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THE COMPARATIVE EVALUATION OF TREATMENT AND PREVENTION MEASURES IN THE COMPLEX THERAPY OF INFLAMMATION IN PERIODONTIUM IN CHILDREN WITH DIABETES MELLITUS

Periodontal disease in children with type 1 diabetes mellitus is registered in 85% of cases, namely: chronic catarrhal gingivitis (63%), chronic periodontitis (22%). It is important to say that inflammatory processes in children with diabetes mellitus usually occur with frequent exacerbations. The inflammatory processes in periodontal tissues increase with the deterioration of the diabetes mellitus. Compensated course of diabetes has a positive effect on the duration of remission of the inflammatory process in the periodontium.
The choice of medications for gingivitis and periodontitis depends on the severity of the inflammatory process, edema, bleeding, the presence of epithelial defects, stage of the process and destructive disorders. There are more and more products on the dental market designed for quality and effective oral care. Toothpastes with extracts of medical herbs have received great recognition among both professionals and patients. The doctor appreciates such qualities as the lack of effect of addiction to the medication, mildness of action, the impossibility of overdose, the complexity of the positive effects, and the patient appreciates the hygienic and therapeutic effect, as well as the naturalness of the components. ***Purpose of the study.*** *The aim of the study was to analyze scientific literature sources about principles of choice correct medications for treating gingivitis and periodontitis in children with type 1 diabetes mellitus in age 6–12 years.* ***Research methods.*** *We analyzed scientific databases, including articles about treating of gingivitis and periodontitis in children with type 1 diabetes mellitus. Prospective and retrospective cohort studies, case-control studies and randomized controlled clinical trials, reference lists were also examined. 21 articles were picked for the final review.* ***Scientific novelty.*** *We have selected and systematized various schemes for the treatment or prevention of gingivitis, and identified the links in the pathogenesis on which they influenced.* ***Conclusions.*** *The analysis of the results of the study shows that inflammation in periodontium in children with type 1 diabetes melitus is a serious medical and social problem, despite the large number of treatment and prevention measures with modern medicaments that have antibacterial, antiseptic, antioxidant properties that inhibit NF-κB activity, provide anti-inflammatory, immunostimulatory effects, etc. Thus, the treatment and prevention of gingivitis and periodontitis in children with endocrine pathology requires increased attention, both pediatric dentists and pediatricians and also endocrinologists.*
Key words: *children, diabetes mellitus, gingivitis, periodontitis, treating.*

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ПОРІВНЯЛЬНА ОЦІНКА ЛІКУВАЛЬНО-ПРОФІЛАКТИЧНИХ ЗАХОДІВ У КОМПЛЕКСНІЙ ТЕРАПІЇ ЗАПАЛЬНИХ ЗАХВОРЮВАНЬ ПАРОДОНТА В ДІТЕЙ ІЗ ЦУКРОВИМ ДІАБЕТОМ

Захворювання пародонта в дітей із цукровим діабетом I типу реєструються у 85% випадків, а саме: хронічний катаральний гінгівіт (63%), хронічний пародонтит (22%). Важливо підкреслити, що запальні процеси в дітей, які страждають на цукровий діабет, зазвичай протікають із частими загостреннями. У разі погіршення перебігу основного захворювання збільшуються запальні процеси у тканинах пародонта. Компенсований перебіг цукрового діабету позитивно позначається на тривалості ремісії запального процесу в пародонті.
Вибір лікарських препаратів у разі захворювань пародонта залежить від ступеня вираженості запального

процесу, набряклості, кровоточивості, наявності дефектів епітелію, стадії процесу та деструктивних порушень. На стоматологічному ринку з'являється все більше продукції, призначеної для якісного й ефективного догляду за порожниною рота. Зубні пасти, які мають у складі витяжки з лікарських трав, отримали велике визнання як серед фахівців, так і серед пацієнтів. Лікар цінує такі якості, як відсутність ефекту звикання до препарату, м'якість дії, неможливість передозування, комплексність позитивних ефектів, а пацієнт – гігієнічну і лікувальну дію, а також натуральність компонентів. ***Мета дослідження.*** *Проаналізувати літературні дані щодо принципів вибору засобів та методів для лікування запальних захворювань пародонта в дітей із цукровим діабетом I типу у віковий період із 6 до 12 років.* ***Методи дослідження.*** *Проведено огляд вітчизняних та іноземних джерел щодо комплексної терапії запальних захворювань пародонта в дітей із цукровим діабетом. Вивчено проспективні та ретроспективні когортні дослідження, дослідження «випадок – контроль» та рандомізовані контрольовані клінічні випробування.* ***Наукова новизна.*** *Авторами було відібрано та проаналізовано різноманітні схеми лікування та профілактики запальних захворювань пародонта в дітей із цукровим діабетом, узагальнено відомості щодо патогенетичних ланок, на які вони впливають.* ***Висновки.*** *Аналіз отриманих результатів дослідження свідчить, що незважаючи на велику кількість лікувально-профілактичних заходів із застосуванням сучасних лікарських препаратів, які володіють антибактеріальними, антисептичними, антиоксидантними властивостями, які пригнічують активність NF-kB, забезпечують протизапальний, імуностимулюючий ефекти тощо, запальні захворювання пародонта в дітей із цукровим діабетом I типу є серйозною медико-соціальною проблемою.*

Отже, лікування та профілактика захворювань пародонта в дітей з ендокринною патологією вимагають підвищеної уваги як дитячих лікарів-стоматологів, так і педіатрів та ендокринологів.

