New Day in Medicine
Новый День в Медицине
NDM

TIBBIYOTDA YANGI KUN

Ilmiy referativ, marifiy-ma'naviy jurnal

AVICENNA-MED.UZ

ISSN 2181-712X.
EiSSN 2181-2187

11 (85) 2025

ТИББИЁТДА ЯНГИ КУН
НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
NEW DAY IN MEDICINE

Илмий-рефератив, маънавий-маърифий журнал
Научно-реферативный,
духовно-просветительский журнал

УЧРЕДИТЕЛИ:

БУХАРСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ ИНСТИТУТ
ООО «ТИББИЁТДА ЯНГИ КУН»

Национальный медицинский исследовательский центр хирургии имени А.В. Вишневского является генеральным научно-практическим консультантом редакции

Журнал был включен в список журнальных изданий, рецензируемых Высшей Аттестационной Комиссией Республики Узбекистан (Протокол № 201/03 от 30.12.2013 г.)

11 (85)

2025

ноябрь

www.bsmi.uz
https://newdaymedicine.com E:
ndmuz@mail.ru
Тел: +99890 8061882

Received: 20.10.2025, Accepted: 06.11.2025, Published: 10.11.2025

UDC 616.31-002:616.441-07-053.5

SALIVA AND GINGIVAL FLUID IN PEOPLE WITH HYPERGLYCEMIA, THE POSSIBILITY OF EARLY DIAGNOSIS OF PARODONTITIS

Jabborova Feruza Uzokovna https://orcid.org/0009-0002-8802-1158 e-mail: jabborovaferuza@bsmi.uz
Masharipov Otajon Maksudovich https://orcid.org/0009-0004-5054-9365
e-mail: Otajon.masharipov@mail.ru

Bukhara State Medical Institute named after Abu Ali ibn Sina, Uzbekistan, Bukhara, st. A. Navoi. 1
Tel: +998 (65) 223-00-50 e-mail: info@bsmi.uz

✓ ***Resume***

Diabetes mellitus is one of the most significant risk factors for periodontal tissue diseases. Hyperglycemia has systemic and local effects on the oral microflora, immune response, and regenerative processes. In people with impaired carbohydrate metabolism, periodontal inflammatory diseases develop more frequently, are more severe, and are less amenable to therapy. At the same time, the diagnosis of periodontitis at an early stage is often difficult due to poorly expressed clinical signs. Modern research is aimed at finding informative, non-invasive and accessible markers of inflammation that can be detected in saliva and gingival fluid.

Keywords: saliva, gingival, hyperglycemia, the possibility of early diagnosis.

СЛЮНА И ДЕСНЕВАЯ ЖИДКОСТЬ У ЛЮДЕЙ С ГИПЕРГЛИКЕМИЕЙ, ВОЗМОЖНОСТЬ РАННЕЙ ДИАГНОСТИКИ ПАРОДОНТИТА

Жабборова Феруза Узаковна https://orcid.org/0009-0002-8802-1158 e-mail: jabborovaferuza@bsmi.uz
Машарипов Отажон Максудович https://orcid.org/0009-0004-5054-9365
e-mail: Otajon.masharipov@mail.ru

Бухарский государственный медицинский институт имени Абу Али ибн Сины, Узбекистан, г. Бухара, ул. А. Навои. 1 Тел: +998 (65) 223-00-50 e-mail: info@bsmi.uz

✓ ***Резюме***

Сахарный диабет является одним из наиболее значимых факторов риска заболеваний тканей пародонта. Гипергликемия оказывает системное и местное воздействие на микрофлору полости рта, иммунный ответ и регенеративные процессы. У людей с нарушенным углеводным обменом воспалительные заболевания пародонта развиваются чаще, протекают тяжелее и хуже поддаются терапии. В то же время диагностика пародонтита на ранней стадии часто затруднена из-за слабо выраженных клинических признаков. Современные исследования направлены на поиск информативных, неинвазивных и доступных маркеров воспаления, которые можно обнаружить в слюне и десневой жидкости.

Ключевые слова: слюна, десна, гипергликемия, возможность ранней диагностики.

