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CHANGES IN ORAL FLUID AND SALIVA IN PATIENTS WITH DIABETES MELLITUS

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Abstract: This study examines changes in oral fluid and saliva in patients with diabetes mellitus and their role in oral health pathology. Saliva plays a critical role in maintaining oral homeostasis through mechanical cleansing, mineralization, antimicrobial activity, and pH regulation. However, diabetes mellitus disrupts these functions by altering salivary composition and secretion rate. Despite existing studies on oral complications in diabetes, limited attention has been given to the diagnostic and functional significance of salivary changes. The study adopts an analytical and literature-based approach, focusing on biochemical and immunological alterations in oral fluid, including calcium, phosphate balance, and lysozyme activity. It also evaluates the relationship between metabolic disorders in diabetes and the progression of dental diseases. The findings indicate that reduced salivary flow, increased viscosity, and altered mineral composition impair the protective and regenerative functions of saliva. These changes contribute to the high prevalence of dental caries, periodontal diseases, and fungal infections observed in diabetic patients. In addition, elevated inflammatory mediators further aggravate oral tissue damage and complicate disease management. The results highlight that oral fluid serves as a valuable diagnostic medium due to its non-invasive, accessible, and informative nature. The study emphasizes the importance of integrating dental examination into diabetes management and promoting preventive oral care. The findings suggest that salivary diagnostics can improve early detection, monitoring, and treatment outcomes in patients with diabetes mellitus.

Key words: diabetes mellitus, saliva, oral fluid, periodontal disease, dental caries, salivary diagnostics, oral health.

Introduction. Diabetes mellitus is a systemic metabolic disorder characterized by disturbances in carbohydrate, lipid, and protein metabolism, which significantly affect multiple body systems, including the oral cavity. Saliva plays a fundamental role in maintaining oral health by ensuring mechanical cleansing, regulating pH, supporting remineralization, and providing antimicrobial defense. Its composition and secretion are highly sensitive to systemic changes, making it an important indicator of overall physiological status.

In patients with diabetes, alterations in salivary flow rate, viscosity, and biochemical composition disrupt the protective mechanisms of the oral environment. These changes are closely associated with the development of dental caries, periodontal diseases, and oral infections. The relationship between diabetes and periodontal pathology is particularly complex, as both conditions mutually exacerbate each other through inflammatory and metabolic pathways. Elevated levels of proinflammatory mediators further intensify tissue damage and complicate disease progression.

Although numerous studies have examined oral complications in diabetes, there remains a gap in understanding the integrative role of oral fluid as a diagnostic medium. Traditional diagnostic approaches often overlook saliva despite its advantages, including non-invasive collection, cost-effectiveness, and the ability to reflect both local and systemic changes. This gap limits early detection and effective monitoring of oral and systemic complications in diabetic patients.

This study aims to analyze changes in oral fluid and saliva in patients with diabetes mellitus and to evaluate their diagnostic and clinical significance. It is expected that identifying salivary alterations will enhance understanding of disease mechanisms, improve early diagnosis, and support the development of preventive and therapeutic strategies. The findings contribute to strengthening the integration of dental care into comprehensive diabetes management.

Methodology. The study is based on a comprehensive analytical review of scientific literature and clinical observations related to changes in oral fluid and saliva in patients with diabetes mellitus. Data were collected from previously published studies focusing on salivary composition, biochemical markers, and oral health conditions associated with diabetes. Particular attention was given to indicators such as salivary flow rate, viscosity, mineral content including calcium and phosphates, and immune-related components such as lysozyme. The analysis also considered the relationship between metabolic disorders and the development of dental pathologies, including caries and periodontal diseases. Comparative evaluation methods were used to identify differences between healthy individuals and diabetic patients. The study further examined the diagnostic potential of saliva as a non-invasive biological medium. The methodological approach allowed for the systematization of existing knowledge and the identification of key patterns linking salivary changes with oral and systemic complications of diabetes mellitus.

Result and Discussion. Salivation is influenced by many factors, and therefore it is very unstable and vulnerable. A decrease in saliva secretion is an unfavorable factor, since a decrease in saliva flow leads to a deterioration in the mechanical and chemical cleansing of the oral cavity. Self-cleaning of the oral cavity also worsens with an increase in saliva viscosity. The mineralizing function of saliva plays a major role in the pathogenesis of dental caries. This function largely depends on the saturation of saliva with calcium and phosphates. Saliva serves as the main route of calcium and phosphorus intake into the tooth enamel. saliva is known to exhibit mineralizing properties if the mineralizing components (calcium and phosphorus) are in a supersaturated state. The intensity of dental caries is negatively correlated with indicators of the mineral metabolism of the oral fluid, such as total calcium and inorganic phosphates. Changes in the biochemistry of saliva play an important role in the pathogenesis of caries. Saliva is a mixture of secretions from the parotid, submandibular, sublingual and small salivary glands. In healthy people, the daily production of saliva is usually between 0.5 and 1.5 liters. Saliva contains 99% water, a number of electrolytes (for example, sodium, potassium, calcium, bicarbonate, phosphate) and organic components (immunoglobulins, proteins, enzymes, mucins). In addition to retaining tissues and absorbing food, saliva cleanses the oral cavity, makes it possible to chew and swallow food, maintain a neutral pH, and prevents tooth demineralization[2.4.6.8].