Ключові слова: *діти, цукровий діабет, гінгівіт, пародонтит, лікування.*

Formulation of the problem. The manifestations of gingivitis have been determined in the vast majority of patients, and some dentists indicate 100% damage of the oral tissues in children [1–4]. Damage of the oral mucosa and gums in endocrine diseases reaches about 80% according to different authors. Diabetes mellitus is the most common endocrine pathology in children. We should also note that type 1 diabetes mellitus in children is usually severe, and remissions are rare. Periodontal disease in children with type 1 diabetes mellitus is registered in 85% of cases, such as chronic catarrhal gingivitis (63%), chronic periodontitis (22%). It is important to emphasize that inflammatory processes in children with diabetes mellitus usually occur with frequent exacerbations [5–7].

The inflammatory processes in the periodontal tissues increase with the deterioration of the course of the above-mentioned disease. The results of clinical studies indicate a high prevalence of dental diseases in patients with type 1 and 2 type diabetes mellitus, at the same time, there is a lack of reliable results of the analysis of indicators such as dependence on the age of patients and the duration of this endocrine pathology, diabetic complications, hypoglycemic therapy, metabolic control [8–10]. We should notice that there are 2 periods of bite, namely, the early and late one. They are also called milk, deciduous, permanent bites. The first is characterized by the presence of eruptive gingivitis. In the second period, the condition of the gums may be affected by hormonal changes associated with puberty. The number of children who has gingivitis in puberty is close to 85–100% [10]. It is quite easy to differ the eruptive gingivitis (it is local process) and chronic catarrhal gingivitis (it is generalized process). So, the period between 6 and 12 years was chosen for our research work. At the same time, insufficient attention is paid to improving the dental health of children with diabetes mellitus, as well as to therapeutic and prophylactic measures aimed at preserving teeth and preventing exacerbations of the inflammatory process in the periodontal tissues. We should note, frequent examinations of the dentist to identify gingivitis and prevent the development of periodontal disease are recommended for children and adolescents with type 1 diabetes mellitus [11; 12].

The choice of medicaments for periodontal diseases depends on the severity of the inflammatory process, edema, bleeding, epithelial defects, stage of the process, and destructive disorders. The inflammatory process in the periodontium begins with the formation of dental plaque, its colonization by various microorganisms. Microbes promote the penetration and spread of toxic products, lytic enzymes by reducing the barrier function of integumentary tissues [13].

The aim of the study was to analyze scientific literature sources about principles of choice correct medications for treating gingivitis and periodontitis in children with type 1 diabetes mellitus in age 6–12 years.

Research methods. We analyzed scientific databases, including articles about treating of gingivitis and periodontitis in children with type 1 diabetes mellitus. Prospective and retrospective cohort studies, case-control studies and randomized controlled clinical trials, reference lists were also examined.

Results and their discussion. According to some authors, gingivitis, the cause of which is plaque, is the opposite phenomenon. It is characterized by swelling and redness of the gums and their bleeding. Gingivitis can lead to periodontitis in people with a genetic predisposition to the development of periodontal disorders. A quarterly professional oral hygiene is recommended in children with type 1 diabetes mellitus to achieve optimal dental health. There are more and more products designed for quality and effective care of the oral cavity in modern dentistry. Kinds of toothpaste, which contain extracts of medicinal herbs, have received great recognition among both professionals and patients [14]. The dentists appreciate such qualities as the lack of addiction to the medication, mildness, impossibility of overdose, the complexity of the positive effects. The patients appreciate the hygienic and therapeutic effect, as well as the naturalness of the components. It is known, that children with type 1 diabetes mellitus suffer from inflammation in periodontium (gingivitis, periodontitis), and dental caries more often than children who do not have somatic diseases [15; 16]. To maintain the dental health of children with diabetes, it is necessary to the dental reception detailed instruction of parents on the rules of oral care and the optimal choice of means for individual oral hygiene in children. It is necessary to carry out professional dental treatment and prevention measures using modern and effective means of oral care every 3 months [11].

