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Conditions Of The Oral Cavity In Patients With Diabetes Mellitus

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Abstrak. This study examines the condition of the oral cavity in patients with diabetes mellitus (DM), with particular emphasis on children. Diabetes is associated with a significantly higher prevalence and severity of oral diseases, including periodontal disease, dental caries, xerostomia, and oral infections. Despite extensive research, inconsistencies remain regarding the direct relationship between diabetes and dental caries, indicating a clear knowledge gap.

The study is based on a theoretical and analytical review of existing clinical and biochemical evidence, focusing on salivary composition, microbial activity, and immune response in diabetic patients. Special attention is given to factors such as increased salivary glucose, elevated lactate levels, altered mineral metabolism, and reduced local immunity.

Findings indicate that diabetes disrupts oral homeostasis through multiple mechanisms, including vascular changes, impaired salivary gland function, and weakened immune defense. These changes promote the growth of pathogenic microorganisms such as Candida, Streptococcus mutans, and Lactobacillus, increasing susceptibility to caries and periodontal diseases. However, evidence regarding caries prevalence remains contradictory.

The results highlight that poor glycemic control and inadequate oral hygiene significantly worsen oral health outcomes in diabetic patients. The study implies that integrated management, including glycemic control, preventive dental care, and patient education, is essential for reducing complications. Strengthening local immunity and improving oral hygiene practices can significantly enhance treatment outcomes and overall health in individuals with diabetes.

Keywords: Diabetes mellitus, oral health, periodontal disease, dental caries, salivary composition, xerostomia, Candida infection, Streptococcus mutans, glycemic control, pediatric dentistry

This Introduction. Diabetes mellitus is a chronic metabolic disorder that affects multiple organ systems, including the oral cavity. It is widely recognized that patients with diabetes experience a higher prevalence of oral diseases such as periodontal inflammation, dental caries, xerostomia, and fungal infections. These complications are primarily associated with metabolic dysregulation, altered immune responses, and changes in salivary composition. Oral health is increasingly viewed as an integral component of systemic health, particularly in pediatric patients with type 1 diabetes.

From a theoretical perspective, the relationship between diabetes and oral pathology can be explained through several mechanisms, including increased salivary glucose levels, vascular dysfunction, and impaired local immunity. Previous studies have demonstrated that diabetic patients exhibit higher levels of pathogenic microorganisms and inflammatory mediators, contributing to periodontal disease progression. However, findings related to dental caries remain inconsistent, with some studies reporting higher prevalence, while others show no significant difference or even lower rates compared to healthy individuals. This inconsistency highlights a critical knowledge gap in understanding the exact role of diabetes in caries development.

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This study aims to analyze the structural, biochemical, and immunological changes in the oral cavity associated with diabetes mellitus. Using a theoretical and evidence-based approach, it examines how these changes influence oral disease progression. The expected outcome is to clarify the mechanisms linking diabetes with oral health conditions and to identify key factors affecting disease severity. The findings are intended to support improved preventive strategies, enhance clinical management, and promote interdisciplinary approaches between dentistry and endocrinology.

Methodology

This study employs a qualitative analytical approach based on a comprehensive review and synthesis of existing scientific literature and clinical data related to oral health in patients with diabetes mellitus. The methodology focuses on examining key pathological mechanisms, including biochemical changes in saliva, microbial composition, immune response, and vascular alterations affecting oral tissues. Relevant data were analyzed regarding salivary enzyme activity, glucose and lactate levels, and the presence of pathogenic microorganisms such as Candida, Streptococcus mutans, and Lactobacillus.

Particular attention was given to the relationship between glycemic control and oral health outcomes, as well as to factors influencing disease progression, including oral hygiene practices, dietary habits, and parental involvement in pediatric cases. Comparative analysis was conducted between diabetic and non-diabetic populations to identify differences in prevalence, severity, and progression of oral diseases. The study also incorporates findings on mineral metabolism disturbances, immune system dysfunction, and structural changes in salivary glands.