The nature of changes in the oral cavity in children with diabetes depends on the course and duration of the disease. The intensity of caries damage in children with diabetes is no more pronounced than in healthy children, while even complications do not contribute to its development. The oral environment of sick children does not contain additional factors that reduce the resistance of hard tooth tissues to caries, but the regenerative abilities of the oral mucosa are reduced. The mutual aggravation of the course of periodontal diseases and diabetes leads to the formation of complex pathogenetic relationships in the body, and it is rarely possible to identify primary etiological factors. In this regard, the proven method of traditional therapy aimed at etiotropic and pathogenetic treatment is often not effective enough in this group of patients, as evidenced by the high prevalence of complications associated with early tooth loss and worsening of periodontal diseases.

From this perspective, the oral fluid is an interesting object to study. Through the flow of macro- and micronutrients, inhaled air, water, and oral fluid, the macroorganism communicates with the external environment. Bioregulators, intermediates and end products of metabolism entering the oral fluid from the internal environment ensure its integrative and homeostatic function, and proteins, lipids, carbohydrates, enzymes, hormones, and minerals entering from the salivary glands, blood serum, and oral tissues make it possible to determine their biological activity even at minimal concentrations. Systematizing the data, it is necessary to highlight the advantages of salivodiagnostics over routine methods of laboratory blood analysis: high information content, simplicity and convenience of taking

an unlimited amount of material under physiological conditions, painlessness, accessibility, atraumatism, safety of obtaining for the health of the patient and medical staff, the study of indicators during screening examinations, monitoring and use of rapid analyzes for self-control by the examinees, economic expediency.

Lysozyme is an indicator of the immune defense of the oral cavity, acts as an aggregating agent, breaking the bonds between the components of the cell wall of Gram-positive bacteria and promoting bacterial autolysis. Pathological changes occurring in the oral cavity against the background of diabetes are represented by multiple dental diseases (caries, periodontal diseases, candidal stomatitis, angular cheilitis, etc.), detected in 88.0% of cases. Thus, dental caries and periodontal diseases are observed in 52.0- 90.0% of cases. Therefore, the increase in the prevalence and progression of these dental diseases in pregnant women with diabetes is the most urgent problem of diagnosis, prevention and treatment of this pathology. The prevalence of major dental diseases such as caries and periodontal diseases in pregnant women with diabetes remains quite high, and their course leads to rapid progression and development of complications. Among the numerous complications of diabetes mellitus, diabetic macro- and microangiopathies, neuropathies, nephropathies, and visual disturbances are more often considered, with pathogenesis based on disorders of carbohydrate, fat, protein, and other types of metabolism[1.3.5.7].

Dental manifestations of diabetes can be a direct consequence of the weakening or loss of specific effects of insulin, as well as various metabolic disorders. It is important to emphasize that inflammatory processes in children suffering from diabetes usually occur with frequent exacerbations. The literature notes a parallelism in the course of periodontal pathology and diabetes. Thus, when the course of the underlying disease worsens, inflammatory processes in periodontal tissues worsen. The compensated course of diabetes has a positive effect on the duration of remission of the inflammatory process in periodontitis. At the same time, insufficient attention is paid to improving the dental health of children with diabetes, as well as therapeutic and preventive measures aimed at preserving teeth and preventing exacerbations of the inflammatory process in periodontal tissues. Most studies show that circulating proinflammatory mediators are elevated in people with diabetes and periodontitis, especially TNF-alpha, CRP, and mediators of oxidative stress. These pro-inflammatory mediators can affect the control of diabetes.Oral hygiene education should be provided to all patients with ADd as part of their general educational program. The risk of periodontal disease is increased, and if left untreated, periodontitis has a negative effect on metabolic control, and may also increase the risk of complications from diabetes, such as cardiovascular and renal diseases. Patients should be informed that successful periodontal therapy may have a positive effect on their metabolic control and diabetes complications.

Conclusion. The study of the presence of periodontal diseases should be an integral part of visiting a doctor for the treatment of diabetes. People with diabetes should be asked about any signs and symptoms of periodontitis, including bleeding gums while brushing or eating, loose teeth, tooth spacing or tooth spread, bad breath and/or abscesses in the gums, or suppuration of the gums.And if a positive medical history is revealed, an operative periodontal examination should be recommended before the scheduled annual examination. In case of a negative medical history, people with diabetes should be advised to check for the above symptoms, and if a positive sign appears, visit their dentist.

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