A.V. Kotelban (2017) used antiseptic solution "Dekasan", probiotic "Bio Gaya ProDentis", "Imupret" in her research work [17]. Chronic catarrhal gingivitis treatment scheme of this author included professional oral hygiene, rinsing the mouth with an antiseptic solution "Dekasan" 0,02% twice a day until the clinical effect of the disappearance of signs of inflammation; chewing 1 probiotic pill "Bio Gaya ProDentis" 2 times a day for 2 weeks; "Imupret" according to the scheme: 25 drops 5–6 times a day for 2 weeks. Children in the comparison group were treated following the protocols of the Ministry of Health of Ukraine. There was a complete elimination of the inflammatory process after the proposed treatment in 80% of patients with chronic catarrhal gingivitis and type 1 diabetes mellitus, and in 20% there was an improvement in periodontal tissues according to their data. This author also studied genetic predisposition to gingivitis in children with type 1 diabetes mellitus. We should notice type 1 diabetes mellitus is autoimmune disease characterized by systemic inflammation that affects the condition of the periodontium [12; 18].

V.P. Kirillova (2017) also treated periodontal disease in people with diabetes mellitus. She also studied the action of kinds of toothpaste based on natural components, namely "BLACKWOOD Splat" and "LAVANDASEPT PROFESSIONAL Splat", and noted their effectiveness. Unfortunately, there are quite a few publications on adequate long-term tests of such products as floss and electric brush even though these care products have existed for a long time. Nowadays, many scientists insist that electric toothbrushes remove plaque better than regular manual toothbrushes, and it helps prevent gingivitis [19–21].

I.Yu. Popovich and co-authors (2017) argue that periodontitis can be caused not only by pathogenic microflora and excessive immune response to infection by autoimmune type but also without infectious factors. According to them, nuclear kappa factor B (NF-kB) plays a leading role in the pathogenesis of systemic inflammation as an inducer of inflammation. So, there is a need to study medicaments that inhibit the activity of NF-kB. They are currently conducting clinical studies on the effectiveness of 1% metformin gel in the treatment of periodontitis in people with diabetes mellitus [22]. Modern scientific sources indicate a significant role of nuclear factor Kappa B in the development of type 1 diabetes mellitus and inflammatory diseases, which are its complications. It is necessary to pay special attention to drugs aimed at inhibiting the activity of NF-kB at the present stage of the development of dental science [23; 24].

L.F. Kaskova, and co-authors (2016) identify some measures and features of medical examination of children with type 1 diabetes mellitus in their work. They consider it necessary to use kinds of toothpaste that contain oil solution of tocopherol acetate, metronidazole, clotrimazole, oral baths of echinacea purpura in combination with antioxidant medicaments (aevit, ascorbic acid), gum massage. Positive changes in the clinical condition of periodontal tissues and laboratory parameters were observed (the value of the PMA, PI, GI index decreased) as a result. Some other authors also consider it necessary to conduct preventive examinations of the oral cavity at least 3–4 times a year and recommend paying special attention to dental diseases that are complications of type 1 diabetes mellitus during classes at the "School of Diabetes" [8; 11].

Several authors rely on studies that state the following: one of the key links in the pathogenesis of many diseases is such a typical pathological process as oxidative stress (OS) in the choice of medicaments for the treatment of gingivitis and periodontitis. It

develops under the condition of intensification of free radical processes, often with the reduced potential of the antioxidant system (AOS), normally maintaining the content of radicals at the physiologically necessary level. AOS is represented in the body by two components: non-enzymatic (vitamins C, E, thiol-containing high- and low-molecular substances, etc.) and enzymatic. There are traditionally several lines of anti-radical protection in the enzyme chain [25–27]. The first-line enzyme is superoxide dismutase, its role is to catalyze the dismutation reaction of superoxide anion radicals, to maintain the concentration of these radicals in the cell at a fairly low level, and to reduce the probability of singlet oxygen formation, which is several orders of magnitude higher than. Catalase is an enzyme of the second line of AOS. It catalyzes the decomposition reaction of hydrogen peroxide. The enzymes of the second and third lines of antioxidant protection include enzymes of glutathione metabolism – glutathione peroxidase, glutathione reductase, and glutathione transferase. Their functioning is aimed at neutralizing free radicals, reactive molecules, and xenobiotics with the participation of reduced glutathione [18]. Thus, we can conclude that the antioxidant system plays an important role in the metabolism of oral fluid [25]. In this regard, it is interesting to study new approaches to their correction, using natural or synthetic antioxidants. One of such promising methods is the use of therapeutic and prophylactic kinds of toothpaste based on plant antioxidants [14; 28; 29].

E.A. Faroponova (2016) analyzed the effect of such kinds of toothpaste as "PresiDENT Junior 6 +" and "PresiDENT Teens 12+" on the mucous membrane of the mouth and gums of children with type 1 diabetes mellitus. They include such components as vitamin E, lemon extracts, sage, linden, aloe, chamomile, which are plant antioxidants. Her research has shown that the above compounds can modify the metabolism in the oral fluid, which leads to metabolic changes in periodontal tissues. In particular, it has been demonstrated that these kinds of toothpaste can inhibit the effects of oxidative stress, which accelerates the recovery period. The data of scientists show that the skills of parents in oral hygiene and their control over the quality of brushing, the duration of this process are equally important in addition to treatment and prevention measures performed by dentists [30].

