

# Current Issues In The Proper Organization Of Modern Prevention Of Dental Caries In Children

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*Abstract. Dental caries is the most common chronic disease among the child population. Caries of milk teeth takes a special place in the structure of this pathology. Despite the improvement in the quality and expansion of the volume of preventive and therapeutic measures, the level of intensity and severity of early childhood caries in our country and the Perm region in particular remains at a very high level. There are more than a hundred reasons contributing to the development of carious process in milk teeth. Of these, the most important are socio-demographic, biological, dietary, hygienic and factors related to the type of feeding. In this case, the consolidation or weakening of the action of such in a number of circumstances will determine the emergence and further development of early childhood caries [69, 103]. In the classical sense, dental caries is a chronic infectious disease induced by a violation of diet.*

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The well-known developments on the classification of the generally accepted terms of teething are not obvious, which dictates the need for a detailed study, taking into account regional and ethnic specificities. Physiological teething is an indicator of the harmonious development, somatic health of the child's body [8].

Leading experts in the field of dentistry, in accordance with the classification of A. F. Tour [1], distinguish physiological periods of a child's development, during which a certain structure of the oral cavity organs is preserved. The first period, highlighted by the author - intrauterine - 280 days, is fundamental, determining resistance, physiological formation and subsequent development of the body.

The state of health, lifestyle and the level of hygienic knowledge of a pregnant woman affect the formation of caries resistance of the tissues of the teeth of the unborn child [2, 9, 8]. During pregnancy, the level of dental health deteriorates [2,7], and complications during pregnancy lead to severe symptoms of oral diseases. Some scientific works demonstrate the dependence of pronounced microbial colonization of the oral cavity by cariogenic streptococci and external manifestations of active caries in pregnant women [7], which will undoubtedly affect the formation of tooth rudiments in young children due to the possible massive transmission of pathogenic flora [9]. The value

Dental well-being of pregnant women, according to a number of authors, establishes hormonal transformation [5], against their background, the characteristics of the oral fluid change, the adhesion and growth of dental plaque is potentiated [3], and the total mass of pathogenic flora increases. On the prevalence of inflammatory manifestations from the periodontal tissues in expectant mothers, there are antagonistic data: from an insignificant prevalence to 100%, they are associated with a lack of sanitation, complicated by the course of pregnancy, and unsatisfactory oral hygiene [9]. According to OV Kopchak [4], half of the women examined at the beginning of pregnancy showed minimal signs of gum inflammation.

Unbalanced nutrition, transformation of the state of organs and systems of the expectant mother, favor the emergence of extragenital pathology, which leads to the decompensation of chronic diseases [5] and is a risk factor for the initiation of pathology of any complexity in the oral cavity in young children [13], which is due to a violation of the formation of a full-fledged structure hard tissues of teeth [2]. In mothers with complicated pregnancy, according to RochaJ. M., children with low birth weight are born [9], the vast majority have an active form of decay teeth caries [6].

Basic knowledge of pregnant women in the field of maintaining a healthy oral

cavity, both for women themselves and for the unborn child, makes it possible to do without negative experience and difficulties in eliminating the consequences of low education of adults. As a result of studies [12], the fact of insufficient awareness among women is associated with socio-economic factors, low quality of education, and a weak interest in dental health. Antenatal prophylaxis is impossible without improving the quality and depth of knowledge of pregnant women, consistent diagnosis and correct treatment with a professional approach, aimed at long-term results [14].

The amount of hygienic understanding of parents and the degree of their adherence to preventive measures in children are commensurate with the risk of carious disease, which is demonstrated by numerous examples [15]. It has been statistically proven that timely visits to the dentist, systematic and timely care of the child's oral cavity under the supervision of parents, and restriction of the use of refined carbohydrates reduce the risk of dental hard tissue diseases in children [5].