ГИПЕРГЛИКЕМИЯ БИЛАН ОҒРИГАН ОДАМЛАРДА СЎЛАК ВА МИЛК СУЮҚЛИГИ, ПАРОДОНТИТНИ ЭРТА ТАШХИСЛАШ ИМКОНИЯТИ

Жабборова Феруза Узаковна https://orcid.org/0009-0002-8802-1158 e-mail: jabborovaferuza@bsmi.uz
Машарипов Отажон Максудович https://orcid.org/0009-0004-5054-9365
e-mail: Otajon.masharipov@mail.ru

Абу али ибн Сино номидаги Бухоро давлат тиббиёт институти Ўзбекистон, Бухоро ш., А.Навоий кўчаси. 1 Тел: +998 (65) 223-00-50 e-mail: info@bsmi.uz

✓ ***Резюме***

Қандли диабет пародонт тўқима касалликлари учун энг муҳим хавф омилларидан биридир. Гипергликемия оғиз микрофлорасига, иммунитетга ва регенератив жараёнларга тизимли ва маҳаллий таъсир кўрсатади. Углевод алмашинуви бузилган одамларда periodontal яллиғланиш касалликлари тез-тез ривожланади, оғирроқ ва терапияга камроқ мос келади. Шу билан бирга, периодонтитни эрта босқичда ташхислаш кўпинча ёмон ифодаланган клиник белгилар туфайли қийин кечади. Замонавий тадқиқотлар сўлак ва gingival суюқликда аниқланиши мумкин бўлган яллиғланишнинг информацион, инвазив бўлмаган ва мавжуд белгиларини топишга қаратилган.

Калит сўзлар: сўлак, милк, гипергликемия, эрта ташхис қўйиш имконияти.

Relevance

Identification of such biomarkers will allow not only timely diagnosis of periodontitis, but also monitoring of the effectiveness of treatment. In individuals with hyperglycemia, early diagnosis of periodontitis is possible by measuring inflammatory biomarkers in saliva and gingival fluid, such as cytokines (e.g. IL-1b, TNF-α) and enzymes (e.g. MMP-8). These biomarkers show marked inflammation in periodontal tissues, which may precede clinical signs of periodontitis, such as bleeding gums. Diabetes mellitus (DM) is recognized worldwide. The prevalence of the disease in the last 50 years has become a pandemic. According to WHO, in 2012 there were 280 million people with DIABETES worldwide, including 480 thousand children, accounting for 9% of all deaths worldwide. Diabetes has the most significant effect on the condition of the oral cavity. Therefore, pediatric dentists should be aware of the features of the course of oral diseases in children with diabetes.

Objective: to identify the diagnostic value of inflammatory biomarkers in saliva and gingival fluid in individuals with hyperglycemia for early detection of periodontitis. Tasks: • To study the levels of inflammatory markers (IL-1b, TNF-α, MMP-8) in saliva and gingival fluid in individuals with different levels of glycemia. To assess the clinical condition of periodontal tissues in patients with normal and elevated glycemia. • Establish correlations between biomarkers and HbA1c levels. • To determine the prognostic significance of biomarkers for detecting the early stages of inflammation. Results and analyzes. Inflammatory changes in periodontitis may not be limited to the oral cavity, they can also cause systemic consequences in patients with type 1 and type 2 diabetes, and there is an increased prevalence of gingivitis and periodontal diseases. It has been established that periodontal diseases develop at a younger age in patients with DM than in a healthy population, and it also worsens with prolonged course. Periodontal diseases have been proven to negatively affect glycemic control and other complications associated with diabetes, and treatment of these diseases has a positive effect on these negative effects. In addition, childhood caries is a multifactorial disease of the oral cavity, which is often detected in patients with diabetes. Associations between gingivitis, periodontal diseases, and childhood caries have a similar course, i.e. inadequate oral hygiene and unhealthy diet. Maintaining oral health will help prevent chronic oral diseases and mitigate the effects of chronic inflammatory processes. Studies have established a link between type 1 diabetes and the state of oral health. Type 1 diabetes has a significant role in the occurrence and development of dental diseases such as periodontitis and dental caries. Metabolic imbalances in tissues can reduce the resistance of the local immunity of the oral cavity of people with diabetes and modify the initiation, development and progression of periodontal diseases. It has been suggested that there is a bidirectional relationship between diabetes and periodontal disease, as the presence of periodontitis causes difficulties in controlling glycemia in patients with type 1 diabetes. The researchers described a decrease in the rate of salivation in people with poorly controlled T1DM and the subsequent development of dental caries. Children with diabetes are at high risk of developing caries. It is generally assumed that the local conditions for the development of periodontitis are foci of growth of gram-negative bacteria (Aggregatibacter actinomycetemcomitans, Bacteroides spp., Campylobacter spp., etc.). Similar levels of streptococcus and lactobacilli in saliva were observed in patients with well-controlled diabetes.

