and delayed wound healing: Changes in the collagen metabolism and host defense contribute to alterations in wound healing, in diabetic patients. Increased degradation of newly formed collagen, due to excessive production of collagenase and decreased solubility of the existing collagen, due to modification by the advanced glycation end products (AGEs), causes a shift in collagen turnover, thereby altering the healing response.

Dental Care In Patients With Diabetes: Dental treatment procedures in patients with diabetes are similar to those provided for non-diabetic patients. However, few important considerations are essential to avoid complications like poor wound healing. Glycemic control of the patient should be monitored. Extensive dental surgical procedures should be avoided in patients with poor glycemic control, as endogenous production of epinephrine and cortisol increase during stressful situations. These hormones elevate the blood glucose levels and interfere with glycemic control. Diabetic patients under insulin therapy will require an increase in insulin dosage in the presence of acute oral infection. Prophylactic antibiotic coverage prior to surgical therapy is preferred by few clinicians, if the diabetic patient's glycemic control is poor. Systemic antibiotics are usually considered in the presence of acute infection. Routine dental treatment in diabetic patients with good glycemic control does not require any antibiotic coverage. Certain medications used by the dentist may require adjustment of medical therapy for diabetes. Minor doses of systemic steroids given to diabetic patients with oral hypoglycemic agents can worsen the glycemic control¹. Such patients require short-term insulin therapy to maintain the blood glucose levels.

Conclusion: Safely managing the patient with diabetes requires effective communication among multiple health care providers. Diabetes has profound effects on oral health and thus the increasing evidence of oral complications in diabetes warrants the inclusion of dental care as a part of primary health care in these patients. Also, dental professionals can play an important role in diagnosing and managing patients with diabetes.

The International Diabetes Federation has published a Guideline for Oral Health for People with Diabetes²⁶. This document listed five recommendations for non-

oral health care providers regarding oral health care for persons with diabetes. These include:

1. On an annual basis, ask if the person follows recommended guidelines for oral self-care, and has regular visits to a dental professional.
2. On an annual basis, ask if the person notices signs of periodontal (gum) disease, including bleeding with tooth brushing and gums that appear red and/or swollen.
3. Emphasize the importance of oral self-care and that seeing a dental professional on a regular basis is part of comprehensive care of diabetes.
4. If signs and symptoms of gum disease are reported, persons should be referred for professional dental care.
5. Provide an explanation of why it is important for persons with diabetes to maintain a healthy mouth, and treat gum disease when it is present.

It is of paramount importance to provide good oral care for diabetic patients to combat complications, reduce the systemic inflammatory burden, prevent morbidity and mortality, and thereby, improve the quality of life of these individuals.

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