The collected data were systematically interpreted to identify patterns, correlations, and contradictions in previous research, especially regarding dental caries prevalence. This integrative approach allows for a comprehensive understanding of how systemic metabolic disorders influence oral health. The methodology ensures a holistic evaluation of both local and systemic factors contributing to oral complications in diabetes, providing a foundation for improved clinical and preventive strategies.

Result and Discussion

There are numerous studies showing that the prevalence, progression, severity, and degree of chronic oral diseases increase significantly in DM patients. The main oral complications associated with diabetes include gum infection, periodontal disease, dental caries, dry mouth, bacterial infections and fungus, bad breath, and prolonged wound healing from dental procedures. Belazi et al. In their research, they found that the growth rate of fungi of the genus Candida was significantly higher in people with diabetes than in the group of healthy people. The knowledge of diabetics about periodontal diseases, dry mouth and related preventive measures to prevent oral diseases is of great importance for maintaining the health of the entire body. Diabetic patients and their families should learn and practice new healthy lifestyle skills, including controlling blood sugar levels, following medication instructions, following a proper diet, physical activity, and more. These skills are very important both in controlling diabetes and in preventing or delaying its complications. Oral fluid plays an important role in ensuring the integrity of the oral mucosa due to the presence in it of more than 60 different enzymes with bactericidal properties that form specific and nonspecific resistance in the oral cavity [1.3.5.7].

The level of lactate in saliva in diabetics is higher than in healthy people. In healthy people and in advanced cases, it can reach up to 5 times the normal level, which is a contributing factor to the development of caries. In addition, diabetes affects almost all tissues and organs of the body, including the hard and soft tissues of the oral cavity, manifested by a host of complications. The first step of a pediatric dentist should be to get a comprehensive systemic history of the disease from the child, his parents and the pediatric endocrinologist, teach them how to control individual glucose levels, and

recognize the triggers of hypo- or hyperglycemia. Since dental caries is a multifactorial disease, the amount of Streptococcus mutans (S. mutans) and lactobacilli in saliva is higher in patients with active caries, whether diabetic or not, and although some factors in DM1 may increase the risk of caries, others may reduce it. Caries-causing bacteria, in particular S. mutans and Lactobacillus casei may be higher in DM patients, especially in those with poor diabetic control, and there is also a positive correlation between caries and salivary glucose levels. RDC is a rampant caries form of the primary dentition and is the current and most common term used to describe dental caries in very young children. It is defined as the presence of one or more decayed, missing, or filled tooth surfaces in any primary tooth in a child under the age of six. Any sign of smooth-surface caries in children under the age of three is known as severe RDC (S-ECC). Worldwide, up to 90% of preschool children suffer from this disease. Important factors for oral hygiene are the age of the child who started brushing, the involvement of parents in brushing the child's teeth, and the use of fluoride. The late start of brushing teeth, the lack of regular hygienic behavior of the oral cavity, as a second brush on the part of parents, is not harmful for removing biofilm and contribute to the development of caries.

Vitamin D deficiency may also be associated with an increased risk of caries, including the formation of dental tissue malformations under the influence of calcium metabolism and calcification of teeth in hard tissues. Children with dental malformations such as enamel hypoplasia appear to be at high risk of developing caries and have coined the term hypoplasia-associated early childhood caries. The American Diabetes Association (ADA) reports that 75% of cases of DM1 are diagnosed in people under the age of 18. Children with diabetes differ from adults in many ways, including pre-puberty insulin sensitivity, physical growth, and neurological vulnerability to hypoglycemia. Serious complications of DM1 are diabetic neuropathy, oral manifestations include decreased salivation, difficulty swallowing and speaking, high susceptibility to oral infections, including candidiasis, dental caries, gingivitis, etc., mucositis. Most lipids in saliva are glandular in origin, and some of them are thought to diffuse directly from the blood serum. The concentration of cholesterol in saliva reflects its concentration in blood serum, especially in people with high cholesterol levels. Salivary lipids are bound to proteins, especially glycoproteins, and are rich in proline. Studies prove the connection of salivary peptides and protein compositions with dental caries. However, there is evidence of an association of triglycerides and salivary gland cholesterol.there are no cavities. Periodontal disease is the most studied pathology of the oral cavity, which is associated with diabetes. Pro-inflammatory cytokines produced by gum tissues during periodontitis can enter the bloodstream, which can lead to increased insulin resistance and, as a result, inadequate glycemic control [2.4.6.8].