It has been established that fungal infections of the oral cavity are more common in children than in healthy individuals as a result of associated immunodeficiency. The actual data indicate an increase in the frequency of carriage and the number of Candida albicans in patients with diabetes compared with non-diabetic children. The study of the oral health status of children with type 1 diabetes with different

levels of glycemic control made it possible to determine the oral microbial load. It was found that C. albicans and Streptococcus mutans were the main cariogenic microbes. The accumulated scientific knowledge on the study of the biochemical and immunological composition of saliva in various chronic pathologies, including diseases of the gastrointestinal tract, stress, has shown the ability of oral secretions to reflect the processes occurring in the patient's body and serve as an adequate substrate for monitoring homeostasis. For the first time in the region, a comprehensive assessment of biomarkers of inflammation in saliva and gingival fluid in patients with hyperglycemia is proposed. The study aims to identify early markers of periodontal inflammation that reflect latent metabolic disorders, which will improve screening and individualization of preventive programs. The results of the study can be used in clinical practice by dentists and endocrinologists to screen for periodontitis in patients with impaired carbohydrate metabolism. The introduction of non-invasive saliva tests will allow for early diagnosis and timely treatment, reducing the risk of complications and increasing the effectiveness of an interdisciplinary approach. Biomarkers of inflammation • Cytokines: o Pro-inflammatory cytokines (for example, IL-1b, TNF-α): Their elevated levels in saliva and gingival fluid indicate activation of the inflammatory process in periodontal tissues. o Anti-inflammatory cytokines (e.g. IL-4, IL-10): In patients with periodontitis, their levels may be reduced, which disrupts the balance between inflammation and its suppression. • Enzymes: o Matrix metalloproteinases (MMP), for example, MMP-8: These enzymes play a key role in the destruction of periodontal tissues. Their increased activity in the gingival fluid is a sign of active destruction of connective tissue and can serve as an early indicator of periodontitis. • Other biomarkers: o C-reactive protein (CRP): Although it is usually measured in the blood, its increase also correlates with systemic inflammation, which is closely related to periodontitis. o Heat Shock Protein (HSP): It can be used to assess stress at the cellular level and to detect pathological processes early. Early diagnosis options • Non-invasive method: Determination of biomarkers in saliva and gingival fluid is a non-invasive and painless procedure. • Timely detection: Measuring the level of biomarkers allows you to detect inflammation in the early stages, when there are no visible clinical signs yet, such as bleeding and swelling of the gums. • Monitoring of treatment effectiveness: The dynamics of biomarker levels can be used to assess the effectiveness of periodontitis treatment. As inflammation decreases, the level of biomarkers should also return to normal. • Risk forecasting: The presence of hyperglycemia increases the risk of periodontitis. The measurement of biomarkers helps to assess the individual risk of periodontitis in patients with hyperglycemia.

