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PRE- AND POST-NATAL METHODS FOR PREVENTING EARLY CHILDHOOD CARIES

O. I. Godovanets, D. G. Romaniuk, L. G. Hrynkevych, O. T. Khomyshyn

Bukovinian State Medical University of the Ministry of Health of Ukraine (Chernivtsi, Ukraine)

Summary

In general, the world recognizes the lack of preventive measures against dental caries in children, as evidenced by its prevalence and intensity with a significant range of fluctuations.

***The aim** of the study. To describe modern approaches to the prevention of early childhood dental caries in children based on the analysis of foreign and domestic literature.*

***Materials and methods.** The study used the bibliosemantic method and structural and logical analysis. The electronic databases PubMed, MEDLINE, Scopus, Web of Science and EMBASE were used to search modern scientific literature using the key words «early childhood caries», «macro and trace elements», «probiotics», «prenatal prevention», «postnatal prevention», «oral cavity microflora».*

***Results and discussion.** At this stage of caries development, the most effective prevention programs are those developed on the basis of methods to minimize the impact of risk factors for the development of the disease, such as microbial plaque, low resistance of dental tissues to demineralization, frequent consumption of carbohydrates. The practical implementation of comprehensive prevention programs is very difficult, as it should be carried out before the birth of a child and continue throughout life. Often the role of the dentist is to organize and monitor the program, while specific preventive measures can and should be implemented by health and education authorities, medical personnel, parents and educators. The greatest impact will be achieved through collaboration among specialists in various medical and non-medical fields.*

***Conclusions.** Based on the analysis of the literature, there is a great interest of the world's leading scientists in the prevention of early childhood caries. However, the problems of developing adapted preventive measures taking into account etiologic factors remain relevant.*

***Key words:** children, early childhood caries, prenatal prevention, postnatal prevention, probiotics, macro- and microelements.*

Introduction

In general, the world recognizes the inadequacy of preventive measures against caries of temporary teeth in children, as evidenced by its prevalence and intensity with a significant range of fluctuations [1-8]. The prevalence of early childhood caries (ECC) in European children is also heterogeneous, in particular, in the United Kingdom the incidence in children aged 3 years is on average 12 % [9], in Switzerland – 24.8 % [10], in Spain – 28 % [11], in Sweden – from 1 to 12 % depending on the age [12], in France – 15.8 % [13], in Italy – 14.4 % [14], in Poland – from 46.6 % to 64.0 % depending on the place of residence [15]. Ukrainian researchers point out the high prevalence and intensity of caries in young children, which varies from region to region and reaches 90 % [16-17].

The aim of the study. To describe modern approaches to the prevention of early childhood dental caries in children based on the analysis of foreign and domestic literature.

Materials and methods. The study used the bibliosemantic method and structural and logical analysis. The electronic databases PubMed, MEDLINE, Scopus, Web of Science and EMBASE were used to search modern scientific literature using the key words «early childhood caries», «macro and trace elements», «probiotics», «prenatal prevention», «postnatal prevention», «oral cavity microflora».

Results and discussion.

In 2016, a meeting of the Global Consultation on ECC was held in Thailand under the auspices of the WHO, which established uniform approaches to the prevention and treatment of dental caries in young children based on the evidence base and is the basis for the development and support of national programs [18-21]. According to this WHO expert consultation, preventive care should be provided at three levels: primary, secondary and tertiary.

Primary prevention of ECC includes promotion of healthy lifestyles and fluoride prophylaxis. It should be integrated into existing primary health care services, especially those related to maternal and child health. Special attention should be given to those who care for the child during the first three years, including feeding. The issues of aetiopathogenesis and prevention of ECC should be included in the curricula of all health care workers involved in working with newborns and young children. It is suggested that a health policy be developed that includes affordable and effective fluoride prophylaxis, a sugar-free diet and a safe environment.

Secondary prevention of ECC should focus on the early detection of caries lesions. Not only dental personnel, but also other health care professionals and even mothers should be trained to detect early signs of caries lesions. Oral health checks should be integrated into the child's overall health profile, which is assessed in the pediatric clinic during routine medical examinations, vaccinations, etc. The use of

fluoride remains relevant at this level. Parents and caregivers should actively and regularly participate in dental hygiene procedures and monitor the child's diet [22].

Tertiary prevention of ECC aims to reduce the negative impact of untreated caries and improve the quality of life of children without loss of functional potential. Treatment methods such as Atraumatic Restorative Treatment (ART), Simplified Modified ART (SMART), Interim Therapeutic Restoration (ITR) using glass ionomer cement as the material of choice for tertiary prevention are used. Depending on the child's behavior and cooperation, treatment under general anesthesia can be used, which of course requires much more resources than at the primary and secondary levels [23].