Collett Brent R. and co-authors (2015) argue that the high level of oral care skills in parents leads to better results in their children [31].

Great importance is attached to creating a balance between the microflora and the natural protective systems of the oral cavity in modern preventive dentistry. Antiseptics of a wide range of action are proposed, most often chlorhexidine [32], which is introduced into many hygienic products – rinses, gels, balms, kinds of toothpaste to correct the composition of the microbial flora. Such agents are widely advertised as effective in eliminating inflammation and regulating the composition of the microflora [15].

P. James and co-authors (2017) believe that chlorhexidine can reduce the accumulation of plaque. Their scientific work proves that the use of rinses containing chlorhexidine as an additional tool, in addition to brushing teeth for a period of 4–6 weeks to 6 months leads to a decrease in the plaque [32].

Natural medicaments have been used for the normal functioning of the protection mechanisms of the oral cavity. Plants are widely used for various pathologies in dentistry [8; 26]. Clinical observations show that herbal medicine is highly effective, harmless, rarely causes side effects and allergic reactions. The plants contain biologically active substances such as vitamins, phytohormones, volatile acids, alkaloids, chlorophylls, trace elements, essential and fatty oils, they affect metabolic processes, increase protective properties, normalize homeostasis. Herbal medicaments have anti-inflammatory, analgesic, immunomodulatory, hemostatic, and wound-healing effects [14].

Natural medicaments are an excellent addition to other medications as a part of complex therapy in treating gingivitis, periodontitis. Some liquids are also used for therapeutic and prophylactic purposes. They are aqueous extracts from medicinal raw materials (infusions, decoctions), as well as tinctures and extracts in the composition of dental elixirs, rinses [8; 12]. The most effective rinses are tinctures of eucalyptus, sage, celandine, peppermint, yarrow. These herbal remedies are suitable not only for rinsing the mouth but also for applications, mouth baths [11]. The role of vitamins in periodontal diseases is well known, so it is reasonable to prescribe not only multivitamins but also vitaminized tea made from rose hips, mountain ash, black currants, nettle leaves, also used plant adaptogens (ginseng, Eleutherococcus, Chinese lemongrass, Rhodiola, etc.) [26].

Some methods combine phytotherapy and physical methods: electrophoresis, ultraphonophoresis, aerosol therapy, fluctuophoresis, hydrotherapy [8]. The possibilities of using herbal remedies are very promising. They can be used alone as a single medicament, but often in combination with an antiseptic or even an antibiotic in modern

dentistry. As a rule, herbal medicaments are included in the complex therapy of inflammatory periodontal diseases [26].

Conclusion. The analysis of the results of the study shows that inflammation in periodontium in children with type 1 diabetes melitus is a serious medical and social problem, despite the large number of treatment and prevention measures with modern medicaments that have antibacterial, antiseptic, antioxidant properties that inhibit NF-κB activity, provide anti-inflammatory, immunostimulatory effects, etc. Thus, the treatment and prevention of gingivitis and periodontitis in children with endocrine pathology requires increased attention, both pediatric dentists and pediatricians and also endocrinologists.

Literature:

1. Хмиль Е.В., Хмиль Д.А., Каськова Л.Ф. Механизмы поражения тканей пародонта и слизистой оболочки ротовой полости у детей с сахарным диабетом. *Актуальные проблемы стоматологии детского возраста и ортодонтии :* сборник научных статей IX Региональной научно-практической конференции с международным участием по детской стоматологии / под ред. А. Антоновой. Хабаровск : Антар, 2019. С. 188–191.

2. Tabatabaei-Malazy O., Nikfar S. Drugs for the treatment of pediatric type 2 diabetes mellitus and related co-morbidities. *Expert Opin Pharmacother.* 2016. № 4. P. 43–47.

3. Погляд на проблему цукрового діабету у дітей полтавського регіону / В.І. Похилько та ін. *Сучасний мультидисциплінарний підхід до діагностики та лікування хворих на цукровий діабет :* матеріали Всеукраїнської науково-практичної конференції з міжнародною участю. Тернопіль, 2017. С. 72–74.

4. Шешукова О.В., Кузь І.О. Взаємозв'язок цукрового діабету І типу та захворювань пародонта у дітей. *Актуальні проблеми сучасної медицини : вісник Української медичної стоматологічної академії.* 2019. Т. 19. Вип. 4 (68). С. 130–135.

5. Удод О.А., Куліш А.С. Сучасні погляди на особливості стоматологічного статусу та стану ротової рідини у хворих на цукровий діабет. *Вісник проблем біології і медицини*. 2017. № 1 (135). С. 63–68.