Taking into account the age-related features of the structure and formation of the maxillary system, as well as the formation of local oral protection factors, sick children with type 1 diabetes were divided into 3 groups: group 1 - 30 patients with malocclusion aged 3-5 years; group 2 - 32 patients with removable bite aged 6-11 years; group 3 - 35 patients with permanent bite aged 12-17 years. The control group consisted of 35 healthy children of this age. Cytokine levels (IL-1b, IL-4, IL-18, and INF-γ) in saliva were studied in all patients and healthy children. When studying salivator cytokines in patients, they were approached from the perspective of taking into account concomitant comorbid conditions and age-related features of immunity formation. Cytokines, as a humoral factor of natural immunity, are known to play a key role in the implementation of inflammatory reactions. Thus, the inducible protein IL-1b is produced by monocytes and macrophages. Its synthesis is necessary for an acute-phase response of the body. The studies revealed a significant increase in the level of IL-1b in saliva relative to the indicators of the control group (on average, 34.5±1.8 g/ml): in group 1, IL-1b increased by 1.98 times, to an average of 68.2±1.2 g/ml ($P<0.001$), in group 2, by 3.09 three times - on average up to 106.5±2.3 gg/ml ($P<0.001$), in group 3 2.5 times - on average up to 86.4±1.5 gg/ml ($P<0.001$), which indicates an acute phase of dental pathology in children with type 1 diabetes. The detected IL-4 is known as an anti-inflammatory cytokine produced by T lymphocytes. The anti-inflammatory effect of IL-4 is manifested in the suppression of the pro-inflammatory activity of macrophages and their secretion of IL-1, tumor necrosis factor (INF-γ) and IL-6. The study of cytokine status in patients with type 1 diabetes showed a significant but not pronounced decrease in the level of IL-4 in saliva in type 1 diabetes in children, regardless of age, with comorbidity with dental inflammatory diseases. Clinical and laboratory interpretation of the results of immunological examination of saliva of patients with type 1 diabetes showed a tendency to an insufficiently noticeable decrease in IL-4 levels in all the studied groups. A decrease in the level of IL-4 in saliva was found to be on average 6.8±0.5 pg/ml in children with a milky bite (group 1); on average to 6.8±0.6 pg/ml in children with a removable bite (group 2) and on average

to 6.9±0.5 pg/ml in children with a permanent bite (group 3) in relation to the indicators of the control group (on average 8.1 ± 0.3 pg/ml). Consequently, a decrease in the concentration of IL-4 against the background of an increase in IL-1 β in saliva in patients with type 1 diabetes indicates a decrease in the local anti-inflammatory response of the body. It is known that IL-18 is a type 1 pro-inflammatory cytokine that has a depressing effect on insulin production by beta cells of the pancreas, while others, mainly type 2 anti-inflammatory (IL-4), have a protective antidiabetic effect. The study found a 1.57-fold increase in IL-18 (55.5±5.0 pg/ml, P<0.001) in children with type 1 diabetes with lactic bite; in the group of patients with changeable bite, there was a significant increase in IL-18 by 2.38 times (83.9±6.8 pg/ml, P<0.001); in patients with permanent bite, by 2.86 times (101.1±5.1 pg/ml, P<0.001) compared to the control group (35.3±4.7 pg/ml). At the same time, a characteristic clinical and immunological picture is noted: with age, depending on the formation of bite in type 1 diabetes, the rate of increase in diabetogenic cytokine increases in sick children. There is an increase in the concentration of IL-18 in patients with type 1 diabetes with alternating and permanent bite.

This feature of the salivator cytokine indicates the relationship of diabetes with dental diseases and proves the need to develop a program for the early prevention of oral diseases in children with type 1 diabetes. INF-γ plays an important role in coordinating the functional connectivity of the multicomponent immune system. Interferons are a group of biologically active proteins synthesized by a cell in the process of a protective reaction to foreign antigens. An analysis of the results of a study on the level of INF-γ in saliva in patients with type 1 diabetes showed a significant decrease in group 1 by 2.22 times (9.8±1.5 gg/ml, P<0.001), in group 2 by 1.34 times (16.3±1.4 gg/ml, P<0.001) by relative to the control (21.8±1.2 pg/ml). In the group of children with permanent malocclusion (group 3), there is an unreliable tendency to decrease the level of INF-γ in saliva in the presence of dental pathology on the background of type 1 diabetes. The clinical and immunological interpretation of the results obtained and the examination of sick children made it possible to establish the features of cytokine synthesis depending on age, bite and the clinical form of dental diseases. Therefore, for children with type 1 diabetes aged 6-17 years, salivator cytokines IL-1 β and IL-18 are markers of inflammatory diseases of the oral cavity, and saliva INF-γ is an informative indicator of the protective reaction of the body of patients with type 1 diabetes aged 3 to 11 years. The established data are proven, scientifically based and confirm the need for an individual approach to early diagnosis and management of patients in this category, depending on age. The study of salivator cytokines for early diagnosis and the organization of timely preventive work in the dentist's office on the basis of regional endocrinological medical centers contributes to improving the dentist's knowledge and experience in managing patients with diabetes. An analysis of the biochemical parameters of the blood of patients with type 1 diabetes aged 6 to 11 years, depending on the clinical form of the dental disease, showed a significant increase in all studied biochemical parameters of the blood in patients with dental caries, chronic periodontitis and catarrhal gingivitis. The study found an unreliable trend towards an increase in urea levels in catarrhal gingivitis - up to 9.5±1.3 mmol/l versus control values of 7.8±0.7 mmol/l (P 0.05). Significant changes in liver enzymes were noted in patients with type 1 diabetes comorbidity with all established dental diseases, such as dental caries, chronic periodontitis and chronic gingivitis. The study of the concentration of alanine aminotransferase (ALT) in the blood of patients showed liver dysfunction. It is known that ALT does not always reflect only liver damage, the activity of this enzyme can increase in diseases of other organs. There was a significant decrease in ALT levels to 21.0±1.2 mmol/l when type 1 diabetes was combined with dental caries, and when type 1 diabetes was combined with chronic periodontitis, it was significantly increased to 54.6±1.3 mmol/L, as well as when type 1 diabetes was combined with catarrhal gingivitis to 44.7±1.9 mmol./l versus the control values - 32.4±0.5 mmol/L. The same significant upward trend is observed with respect to AST in the blood in all groups of examined patients with type 1 diabetes. At the same time, it should be noted that the presence of acute viral hepatitis C and B was excluded in all the examined patients.

