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A SET OF PREVENTIVE MEASURES AGAINST CARIES IN CHILDREN WITH TYPE 1 DIABETES

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Abstract
The article is a literary review devoted to the prevention of tooth decay in children with type 1 diabetes mellitus.
The data of foreign, russian and uzbek literature has been studied using scientific search library databases: PubMed, Elibrary. The literature analysis was conducted based on 20 sources. The conducted analysis of literature data on issues of early diagnosis of caries in children and adolescents shows that this topic does not lose its relevance.

Keywords: Caries, childhood and adolescent diabetes, humoral and local oral immunity, immunometabolic disorders

INTRODUCTION:

According to WHO (2018), the International Diabetes Federation (IDF, 2016) and the International Society for Pediatric and Adolescent Diabetes (ISPAD, 2014), type 1 diabetes, despite the achieved scientific and practical results and progress in diabetology, remains a global and priority health problem for most countries in the world, while the number of registered cases of type 1 diabetes in the pediatric population worldwide has reached 549,000. According to national registries, over the past ten years, the increase in the prevalence of type 1 diabetes in children worldwide was 35.7% (from 59.4 to 80.6 cases per 100 thousand children), in adolescents - 68.9% (from 108.5 to 183.5 cases per 100 thousand adolescents), with an annual growth rate of about 3%. [18]

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In Uzbekistan, the number of patients with diabetes mellitus is more than 245 thousand, of which more than 2,300 are children and 879 are adolescents. It is known that with various general somatic pathologies, in particular with type 1 diabetes in children, significant functional and morphological shifts occur in the system of humoral and local immunity of the oral cavity.

Despite the introduction of a set of organizational and legal, scientific research, treatment and preventive measures, type 1 diabetes in childhood continues to be the most acute medical, social and economic problem of modern society and healthcare, the solution of which is impossible without state support (Global report on diabetes, WHO, 2016). The dramatic nature of the problem of type 1 diabetes in childhood is due to the involvement of almost all organs and systems in the pathological process, the latent nature of endocrinopathy with the manifestation of clinical symptoms already with complete depletion of the functional capabilities of the pancreas, the early development of severe specific complications, impaired sexual and physical development with subsequent limitation ability to work and early disability, reduced quality and life expectancy, premature mortality. With the development of type 1 diabetes in childhood, the life expectancy of sick children, compared to the average statistical indicators, is reduced by 50%, rarely exceeding 40 years (data from WHO experts, 2012). According to the recommendations of WHO and IDF (1989), the key tasks in the management of children suffering from type 1 diabetes are early diagnosis, reducing the incidence of complications, maintaining quality of life, as well as social and psychological rehabilitation. [6,7]

The complexity of early detection and the high prevalence of type 1 diabetes in the pediatric population make it extremely important to solve problems related to the early diagnosis of endocrinopathy. According to modern concepts, the level of dental health in type 1 diabetes, determined by the resistance of hard dental tissues and periodontium, the constancy of the physicochemical composition of oral fluid, the protective function of the oral mucosa, as well as the state of local immunity, objectively reflects the intensity of neuroregulatory, metabolic, immunological, homeostatic and hemodynamic disorders occurring in the macroorganism. The works of domestic and foreign specialists have proven the

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existence of close relationships between dysfunction of the insular apparatus and the intensity of damage to organs and tissues of the oral cavity, and the severity of manifestations in children with type 1 diabetes varies from a state of complete compensation to the most severe degree of disorders. [14]

In accordance with the established scientific concept, type 1 diabetes is an organ-specific autoimmune disease leading to the destruction of insulin-producing β-cells of the islets of Langerhans of the pancreas. Despite the large number of studies conducted, a holistic understanding of the state of the immune mechanisms underlying the pathogenesis of endocrinopathy is absent, and data on disorders of the humoral and cellular immunity in children with type 1 diabetes, depending on the duration and degree of compensation of the disease, are interpreted ambiguously by specialists. [15]

In the available scientific literature, data on the relationship between serum and salivary biochemical parameters in children with different durations of type 1 diabetes are rare and scattered. An in-depth study of the immune and metabolic status based on the results of a study of salivary and hematological parameters in children with different durations of type 1 diabetes will make it possible to specify diagnostic criteria in various phases of endocrinopathy, identify prognostically significant indicators of humoral and cellular immunity, assess the intensity of the imbalance of the components of the immune system and the factors of non-specific protection functioning with it in projection onto the level of dental health. Of particular laboratory-diagnostic and clinical significance are data on the impact of sanitation, as a complex of health-improving and restorative treatment and preventive measures, on the state of the immunological and cytokine status, calcium-phosphorus metabolism, as well as on the level of dental health in children with type 1 diabetes.[13]

The development of a "patient-oriented" approach to diagnostics and monitoring of treatment in children with type 1 diabetes is based on coordinated interdisciplinary cooperation, modern high-tech capabilities of clinical laboratory research, accumulated fundamental knowledge, and improved diagnostic panels. In this regard, the interaction of clinical disciplines (endocrinology, biochemistry,