These risk factors usually change in patients with diabetes mellitus. However, there is no clear evidence of a link between diabetes and dental caries. Some studies have shown that there is a higher prevalence of caries in diabetic patients compared to non-diabetic groups, others have found a lower prevalence of dental caries, and some have reported similar rates between the groups. Children with DM suffer oral health problems throughout their lives. Poorly controlled glucose levels along with local factors such as poor oral hygiene (due to plaque buildup and calculus) cause oral health problems in these children. Changes in the oral environment lead to an increase in pathogenic microorganisms that cause dental diseases such as caries and gingivitis. In addition, diabetic children have more gum disease than children without diabetes, despite similar plaque levels. One of the predisposing local factors associated with the development and progression of gum inflammation may be tartar. It has been shown that a higher incidence and severity of gingivitis are associated with poor metabolic control in DM. Recently, diabetes treatment has been based on the flexibility of insulin administration and regular monitoring of blood glucose levels, which allows for a less restrictive diet and reduces the importance of dietary factors in the development of caries in patients with diabetes. Lesions of the hard tissues of teeth in DM are not more common than in healthy people and depend on the course of the

underlying disease and hereditary factors. A pathohistological examination of the pulp of extracted teeth in individuals with diabetes revealed that it mainly contains large multiple dentils, and the pathomorphological changes are both inflammatory and dystrophic in nature. It was also found that the content of macronutrients such as zinc and copper decreases depending on the duration of the disease, which probably affects tooth resistance to caries.

The compensated form of ADHD will lead to a violation of mineral metabolism, a decrease in the formation and activation of bone destruction, which affect the condition of the hard tissues of the tooth. When mineral metabolism is disrupted, calcium begins to be washed out of the body, followed by fluorine. When calcium and fluoride are insufficient, the enamel becomes brittle. The acid released by bacteria penetrates into it faster, which contributes to the formation of caries, the high rate of its progression is due to the fact that the dentinal tubules are expanded, and this facilitates the spread of the process deeper. Diabetes affects the condition of periodontal tissues, as shown by a number of reviews and studies. With this pathology, there is a violation of regional hemodynamics. Vascular disorders in DM develop not only due to spastic changes in blood vessels and capillaries, but also due to changes in the function of the blood itself. During the above processes, the wall of blood vessels thickens, which slows down the intake of nutrients and reduces tissue resistance to microorganisms.

Vascular changes in periodontal tissues in children with diabetes occur earlier than in other organs. In the absence of treatment, the signs of periodontitis in childhood diabetes are: bleeding of the gingival papillae, bright red color of the gingival margin, possibly bulging granulations from pathological gingival pockets. Children also have angular cheilitis, geographical tongue, oral candidiasis, chronic catarrhal and recurrent aphthous stomatitis. Structural changes in the salivary glands that develop in diabetes lead to impaired salivation and biochemical changes in the composition of saliva; they cause xerostomia and the development of multiple caries, candidiasis, halitosis.

Conclusion

Local immunity factors play an important role, including specific, nonspecific, cellular and humoral, which function in close interrelation. It is known that the amount of salivary lysozyme, which suppresses pathogenic bacteria, is reduced in DM patients by one and a half times compared with healthy ones, while the phagocytic function of polymorphonuclear leukocytes, immunoglobulin M is significantly inhibited and the content of immunoglobulins A and G increases. Numerous studies have established that maintaining the functional capabilities of the immune system contributes to a favorable outcome of dental treatment.

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