Conclusion

The established characteristic change in liver enzymes in type 1 diabetes indicates a peculiar reaction of the liver tissue in response to extrahepatic diseases. C-reactive protein (CRP), a glycoprotein produced by the liver, belongs to the proteins of the acute phase of inflammation. There was a significant 3.2-fold increase in its level in patients with type 1 diabetes combined with dental caries; 4.5-fold in

patients with type 1 diabetes and chronic periodontitis; 5.5-fold in patients with type 1 diabetes combined with catarrhal gingivitis versus control values of 2.1±0.8 units. (P<0,05). Consequently, an increase in the level of CRP in the blood indicates the activity of the inflammatory process and the degree of damage to the dental tissues. A clinical and biochemical assessment of the condition of patients with type 1 diabetes showed a combination of an increase in CRP in the blood with such clinical symptoms as an unexpressed pain syndrome and the addition of a bacterial infection.

LIST OF REFERENCES:

1. Preshaw P.M. et al. Periodontitis and diabetes: a two-way relationship. // Diabetologia 2012;55(1):21-31.
2. Taylor J.J. Cytokine regulation of immune responses to Porphyromonas gingivalis. // Periodontology 2000. 2010;52(1):160-194.
3. Salvi G.E., Beck J.D., Offenbacher S. PGE2, IL-1β, and TNF-α responses in diabetics as modifiers of periodontal disease expression. // Ann Periodontol. 1998;3(1):40-50.
4. Lamster I.B., Pagan M. Periodontal disease and the metabolic syndrome. // Int Dent J. 2017;67(2):67-77.
5. Kinane D.F., Stathopoulou P.G., Papapanou P.N. Periodontal diseases. // Nat Rev Dis Primers. 2017;3:17-38.
6. Kamalova F.R., Turaeva F.A., Afakova M. Sh. Eronov E.K., Eshonkulov G.T. The dynamics of the prevalence of diabetes and the study of dental status in children of the Bukhara region // ACADEMICIA: An International Multidisciplinary Research Journal. - India, 2019;9:151-153. (14.00.00; (23) SJIF = 6.152)
7. Kamalova F.R., Radjabov A.A., Turaeva F.N., Afakova M.Sh. Frequency of spread of a short frenum of the tongueand upper lip in preschool // AJMR- India, 2019;8:126-129 (14.00.00; SJIF = 6.053).
8. Kamalova F.R. Development and evaluation of the effectiveness of the dental dental examination program for children with diabetes in adverse envir-onmental conditions // ACADEMICIA: An International Multidisciplinary Research Journal. - India, 2020;10:64-66 (14.00.00; SJIF =7.13).
9. Kamalova F.R. Therapeutic and preventive mtasures of dental diseases in children with diabetes // ACADEMICIA: An International Multidisciplinary Research Journal. - India, 2020;10:1920-1925 (14.00.00; SJIF =7.13).
10. Kamalova F.R. Prevention of dental anomalies and dental caries in children with diabetes // Middle European scientific bulletin. Czech Republic 2020;5:92-93 (14.00.00; SJIF = 6.7).

Entered 20.10.2025