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Review Article

Diabetes and oral health - A review

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ABSTRACT

There are two types of DM: primary and secondary. Primary diabetes includes both type 1 and type 2. Type 1 diabetes can be immune-mediated (A) or idiopathic (B). Diabetes can induce changes in the oral cavity, including periodontitis (pyorrhea) and gingival hyperplasia, both gum-related conditions. Diabetes-related oral conditions include dental caries, oral mucosal diseases, glossodynia, trigeminal neuropathy, and taste impairment. Some people may have xerostomia, whilst others may have fruity (acetone) breath.

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1. Introduction

At least 220 million people globally, or 2.8% of the population, have diabetes, according to the World Health Organization. Its frequency is rising quickly, and by 2030, this number is predicted to nearly double. Asia and Africa are predicted to experience the biggest increases in prevalence. The trend of urbanization and changes in lifestyle is reflected in the rising incidence of diabetes in developing nations.^{1,2}

Diabetes can cause changes in the oral cavity, including periodontitis (pyorrhea) and gingival hyperplasia, two conditions related to the gums. Other oral diseases associated with diabetes include glossodynia, candidiasis, and dental decay. Some people may have xerostomia, while others may notice a fruity (acetone) breath.^{2,3} Sadly, taking proper care of the mouth is sometimes neglected when attempting to manage other diabetes-related issues, which can lead to hidden morbidity and unnecessary suffering from dental health issues.^{2,4}

1.1. Classification

Wilson et al. and Aguirre et al. divided DM into four primary types in 2010 and 2013. They consist of gestational diabetes, type 1 and type 2 diabetes, and other causes. First, type 1 diabetes is defined as a complete B-cell loss that results in a severe shortage in insulin secretion. Second, type 2 diabetes may be brought on by insufficient insulin secretion or by the cells' inadequate response to this hormone. Thirdly, diabetes can afflict expectant mothers in the second and third trimesters. Lastly, diabetes might have different forms resulting from different causes. They identify themselves as genetic abnormalities, exocrine pancreas diseases, and drug-induced conditions as chemical or cyclosporine diabetes.⁵

Furthermore, 1998 saw the classification of diabetes mellitus (DM) based on its aetiology by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. The two types of DM are primary and secondary. Types 1 and 2 are involved in primary DM. Type 1 and type 2 diabetes are categorized as primary diabetes; type 1 diabetes may be immune-mediated type A or idiopathic type B. Insulin resistance and

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an insulin secretory malfunction are features of type 2 diabetes.^{5,6} Numerous conditions, including pancreatic disease, hormone imbalances, serious sickness, and other conditions like gestational diabetes, can result in secondary diabetes. In addition, secondary diabetes can result from medication side effects, autoimmune endocrinopathies, hereditary disorders, and insulin resistance.^{5,6}

2. Discussion

2.1. Oral manifestations

2.1.1. Salivary dysfunction

Xerostomic complaints can be caused by dehydration, hyposalivation (reduced salivary flow), changed saliva composition, oral sensory dysfunctions, or thirst (a typical symptom of diabetes mellitus). Studies by Chavez et.al.^{7,8} revealed trends toward reduced salivary flow rates when HbA1c values rose, whereas other research^{8–10} demonstrated considerably lower flow rates when one or more xerostomic drugs were taken. Few treatments and drugs have been examined for objective changes in salivary flow, despite the fact that many identify xerostomia as a potential side effect.^{8,11}

The goals of treating xerostomia should be to reduce symptoms, manage oral health conditions, and enhance salivary production. If xerostomia is a side effect of taking medication, it may be possible to relieve it by chewing or eating sugar-free gum or sweets. Alternatively, drug scheduling modifications, dose adjustments, or prescription substitutions may be investigated. Patients should be counselled against using tobacco products, spicy or acidic foods, dry or bulky foods, alcoholic or carbonated beverages, and tobacco products. A diet high in fluids should be promoted. The oral discomfort associated with xerostomia may also be lessened by using mouthwashes designed specifically to treat dry mouth and free of alcohol. It has been shown that immunologically active saliva substitute therapy is beneficial in lowering gingivitis, bacterial plaque, and positive oral yeast counts.^{8,12} It is best to recommend patients with xerostomic problems to a dentist so that their dental health can be strictly maintained. All medical professionals should be aware of the impact xerostomia can have on a patient's quality of life and should treat or refer patients who complain of dry mouth appropriately.⁸

2.1.2. Dental caries

Although the connection between diabetes and dental caries has been studied, it remains unclear. Patients with diabetes may be more likely to experience new and recurring dental caries due to their susceptibility to salivary, periodontal, and oral sensory problems. For instance, a number of studies have shown that individuals with diabetes have a higher history of dental caries.^{13–15} Traditional factors (e.g.,

Streptococcus mutans levels, prior caries experience) and poor metabolic control of diabetes are also associated with the development of caries^{15,16}, highlighting the necessity for dental professionals to routinely monitor all diabetic patients for new and recurring dental decay.¹⁵

2.1.3. Oral mucosal diseases

Certain oral soft tissue lesions have also been linked to diabetes; however, these links have not always been reported in various diabetic groups.^{8,17} More cases of traumatic ulcers,^{8,17} lichen planus,^{8,18} recurrent aphthous stomatitis,^{8,19} fissured tongue, irritant fibroma, and oral fungal infections (like oral candidiasis)^{8,20} have been reported. These correlations might result from delayed healing, persistent immunosuppression, or hypofunction of the salivary glands.^{8,21} They also offer a chance to coordinate diabetes treatment between dentists and medical professionals.