6. Arheiam A., Omar S. Dental caries experience and periodontal treatment needs of 10- to 15-year old chidren with type 1 diabetes mellitus. *Int. Dent. J.* 2014. № 64 (3). P. 150–154.

7. Maksymenko A.I., Sheshukova O.V., Kuz I.O. Dental status analysis in children with insulin-dependent diabetes mellitus. *New trends and unresolved issues of preventive and clinical medicine:* Conference proceedings, September 25–26, 2020. Lublin : Baltija Publishing, 2020. P. 1. P. 137–140.

8. Особливості клініки та лікування пародонтального синдрому в дітей, хворих на цукровий діабет : монографія / Л.Ф. Каськова та ін. Полтава : ТОВ НВП «Укрпромторгсервіс», 2016. 102 с.

9. The level of interleukin–18 in the oral fluid in primary school children with chronic catarrhal gingivitis and type I diabetes mellitus / A.I. Maksymenko et al. *Wiadomości Lekarskie.* 2021. № 74 (6). P. 1336–1341.

10. Взаємозв'язок запальних захворювань тканин пародонта та соматичних захворювань у дітей. Огляд літератури / Л.О. Хоменко та ін. *Новини стоматології.* 2015. № 2. С. 90–94.

11. Каськова Л.Ф., Карпенко О.А., Андриянова О.Ю. Состояние гуморального иммунитета при пародонтальном синдроме у детей на фоне сахарного диабета. *Актуальные проблемы стоматологии детского возраста и ортодонтии :* сборник научных статей VII Региональной научно-практической конференции с международным участием по детской стоматологии. Хабаровск, 2017. С. 99–103.

12. Падалка А.І. Особливості лікування стоматологічної патології у дітей, хворих на цукровий діабет. *Біологічні, медичні та науково-педагогічні аспекти здоров'я людини.* Матеріали Міжнародної науково-практичної конференції / за заг. ред. С.В. Пилипенка. Полтава : Астрая, 2018. С. 67–69.

13. Functioning of NO-cycle in the saliva of children with type 1 diabetes mellitus / I.O. Kuz et al. *PEP.* 2021. № 78 (4). P. 34–39.

14. The efficacy and safety of a herbal toothpaste in reducing gingivitis: a double-blind, randomized, placebo-controlled, parallel allocation clinical trial / Jinfeng He et al. *Evidence-based complementary and alternative medicine.* 2019. № 1. P. 1–10.

15. Ismail A.F., Mcgrathb C.P., Yiu K.Y.C. Oral health of children with type 1 diabetes mellitus: A systematic review. *Diabetes Research and Clinical Practice.* 2015. № 108 (3). P. 369–381.

16. Dental, periodontal and salivary conditions in diabetic children associated with metabolic control variables and nutritional plan adherence / C.Y. Díaz Rosas et al. *European Journal of Paediatric Dentistry.* 2018. № 19/2. P. 119–126.

17. Котельбан А.В. Оцінка ефективності лікування хронічного катарального гінгівіту в дітей за умов цукрового діабету. *Клінічна стоматологія.* 2017. № 1. С. 39–44.

18. Годованець О.І., Котельбан А.В. Особливості перебігу хронічного катарального гінгівіту в дітей за умов цукрового діабету. *Вісник стоматології.* 2016. № 4. С. 60–65.

19. Применение противовоспалительных зубных паст в комплексном лечении заболеваний пародонта у больных сахарным диабетом / В.П. Кириллова и др. *Проблемы стоматологии.* 2017. Т. 13. № 3. С. 18–23.

20. Костура В.Л., Безвушко Е.В. Освітні знання та рівень гігієни порожнини рота у дітей з надмірною масою тіла. *Актуальні проблеми сучасної медицини. Вісник Української медичної стоматологічної академії.* 2018. Т. 18. № 1. С. 234–240.

21. Засіб рослинного походження для лікування запальних захворювань пародонта / І.В. Стефанів та ін. *Фармакоекономіка в Україні: стан та перспективи розвитку :* матеріали X Науково-практичної конференції, м. Харків, 21 травня 2018 р. Харків, 2018. С. 117–119.

22. Попович И.Ю., Расин М.С., Петрушанко Т.А. Системное воспаление низкой интенсивности как причина и следствие воспалительно-дистрофических болезней пародонта. *Вісник проблем біології і медицини.* 2017. Вип. 4. Т. 1 (139). С. 65–69.

23. Гасюк Н.В., Єрошенко Г.А. Характеристика поліморфних варіантів ядерного фактора транскрипції NF-kB1 як предикторів розвитку генералізованого пародонтиту. *Галицький лікарський вісник.* 2015. № 3. С. 51–53.

24. Ляшенко Л.І., Костенко В.О. NF-κB-опосередкований вплив NO-синтаз на вільнорадикальні процеси у тканинах пародонта за умов експериментального метаболічного синдрому. *Актуальні проблеми сучасної медицини.* 2014. Т. 14. № 2. С. 140–143.