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Analysis of works by domestic and foreign authors indicates that the issues of dependence of the level of dental health on the severity of immunometabolic disorders, the state of phosphorus-calcium metabolism, cytokine imbalance in children with different duration of type 1 diabetes have not been fully studied. To date, no comprehensive assessment of periodontal status, caries resistance of hard

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dental tissues depending on local immunity and mineral metabolism of children suffering from type 1 diabetes has been developed. No unified methodological approach to early diagnostics of type 1 diabetes in children based on the results of laboratory, clinical and immunobiochemical studies has been formulated. No assessment of the balance of bone metabolism processes in the "bone formation - bone resorption" system has been proposed in children diagnosed with type 1 diabetes at various stages of endocrinopathy. The issues of assessing changes in the state of oral homeostasis and local factors of non-specific protection between sanitized children suffering from type 1 diabetes and children with endocrine pathology in need of sanitation, according to immunological, biophysical, biochemical salivary indicators that adequately reflect the intensity of dysbiotic disorders, are insufficiently covered. The above problems predetermined the relevance of the dissertation study, and the established unexplored aspects served as the basis for the formation of the goal and objectives of the work. Insufficient volume, availability of qualified pediatric dental care, low sanitary culture, lack of motivation of the child population for oral hygiene and prevention of diseases of hard dental tissues do not allow achieving a significant reduction in the severity and prevalence of carious lesions of the teeth. According to domestic cariesologists, the prevalence and intensity of caries of permanent teeth among children of the "key" age groups is: 6 years old - 22% and 0.30; 12 year olds - 78% and 2.91; 15 year olds - 88% and 4.37 respectively. Published scientific data indicate that the incidence caries among children with type 1 diabetes is determined by enamel resistance, physicochemical composition of saliva, balance of local immunity factors, salivary activity of cariogenic microflora, degree of compensation of carbohydrate metabolism. The established complex of etiopathogenetic factors adequately reflects the severity of immunometabolic, homeostatic, neuroregulatory, hemodynamic shifts in the child's body with endocrinopathy

Data from domestic and foreign cariesologists indicate that the trend that has formed in recent years towards an increase in the prevalence and intensity of caries of permanent teeth in children aged 6-15 years is associated with a deterioration in the environmental situation, an increase in the number of

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pathological conditions in women during pregnancy, an increase in the number of children with a detectable genetic predisposition to caries, a change in diet towards an unbalanced one with a predominance of high-carbohydrate foods, a decrease in the resistance of the child's body. Among the negative reasons, experts note the early refusal of breastfeeding, leading to overstraining of the adaptive immunity mechanisms. The immaturity of the physiological systems supporting homeostasis during the early transition to artificial feeding contributes to an increase in mass and growth parameters with a shift in phosphorus-calcium metabolism in favor of building up bone mass to the detriment of hard dental tissues. Also, the acceleration of age-related development (acceleration) plays an important role, which leads to premature eruption of both milk and permanent teeth. [7,14] Analysis of scientific provisions shows that among the anatomical and morphological features of the structure of erupted permanent teeth in the period of mixed dentition, the most significant are: incompleteness of the process of tertiary mineralization of enamel; increased permeability and microporosity of enamel for compounds (organic, inorganic) from the composition of saliva and the network of blood capillaries of the pulp tooth; predominance of “mature” enamel in the tubercles in relation to the cervical zone; excess water in the tooth enamel; presence of microcracks and extensive interprismatic spaces in the enamel; small thickness and low degree of mineralization of the peripulpar dentin in teeth with unformed roots. High susceptibility to caries with insufficient caries resistance of hard tissues of hypomineralized teeth in children and adolescents predetermines the specificity of carious lesions, which are characterized by a "rapid" course, the absence of the ability to limit (localize) the lesion, "lightning-fast" development of stages of damage from early (initial) to late (final). [9,10,20] Fully "matured" tooth enamel, as the hardest tissue in the human body, includes: mineral salts (hydroxyapatite - 75.04%; carbonate apatite - 12.06%; chlorapatite - 4.39%; magnesium carbonate - 1.62%; calcium carbonate - 1.33%; itorapatite - 0.63%); substances of organic nature (proteins, lipids - 1.2%); water (free and bound with organic substances - 3.8%). In enamel, as a cell-free tissue incapable of recovery, there is a continuous exchange of water, macro- and microelements, which penetrate both from the mixed saliva and from the tissues (dentin, pulp) of

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the tooth. The authors state that a dynamically balanced state is maintained by the consistency of the "demineralization - remineralization" mechanisms, and the phase shift is due to the pH level (mixed saliva and the surface of tooth enamel), as well as the quantitative ratio of minerals. At different stages of tooth development, the following trend is noted in terms of the degree of decrease in enamel permeability: unerupted tooth - temporary tooth - permanent tooth of a young person - permanent tooth of a mature person - permanent tooth of an elderly person. [12,16]