2.1.4. Trigeminal neuropathy

According to literature, DM may have an impact on trigeminal nerve function. Fifty-eight patients (48%) with trigeminal neuralgia (TN) had diabetic mellitus (DM). In a different study, 30 TN patients were examined, and 10 of them had high blood sugar. TN can therefore result from DM.^{5,22}

2.1.5. Periodontitis

One significant factor influencing the connection between diabetes and periodontitis is the level of glycemic control. A thorough examination revealed that those with type 1 diabetes had advanced periodontal illnesses, with those with a higher glycemic index exhibiting greater rates and severity of gingival inflammation as well as periodontal damage. Individuals with type 1 diabetes who had poor glycemic control lost significantly more alveolar bone and periodontal attachment loss than individuals with well-controlled diabetes.^{23,24}

Similarly, poorly maintained type 2 diabetic people had an 11-fold increased risk for alveolar bone loss over a two-year period compared to non-diabetic control subjects in a longitudinal trial with 362 participants.^{24,25} It has been found that tooth loss is fifteen times more common in Pima Indians with type 2 diabetes than in individuals without the disease.^{24,26} A meta-analysis of research conducted in different diabetes populations has validated this conclusion.^{24,27} Nonetheless, when compared to non-diabetic controls, well-managed type 2 diabetes patients did not exhibit a statistically significant risk of longitudinal bone loss. Other researchers have noted the same effect.^{24,28–30} When children and adolescents have periodontitis, their glycosylated hemoglobin, or HbA1c, readings are observed to be significantly higher.^{24,31–33}

Compared to people with controlled diabetes, those with poorly managed or uncontrolled diabetes have a higher risk of complications. It has been noted that greater diabetes control is associated with granulocyte abnormalities such as phagocytosis. Glycemic management has been demonstrated to lower the risk of complications. Compared to those with controlled diabetes, those with uncontrolled diabetes have a higher risk of infection. A series of factors, including an increased risk of infection and slowed recovery, are brought on by hyperglycemia. Research has demonstrated that uncontrolled diabetics exhibit higher rates of severe bleeding, bone loss, and periodontal disease compared to those with controlled diabetes.³⁴ Miller³⁵ examined the effect of periodontal therapy in diabetics and discovered that there was reduction in glyHbAc in patients who had periodontal therapy with systemic doxycycline and chlorhexidine rinse. The eradication of pathogens by therapy leads to a decrease of inflammation, which in turn reduces insulin resistance; this in turn reduces the sugar level. The absence of inflammation causes a decrease in adrenaline level, which in turn modulates anti-insulin action, leading to fall in sugar level. These factors together contribute to an overall reduction in the dosage of insulin or oral hypoglycemic medications.³⁴

2.1.6. Impaired wound healing

Diabetes is frequently associated with poor wound healing, which is characterized by decreased tensile strength and less wound collagen. In diabetic rats, decreased granular tissue as well as lower levels of protein and DNA have been documented. The non-enzymatic glycosylation of collagen and other proteins during the hyperglycemia phase may be the cause of the impaired wound healing. One important mechanism for diabetics' worse wound healing may be decreased growth factor secretion. The primary cell involved in growth factor secretion and wound debridement is the monocyte. A shared underlying cause for both delayed wound healing and an increased inflammatory response in diabetics may be the transition in monocytes from a reparative regenerative cell to an inflammatory phenotype.³⁴

2.1.7. Taste dysfunction

Taste sensation or gustation is an important trait that determines the food selection and nutrition of human beings. Gustation is a complex process that takes place in the taste buds resulting in the chemosensory perception of the food ingredients. Humans have the ability to experience a range of flavours such as sweet, sour, bitter, salty and umami. Taste disorder is a wide term used to represent any abnormality in the perception of tastes. Taste issue is one of the regularly reported oral manifestation of both type 1 and type 2 diabetes mellitus, which is often disregarded.

These illnesses can have a direct impact on the glycemic management of the diabetes patients. There are many chairside investigations that can help in the identification of taste problems. Early detection and effective care of taste problems in people with diabetes is critical for a better control of the glycemic levels.³⁶

3. Conclusion

There are two forms of DM: main and secondary. Primary DM involves both types 1 and 2. Type 1 and type 2 diabetes are classified as primary diabetes. Type 1 diabetes can be immune-mediated type A or idiopathic type B. Diabetes can cause changes in the oral cavity, such as periodontitis (pyorrhea) and gingival hyperplasia, which are both gum-related disorders. Diabetes-related oral disorders include dental caries, oral mucosal diseases, glossodynia, trigeminal neuropathy, and taste dysfunction. Some persons may have xerostomia, whilst others may experience fruity (acetone) breath.

4. Source of Funding

None.

5. Conflict of Interest

None.

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