25. Изменение иммунологической реактивности и функционирование тиоловой системы антиоксидантной защиты на локальном и системном уровне при хроническом пародонтите и коморбидной патологии / А.Р. Горкунова и др. *Аллергология и иммунология.* 2014. Т. 15. № 3. С. 186–190.

26. Метью І.І., Хохленкова Н.В., Столпер Ю.М. Вибір основи-носія гелю «Алое-дентал» для застосування у стоматології. *Соціальна фармація в охороні здоров'я.* 2016. Т. 2. № 2. С. 19–24.

27. Іващенко О.Д. Визначення загального вмісту поліфенолів і антиоксидантної активності масляних екстрактів петрушки і м'яти перцевої. *XIV Менделєєвські читання :* матеріали Міжнародної науково-практичної конференції. Полтава, 2021. С. 11–14.

28. Максименко А.І. Вплив антиоксидантів на карієсогенність зубного нальоту. *Матеріали XXIV Міжнародного медичного конгресу студентів та молодих вчених.* Тернопіль : Укрмедкнига, 2020. С. 71.

29. Ступак О. П. Экспериментальная профилактика гингивита у крыс с сахарным диабетом 2 типа с использованием пасты черники. *Вісник стоматології.* 2015. № 4. С. 12–15.

30. Clinical efficacy of a 1% Matricaria chamomile L. mouthwash and 0.12% chlorhexidine for gingivitis control in patients undergoing orthodontic treatment with fixed appliances / G. Paula et al. *Journal of Oral Science.* 2016. № 58 (4). P. 569–574.

31. Observed child and parent toothbrushing behaviors and child oral health / R.C. Brent et al. *International Journal of Paediatric Dentistry*. 2015. № 1. P. 1–9.

32. Chlorhexidine mouthrinse as an adjunctive treatment for gingival health / P. James et al. *Cochrane Database of Systematic Reviews.* 2017. № 3. P. 345–351.

References:

1. Khmil' Ye.V., Khmil' D.A., Kas'kova L.F. (2019). Mekhanizmy porazheniya tkaney parodonta i slizistoy obolochki rotovoy polosti u detey s sakharnym diabetom [Mechanisms of damage to periodontal tissues and oral mucosa in children with diabetes mellitus]. *Aktual'nyye problemy stomatologii detskogo vozrasta i ortodontii: cb. nauch. statey IKH regional'noy nauch.-prakt. konf. s mezhdunar. uchastiyem po detskoy stomatologii / pod red. prof. A.A. Antonovoy, Khabarovsk*, 188–191 [in Russian].

2. Tabatabaei-Malazy O., Nikfar S. (2016). Drugs for the treatment of pediatric type 2 diabetes mellitus and related co-morbidities. *Expert Opin Pharmacother,* 4, 43–47.

3. Pokhyl'ko V.I., Tsvirenko S.M., Fastovets' M.M., Lysak V.P., Cherevko I.H. (2017). Pohlyad na problemu tsukrovoho diabetu u ditey poltavs'koho rehionu [A look at the problem of diabetes in children in the Poltava region]. *Suchasnyy mul'tydystsyplinarnyy pidkhid do diahnostyky ta likuvannya khvorykh na tsukrovyy diabet: Materialy Vseukrayins'koyi naukovo-praktychnoyi konferentsiyi z mizhnarodnoyu uchastyu, Ternopil',* 72–74 [in Ukrainian].

4. Sheshukova O.V., Kuz'I.O. (2019). Vzayemozv'yazok tsukrovoho diabetu I typu ta zakhvoryuvan' parodonta u ditey [Relationship between type I diabetes mellitus and periodontal disease in children]. *Aktual'ni problemy suchasnoyi medytsyny: Visnyk UMSA,* 4 (68), 130–135 [in Ukrainian].

5. Udod O.A., Kulish A.S. (2017). Suchasni pohlyady na osoblyvosti stomatolohichnoho statusu ta stanu rotovoyi ridyny u khvorykh na tsukrovyy diabet [Modern views on the features of dental status and oral fluid status in patients with diabetes]. *Visnyk problem biolohiyi i medytsyny,* 1 (135), 63–68 [in Ukrainian].

6. Arheiam A., Omar S. (2014). Dental caries experience and periodontal treatment needs of 10- to 15-year old chidren with type 1 diabetes mellitus. *Int. Dent. J,* 64 (3), 150–154.

7. Maksymenko A.I., Sheshukova O.V., Kuz I.O. (2020). Dental status analysis in children with insulin-dependent diabetes mellitus. *New trends and unresolved issues of preventive and clinical medicine: Conference proceedings, September 25–26, 2020.* Lublin : Izdevnieciba "Baltija Publishing", 1, 137–140.