Summarizing the published scientific data, it should be noted that in the child population at the stage, or immediately after the end of eruption, the hard tissues of the teeth, due to insufficient calcification and "saturation" with mineral substances, are in a state of structural and functional "immaturity" and have a high tendency to accumulate macro- and microelements. Despite the insignificant mineral component of the enamel of an "immature" tooth (about 30%), it is characterized by significant variability of morphological structures. The authors note that the morphological features of hypomineralized enamel are the presence of areas (zones) that have a low packing density of crystal-prismatic structures, wide interprismatic spaces, fuzzy (blurred) boundaries of enamel prisms, thereby creating surface microporosity and microroughness. According to researchers, the volume content of microspaces in tooth enamel after eruption is about 6%, and in fully "mature" enamel - less than 0.2%, and apatites in "immature" enamel are mainly represented by hydroxyapatites, which are most susceptible to the action of plaque acids. Based on the above, against the background of type 1 diabetes manifestations, there is a significant prevalence of major dental diseases, which often depends not only on the duration of the course and severity of type 1 diabetes, but also on the state of compensation of carbohydrate metabolism and gender. Studying the literature data and despite significant advances in the prevention of carious lesions of teeth, the study of early diagnosis of caries in children and adolescents in modern dental discipline does not lose its relevance, since the incompleteness of the calcification (mineralization) processes in erupted teeth creates a high risk of developing caries and its complications

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REFERENCES:

1. Badriddinovna D. S. et al. Clinical Picture and Characteristics of the Course of Children's Caries //Annals of the Romanian Society for Cell Biology. – 2021. – pp. 6766-6771.
2. Badriddinovna D. S. et al. Current Issues In The Proper Organization Of Modern Prevention Of Dental Caries In Children //European Journal of Molecular & Clinical Medicine. – 2020. – T. 7. – No. 3. – pp. 1524-1533.
3. Burieva N. A., Makhsumova I. Sh. Preventive work in the aspect of dental diseases // BBK 60 S 56. - 2019. - P. 185.
4. Daminova Sh. B., Makhsumova S. S., Makhsumova I. Sh. CLINICAL AND IMMUNOLOGICAL INDICATORS OF THE ORAL CAVITY IN CHILDREN WITH ACUTE HERPETIC STOMATITIS BEFORE AND AFTER TREATMENT // Dentistry - science and practice, development prospects. - 2018. - P. 87-88.
5. Makhsumova S. S. et al. Features of the manifestation of type 1 diabetes mellitus in children on the mucous membrane of the oral cavity and lips // Bulletin of Science and Education. - 2021. - No. 15-2. – P. 118.
6. Makhsumova S. S. et al. Problems in modern prevention of dental caries in children // Bulletin of science and education. – 2021. – No. 13-2 (116). – P. 9-16.
7. Murtazaev S. S. et al. Traumatic injuries of the oral mucosa in children // Bulletin of science and education. – 2021. – No. 15. – P. 118.
8. Dental caries activity according to T. F. Vinogradova. Degrees of caries activity [Electronic resource]. - Access mode: http://krasgmu.net/publ/1/5-1-0-174.
9. Domenyuk, D. A. Features of the morphology of enamel of permanent teeth at the stages of tertiary mineralization (Part I) / D. A. Domenyuk, B.N. Davydov, S.V. Dmitrienko [et al.] // Institute of Dentistry. - 2019. - No. 1
10. Anisimov, N.V. Efficiency of using vitamin-mineral complexes in the diet of children and adolescents / N.V. Anisimov, I.N. Sakharova // Bulletin of the V.G. Belinsky Institute of Dentistry, natural sciences. - 2009. - No. 14 .
11. Akhmetzyanova, G.R. Anti-caries effect of Calcemin in children with high activity of dental caries / G.R. Akhmetzyanova, R.Z. Urazova, V.M. Smirnov // Kazan Medical Journal. - 2007.- v.88.- No. 3.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
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Website: usajournals.org

12. Domenyuk, D.A. Capabilities of microcomputer tomography in diagnostics of early forms of caries of the chewing surface of permanent molars in children. Part II / D.A. Domenyuk, B.N. Davydov // Pediatric dentistry and prevention. - 2019. - Vol. 19. - No. 2
13. Bondar, T.P. Laboratory and clinical diagnostics of diabetes mellitus and its complications / T.P. Bondar. - M .: Medical Information Agency, 2003.
14. Borisov, L.B. Microbiology and immunology of dental diseases / Ed. L.B. Borisov // Medical microbiology, virology, immunology. - M: Medicine, 2004.
15. Borovsky, E.V. Biology of the oral cavity / E.V. Borovsky, V.K. Leontiev. - M: MIA, 2011.
16. Leontiev, VK Caries and mineralization processes. - M: MMSI, 2007.
17. Dedov I.I., Shestakova M.V., Vikulova O.K. Epidemiology of diabetes mellitus in the Russian Federation: clinical and statistical report based on the Federal Register of Diabetes Mellitus // Diabetes mellitus.-2017.-Vol. 20. -No. 1.
18. Bykov, VL Histology and embryology of human oral organs / VL Bykov. - SPb: "SOTIS", 2009
19. Vavilova, TP Biochemistry of tissues and fluids of the oral cavity / TP Vavilova. - M: GEOTAR-Media, 2011.
20. Borovsky, EV Caries resistance / E.V. Borovsky, V.K. Leontiev // Dentistry. - 2002.