At this stage of caries development, the most effective prevention programs are those based on methods to minimize the impact of risk factors for the development of the disease, such as microbial plaque, low resistance of dental tissues to demineralization, and frequent consumption of carbohydrates. The practical implementation of comprehensive prevention programs is very difficult, as it should be carried out before the birth of a child and continue throughout life. Often the role of the dentist is to organize and monitor the program, while specific preventive measures can and should be implemented by health and education authorities, medical personnel, parents and educators. The greatest impact is achieved through collaboration between specialists from different medical and non-medical fields [24-28].

Soares RC et al. conducted a systematic review of the literature and identified effective methods of preventing early childhood caries, including: preventive dental programs for pregnant women; diet and nutrition counseling; prenatal oral care; maternal and child oral health promotion involving nurses; maternal oral health programs conducted by non-dentists; dental health education combined with fluoride use for children; early preventive visits to dental clinics; use of fluoride varnishes and toothpastes containing more than 1000 ppm fluoride [29].

Most scientists agree that the key role in the prevention of dental caries in young children is played by the child's mother. The relationship between the incidence of early childhood caries and the age, education, social and financial status of parents and their attitude to oral care and prevention of dental diseases in general has been established [30-34].

When carrying out preventive work with pregnant women, the following areas should be clearly separated: prevention of dental caries, periodontal pathology and other dental diseases in the women themselves; measures to ensure normal dental development in the fetus; prevention of dental caries in newborns and children in the first years of life. The state of oral hygiene of a pregnant woman and other family members is the key parameter to be taken into account when planning sanitary and educational work [35, 36].

Oral hygiene plays a key role in the pathogenesis of dental caries, so dentists should begin by teaching pregnant women, and later new mothers, proper oral hygiene [24, 37-39].

Since the key element in triggering the pathological process in enamel is the cariogenic microflora, scientists and clinicians have developed ways to restore or maintain a healthy oral microbiome to prevent dental caries. Non-pharmaceutical measures that should be influenced include lifestyle, including oral hygiene and reduced sugar consumption. The main biological methods used in caries prevention are the use of inhibitors of microbial metabolism, pH-raising supplements, stimulation of salivation, and biofilm formation with prebiotics and probiotics [40, 41].

Probiotic bacteria are widely used in the fight against tooth decay, especially in pre-school children. The main natural means of their introduction are dairy products, fermented vegetables and sourdough bread. In addition, drops, tablets and lollipops containing different strains of lactobacilli and/or bifidobacteria are used to ensure both the general health of the child and oral health [42].

Numerous clinical trials have shown that probiotic therapy can selectively reduce the number of mutans streptococci [43]. Romani Vestman N et al. demonstrated a change in the oral microbiota after 12 weeks of administration of two strains of Lactobacillus reuteri, with an increase in the level of friendly non-mutans streptococci, while reducing the number of S. mutans, Fusobacterium spp. and Prevotella spp [44]. According to the results of Savychuk's research, the use of Lactobacillus reuteri ATCC 55730 and Lactobacillus reuteri ATCC 55730 helps to reduce the number of mutans streptococci in saliva and improve the quality of oral hygiene [45].

There are few studies on prebiotics for caries prevention, with the exception of the amino acid arginine. A meta-analysis of clinical trials showed a synergistic effect of arginine in combination with fluoride on early crown and root caries compared to placebo or fluoride alone [46].

Another interesting aspect of prebiotics is breastfeeding. Breast milk contains about 7 % carbohydrates, mainly lactose, but is also rich in complex prebiotic oligosaccharides, so breastfeeding during the first year of life may protect the child from caries [47].

The pathogenetic prevention of dental caries also includes the use of fluorides, which contribute to the formation of caries-resistant enamel by forming hydrosiapatites and activating enamel remineralization processes. Nowadays, the use of fluoride-containing agents is the first among all caries prevention measures in children, but these methods are rarely used for early childhood caries and in the complex of prenatal prevention [48, 49].

Ukrainian scientists have developed and clinically proved the effectiveness of a caries prevention regimen for pregnant women and children, which includes the use of probiotic preparations (BioGaya Prodentis) for 10 days in the first and second trimesters of pregnancy for women with compensated caries and no periodontal tissue diseases; for women with sub and decompensated caries – for 14-20 days. To prevent infection of the newborn, the drug is repeatedly prescribed in 36-38 weeks of pregnancy (before delivery) [45].

In children of the first years of life, according to Smolyar NI and co-authors [50], the caries prevention algorithm should include a series of preventive measures, such as regular preventive measures to control plaque and Str. mutans contamination, professional oral hygiene if necessary, sanitary and educational work with the child's parents,

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topical application of calcium and fluoride preparations (Tooth Mousse, MI Paste™, MI Paste Plus™, 10 % calcium gluconate solution, gels with aminofluoride, etc.).