8. Kas'kova L.F., Karpenko O.O., Makovka I.L., Andriyanova O.Yu. (2016). *Osoblyvosti kliniky ta likuvannya parodontal'noho syndromu u ditey, khvorykh na tsukrovyy diabet [Features of the clinic and treatment of periodontal syndrome in children with diabetes]: monohrafiya.* Poltava: TOV NVP "Ukrpromtorhservis" [in Ukrainian].

9. Maksymenko A.I., Sheshukova O.V., Kuz I.O., Lyakhova O.V., Tkachenko I.M. (2021). The level of

interleukin–18 in the oral fluid in primary school children with chronic catarrhal gingivitis and type I diabetes mellitus. *Wiadomości Lekarskie*, 74 (6), 1336–1341.

10. Khomenko L.O., Marushko YU.V., Moskovenko O.D., Duda O.V. (2015). Vzayemozv'yazok zapal'nykh zakhvoryuvan' tkanyn parodonta ta somatychnykh zakhvoryuvan' u ditey. Ohlyad literatury [Relationship between periodontal disease and somatic disease in children. Literature review]. *Novyny stomatolohiyi*, 2, 90–94 [in Ukrainian].

11. Kas'kova L.F., Karpenko O.A., Andriyanova O.Yu. (2017). Sostoyaniye gumoral'nogo immuniteta pri parodontal'nom sindrome u detey na fone sakharnogo diabeta [The state of humoral immunity in periodontal syndrome in children with diabetes mellitus]. Aktual'nyye problemy stomatologii detskogo vozrasta i ortodontii: Sbornik nauchnykh statey VII regional'noy nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiyem po detskoy stomatologii, Khabarovsk, 99–103 [in Russian].

12. Padalka A.I. (2018). Osoblyvosti likuvannya stomatolohichnoyi patolohiyi u ditey, khvorykh na tsukrovyy diabet [Features of treatment of dental pathology in children with diabetes]. *Biolohichni, medychni ta naukovo-pedahohichni aspekty zdorov'ya lyudyny. Materialy Mizhnarodnoyi naukovo-praktychnoyi konferentsiyi / za zahal'noyu redaktsiyeyu prof. Pylypenka S.V.* Poltava: Astraya, 67–69 [in Ukrainian].

13. Kuz I.O., Akimov O.Ye., Kostenko V.O., Sheshukova O.V., Maksymenko A.I., Pysarenko O.E. (2021). Functioning of NO-cycle in the saliva of children with type 1 diabetes mellitus. *PEP,* 78 (4), 34–39.

14. Jinfeng He., Yalan D., Fangzhi Zh., Ting Zh., Nanyu L., Lei L., Li Ch., Tao H. (2019). The efficacy and safety of a herbal toothpaste in reducing gingivitis: a double-blind, randomized, placebo-controlled, parallel allocation clinical trial. *Evidence-based complementary and alternative medicine,* 1, 1–10.

15. Ismail A.F., Mcgrathb C.P., Yiu K.Y.C. (2015). Oral health of children with type 1 diabetes mellitus: A systematic review. *Diabetes Research and Clinical Practice,* 108 (3), 369–381.

16. Díaz Rosas C.Y., Cárdenas V.E., Castañeda-Delgado J.E., Aguilera-Galaviz L.A., Aceves Medina M.C. (2018). Dental, periodontal and salivary conditions in diabetic children associated with metabolic control variables and nutritional plan adherence. *European Journal of Paediatric Dentistry,* 19/2, 119–126.

17. Kotelban A.V. (2017). Otsinka efektyvnosti likuvannya khronichnoho kataral'noho hinhivitu v ditey za umov tsukrovoho diabetu [Evaluation of the effectiveness of treatment of chronic catarrhal gingivitis in children with diabetes mellitus]. *Klinichna stomatolohiya*, 1, 39–44 [in Ukrainian].

18. Hodovanets O.I., Kotelban A.V. (2016). Osoblyvosti perebihu khronichnoho kataral'noho hinhivitu v ditey za umov tsukrovoho diabetu [Features of chronic catarrhal gingivitis in children with diabetes mellitus]. *Visnyk stomatolohiyi*, 4, 60–65 [in Ukrainian].

19. Kirillova V.P., Postnikov M. A., Sultanova N. I., Serazetdinova A. R., Kostionova Ovod I. A. (2017). Primeneniye protivovospalitel'nykh zubnykh past v kompleksnom lechenii zabolevaniy parodonta u bol'nykh sakharnym diabetom [The use of anti-inflammatory toothpastes in the complex treatment of periodontal diseases in patients with diabetes mellitus]. *Problemy stomatologii,* 13 (3), 18–23 [in Russian].

20. Kostura V.L., Bezvushko E.V. (2018). Osvitni znannya ta riven' hihiyeny porozhnyny rota u ditey z nadmirnoyu masoyu tila [Educational knowledge and level of oral hygiene in overweight children]. *Aktual'ni problemy suchasnoyi medytsyny. Visnyk Ukrayins'koyi medychnoyi stomatolohichnoyi akademiyi,* 18 (1), 234–240 [in Ukrainian].