In order to increase the effectiveness of caries prevention, it is advisable to include BioGaia Protectis in the caries prevention regimen of their mothers (once every 2-3 months for 10 days during the first year of life). For children it is recommended to use BioGaia Protectis baby drops: from the first days of life 5 drops once a day for 10 days, repeat the regimen during teething and every 2-3 months. The program for the prevention of dental caries in children over three years of age should include the probiotic «BioGaia Protectis» according to the following regimens: in the case of compensated caries, one lozenge every 3-6 months for 10 days; in the case of subcompensated and decompensated caries, one or two lozenges every 6 weeks for 10 days [45].

A phased scheme of prevention of caries of temporary teeth in children from birth to 24 months has been developed. According to VA Kuzmina and II Yakubova, in the first year of life great attention should be paid to breastfeeding, if necessary, artificial feeding should be organized and formulas containing B. lactis, L. reuteri, L. fermentum, L. acidofilus, Str. termofilus should be chosen. In case of intestinal dysbiosis of the infant, which can be caused by intrauterine infection or contamination of breast milk, it is recommended to use formulas with Lactobacillus spp. of the species L. plantarum, L. fermentum or L. rhamnosus. Another important element in the prevention of early childhood caries is the hygiene of persons in contact with the child and their education about neonatal oral hygiene. From 6 to 12 months of age, special attention is paid to the child's diet and individual oral hygiene. Preventive measures recommended for children aged 12 to 24 months include correction of diet and its regimen, normalization of oral biocenosis. In addition to a toothbrush and xylitol paste, the child's oral care should include remineralization therapy at least twice a year. With this scheme of preventive measures, the reduction of caries growth is 78.37 % [51].

For remineralization therapy in young children, it is desirable to use preparations based on calcium glycerophosphate, magnesium chloride and xylitol, which are safe and available for home use [52, 53].

NV Bidenko prevented dental caries in children under 3 years of age by using the fluoride preparation Bifluoride 12, applied to temporary teeth once a quarter, and the remineralizing gel R.O.C.S. Medical Minerals, applied daily at home for 1 month, alternating with the use of tooth mousse every 2 months. Toothpastes with a fluoride content of at least 500 ppm were recommended for oral care [40].

A complex consisting of a differentiated approach to the choice of toothbrush, the use of Sanodent mouthwash and fluoride-free toothpaste such as New Pearl Calcium, and the use of chewable tablets containing multivitamins and minerals (Multi-Tabs Baby Maxi) has been proposed for the treatment and prevention of dental caries in children aged 1-3 years [55].

For the prevention of early childhood caries, it was suggested that children aged 2-3 years should use Kinder Biovital Gel systemically, apply Osteovit topically and rinse the mouth with Sanodent dental mouthwash [56].

A treatment and prevention complex for children aged 3 years, which included rational oral hygiene and the use of bioflavonoid-based drugs and calcium-containing agents, showed high efficacy [57]. The use of 10 % calcium gluconate solution and Biotrit Denta tablets is also effective [58].

For the treatment and prevention of early childhood caries in children aged 2-5 years, Kovalchuk VV suggested, in addition to conventional methods of exogenous prevention, in particular, remineralizing and antimicrobial therapy, the use of systemic antioxidants, adaptogens and anti-stress drugs such as Alphabet, Calcicor, Carniel, Lecithin, Biotrit-denta [59].

In order to influence the microbial landscape of the oral cavity of children, as well as to increase the secretion of oral fluid and lysozyme activity, a method of caries prevention of temporary teeth has been developed using the sorbent «Enterosgel», which is used in the form of rinses [60].

A caries prevention complex has been developed for preschool children living in conditions of low fluoride intake in drinking water, which includes oral administration of the drug Vitafluor and topical application of the agent Osteovit, as well as fluoride toothpastes and deep fluoridation of enamel [61].

A treatment and preventive complex for caries of temporary teeth in children is proposed, taking into account the state of their dental health, in particular, it is recommended to differentiate the choice of toothpaste depending on the degree of intensity of the carious process: in the case of high and very high intensity, use a toothpaste with a concentration of amino fluorides (500 ppm), in the case of medium and low intensity – a toothpaste with a concentration of amino fluorides of 250 ppm. Exogenous preventive measures include fissure sealing, deep enamel fluoridation once a year, and application of fluoride varnishes such as Bifluorid-12 during preventive examinations [62].

The use of macro- and microelements in the prevention of dental caries is effective. Their systemic use reduces the frequency and intensity of damage to hard dental and periodontal tissues in children [63-65].

Conclusions. Thus, practical dentistry has a number of tools aimed at preventing the development of early childhood caries. The most effective among them are those that influence etiopathologic factors and minimize their impact. However, the issues of developing adapted preventive measures that take into account etiologic factors remain relevant.