21. Stefaniv I.V., Hrashchenkova S.A., Piminov O.F., Shul'ha L.I. (2018). Zasib roslynnoho pokhodzhennya dlya likuvannya zapal'nykh zakhvoryuvan' parodontu [Herbal remedy for the treatment of inflammatory periodontal diseases]. *Farmakoekonomika v Ukrayini: stan ta perspektyvy rozvytku: Materialy X naukovo-praktychnoyi konferentsiyi, m. Kharkiv, 21 travnya 2018 roku, Kharkiv,* 117–119 [in Ukrainian].

22. Popovich I.Yu., Rasin M.S., Petrushanko T.A. (2017). Sistemnoye vospaleniye nizkoy intensivnosti kak prichina i sledstviye vospalitel'no-distroficheskikh bolezney parodonta [Systemic inflammation of low intensity as a cause and consequence of inflammatory-dystrophic periodontal diseases]. *Visnik problem biologiyi i meditsini*, 1 (139), 65–69 [in Russian].

23. Hasyuk N.V., Yeroshenko H.A. (2015). Kharakterystyka polimorfnykh variantiv yadernoho faktora transkryptsiyi NF-kB1 yak predyktoriv rozvytku heneralizovanoho parodontytu [Characteristics of polymorphic variants of nuclear transcription factor NF-kB1 as predictors of generalized periodontitis]. *Halyts'kyy likars'kyy visnyk,* 3, 51–53 [in Ukrainian].

24. Lyashenko L.I., Kostenko V.O. (2014). NF-kB-oposeredkovanyy vplyv NO-syntaz na vil'noradykal'ni protsesy u tkanynakh parodonta za umov eksperymental'noho metabolichnoho syndromu [NF-κB-mediated effect of NO synthases on free radical processes in periodontal tissues under the conditions of experimental metabolic syndrome]. *Aktual'ni problemy suchasnoyi medytsyny,* 14 (2), 140–143 [in Ukrainian].

25. Gorkunova A.R., Bykov I.M., Basov A.A., Lapina N.V. (2014). Izmeneniye immunologicheskoy reaktivnosti i funktsionirovaniye tiolovoy sistemy antioksidantnoy zashchity na lokal'nom i sistemnom urovne pri khronicheskom parodontite i komorbidnoy patologii [Changes in immunological reactivity and functioning of the thiol system of antioxidant defense at the local and systemic levels in chronic periodontitis and comorbid pathology]. Allergologiya i immunologiya, 15 (3), 186–190 [in Russian].

26. Met'yu I.I., Khokhlenkova N.V., Stolper Yu.M. (2016). Vybir osnovy-nosiya helyu "Aloe-dental" dlya zastosuvannya u stomatolohiyi [Choice of base-carrier of Aloe-dental gel for use in dentistry]. *Sotsial'na farmatsiya v okhoroni zdorov'ya*, 2, 19–24 [in Ukrainian].

27. Ivashchenko O.D. (2021). Vyznachennya zahal'noho vmistu polifenoliv i antyoksydantnoyi aktyvnosti maslyanykh ekstraktiv petrushky i m'yaty pertsevoyi [Determination of total polyphenols and antioxidant activity of oil extracts of parsley and peppermint]. *XIV Mendelyeyevs'ki chytannya: materialy mizhnar. nauk.-prakt. konf., Poltava,*11–14 [in Ukrainian].

28. Maksymenko A.I. (2020). Vplyv antyoksydantiv na kariyesohennist' zubnoho nal'otu [The effect of antioxidants on the cariogenicity of plaque]. *Materialy XXIV Mizhnarodnoho medychnoho konhresu studentiv ta molodykh vchenykh. Ternopil':* Ukrmedknyha, 71 [in Ukrainian].

29. Stupak O. P. (2015). Eksperimental'naya profilaktika gingivita u krys s sakharnym diabetom 2 tipa s ispol'zovaniyem pasty cherniki [Experimental prevention of gingivitis in type 2 diabetic rats using blueberry paste]. *Visnik stomatologiyi,* 4, 12–15 [in Russian].

30. Paula G., Caio S.D., Mario R.P.L., Delane V.G., Renata L., Gerly A.C.B., Rodrigo O.R. (2016). Clinical efficacy of a 1% Matricaria chamomile L. mouthwash and 0,12% chlorhexidine for gingivitis control in patients undergoing orthodontic treatment with fixed appliances. *Journal of Oral Science,* 58 (4), 569–574.

31. Brent R.C., Colleen E.H., Ana L.S., Erin W., Kristen E.G., Matthew L.S. (2015). Observed child and parent toothbrushing behaviors and child oral health. *International Journal of Paediatric Dentistry*, 1, 1–9.

32. James P., Worthington H.V, Parnell C. (2017). Chlorhexidine mouthrinse as an adjunctive treatment for gingival health. *Cochrane Database of Systematic Reviews.* 3. 345–351.