Prospects for further research. Development and implementation of new methods of caries prevention in young children.

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АНТЕНАТАЛЬНІ ТА ПОСТНАТАЛЬНІ МЕТОДИ ПРОФІЛАКТИКИ РАННЬОГО ДИТЯЧОГО КАРІЄСУ ЗУБІВ У ДІТЕЙ

О. І. Годованець, Д. Г. Романюк, Л. Г. Гринкевич, О. Т. Хомишин

Буковинський державний медичний університет МОЗ України
(м. Чернівці, Україна)

Резюме.

У цілому у світі визнається недостатність профілактичних заходів щодо карієсу зубів у дітей, про що свідчать показники його поширеності та інтенсивності зі значним розмахом коливань.

Мета дослідження. Оприлюднити сучасні підходи у профілактиці раннього дитячого карієсу зубів у дітей на підставі аналізу закордонних та вітчизняних літературних джерел.

Матеріал і методи дослідження. Під час дослідження використано бібліосемантичний метод та структурно-логічний аналіз. Для пошуку сучасної наукової літератури були використані електронні бази даних PubMed, MEDLINE, Scopus, Web of Science та EMBASE за ключовими словами: «early childhood caries», «macro- and trace elements», «probiotics», «antenatal prevention», «postnatal prevention», «microflora of the oral cavity».

Результати дослідження. На даному етапі розвитку карієсології найефективнішими є програми профілактики, розроблені на основі методів мінімізації впливу чинників ризику розвитку захворювання, таких як мікробний зубний наліт, низька резистентність зубних тканин до демінералізації та часте вживання вуглеводів. Практична реалізація комплексних програм профілактики є дуже складною, оскільки вона повинна проводитися ще до народження дитини та тривати все життя. Нерідко роль стоматолога полягає в організації та моніторингу програми, а конкретні профілактичні заходи можуть і повинні виконуватися органами охорони здоров'я та освіти, медичним персоналом, батьками та освітянами. Найбільший ефект дає кооперація між спеціалістами різних медичних і немедичних напрямків.

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Висновки. На основі проведеного аналізу літератури прослідковується неабиякий інтерес провідних науковців світу до питань профілактики раннього дитячого карієсу. Однак актуальними залишаються питання розробки адаптованих профілактичних заходів з урахуванням етіологічних чинників.

Ключові слова: діти; ранній дитячий карієс; антенатальна профілактика; постнатальна профілактика; пробіотики; макро- та мікроелементи.

Contact Information:
O. I. Godovanets – Doctor of Medical Sciences, Professor, Head of the Department of Pediatric Dentistry Bukovinian State Medical University, Chernivtsi, Ukraine
e-mail: godovanec.oksana@bsmu.edu.ua
ORCID ID: 0000-0002-1889-3893
Scopus Author ID: 57205579182

D. G. Romanuyk – assistant of the Department of Pediatric Dentistry, Bukovinian State Medical University, Chernivtsi, Ukraine
e-mail: romanyuk.d@bsmu.edu.ua
ORCID ID: 0000-0003-3763-4720

L. G. Hrynkevych – assistant of the Department of Pediatric Dentistry, Bukovinian State Medical University, Chernivtsi, Ukraine
e-mail: grynkevych.l@bsmu.edu.ua
ORCID ID: 0000-0003-2460-2105

O. T. Khomyshyn – a postgraduate of the Department of Pediatric Dentistry, Bukovinian State Medical University (Chernivtsi, Ukraine)
e-mail: homyshyn_oleksandr@bsmu.edu.ua
ORCID ID: 0000-0002-8144-4257

Контактна інформація:
Годованець О. І. – доктор медичних наук, професор, завідувач кафедри стоматології дитячого віку Буковинського державного медичного університету (м. Чернівці, Україна)
e-mail: godovanec.oksana@bsmu.edu.ua
ORCID ID: 0000-0002-1889-3893
Scopus Author ID: 57205579182

Романюк Д. Г. – асистент кафедри стоматології дитячого віку Буковинського державного медичного університету (м. Чернівці, Україна)
e-mail: romanyuk.d@bsmu.edu.ua
ORCID ID: 0000-0003-3763-4720

Гринкевич Л. Г. – асистент кафедри стоматології дитячого віку Буковинського державного медичного університету (м. Чернівці, Україна)
e-mail: grynkevych.l@bsmu.edu.ua
ORCID ID: 0000-0003-2460-2105

Хомишин О. Т. – аспірант кафедри стоматології дитячого віку Буковинського державного медичного університету (м. Чернівці, Україна)
e-mail: homyshyn_oleksandr@bsmu.edu.ua
ORCID ID: 0000-0002-8144-4257

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