The involvement of the carbohydrate factor in the development of caries is stated by many authors [1]. According to T.N. Gomenyuk, the prevalence and intensity of RDK rapidly increases with uncontrolled sugar consumption: in children under three years of age, the standard indicators are 50% and 1.96 teeth, respectively. This factor is the most accessible for correction: if sugar is limited to twenty grams per day, the prevalence of caries is less than two percent, with an efficiency not exceeding 0.04. With the consumption of sugars over sixty grams per day, these indicators increase to 18% and 0.55, respectively [12]. A similar dependence in their studies was proved by other authors: in countries where the average human consumption of sugar per day is less than fifty grams - a low level of prevalence of diseases of hard tissues of teeth is recorded [15], at the same time in people with a high frequency of sugar consumption - the level of caries is higher average values [16]. The relationship between blooming caries and the habit of falling asleep with a bottle, with juice, compote or water with honey has been proven [9], while the risk of caries development increases six and a half times [16].

Unreasonably early introduction of starchy, carbohydrate products into the child's nutritional system causes disruption of the physiological work of the hormonal and digestive systems and adversely affects the formation of the dentition. A balanced diet contributes to the prudent formation of eating behavior [4]. The increase in the number of diseases and the disastrous consequences associated with errors in the diet, insufficient nutritional culture are becoming the object of research by authors from different countries [10].

Breastfeeding is excellent nutrition for the baby, and both traditional and recent

research have shown the critical role of breast milk in a healthy microbial landscape. Breast milk contains immunoglobulins, lactobacilli and bifidobacteria, enzymes [15], all of these elements protect the immature body of the child and are involved in the formation of innate and acquired immunity [13]. A series of experiments demonstrates a decrease in the likelihood of development. Existing measures for the prevention and treatment of RDK do not bring the expected results, and the prevalence of carious disease reaches 80%, depending on the territory [11], with an average intensity of four teeth, which is two times higher than in economically developed countries [5]. The progression of diseases of dental hard tissues is catastrophic, the clinical picture irreversibly changes in two years: if a child at the age of one year has single lesions, then by three years of age - five times more [8].

Diseases of the digestive tract and respiratory infections [18]. At the same time, prolonged and / or nocturnal uncontrolled feeding on demand increases the risk of developing RDC [8], especially after 12 months [4], 18 months of age [13]. This is due to a decrease in the total volume of saliva at night, a doubling of the level of lactose concentration in saliva and dental plaque, and a violation of the processes of self-cleaning of the oral cavity. In her studies, Yakubova I.I. proved that not only the timing of breastfeeding creates conditions for the development of caries of deciduous teeth, but also contamination of breast milk with bacteria, which is registered in 36.5% of women and the presence of dysbiotic shift of the oral cavity in 73.9% babies [10].

Kiselnikova L.P. et al. found that early weaning and formula feeding leads to the progression of carious disease [5]. The latter statement is consistent with the findings of GA Chetvertnova, who determined [12] that early mixed and artificial feeding, especially excluding breastfeeding, allows a failure in the formation of the physiological community of oral bacteria, disposes to massive contamination of mucous membranes with pathogenic species.

Regardless of the type of feeding, the risk of developing RDK, according to NV Kuyumdzhidi [6], increases several times with poor personal hygiene of infants, which should begin immediately after the eruption of the first tooth. The degree of parental conviction in this issue is important [17], the dependence of the high motivation of parents and the connection with regular brushing of teeth. The formation of behavioral habits in their children was demonstrated by WigenT. I. [5]. The interdependence of the dental status on the level of oral hygiene is supported by the works of many authors [83, 105, 109]: in children aged three to four years, with a high index of oral hygiene, the intensity of caries does not exceed 2, with a satisfactory one -  $2.7 \pm 0,23$ , with poor oral hygiene -  $3.4 \pm 0.28$ . The

existence of dense dental plaque with virulent properties blocks the completion of the formation of tooth enamel and plays a key role in the initiation and progression of caries in children, due to the accumulation of acid-forming bacteria in it [15].

Taking into account modern views on the etiology and pathogenesis of dental caries, microorganisms play an important role in its occurrence [17]. Demineralization of the enamel in caries is caused by bacterial acids, especially *Str. mutans* and lactobacilli, which ferment carbohydrates [16]. The entry of the substrate into dental plaque is carried out through complex biochemical reactions in the mouth, as a result of which polysaccharides, such as starch, are converted into disaccharides (maltose), and then into glucose, which is a ready substrate for acid production [15]. The main factors in the development of the disease in young people are metabolites of microbial cells, mainly glyco- and proteolytic enzymes, and substances formed upon exposure. these enzymes on the tooth tissue [2, 14].

General etiopathogenetic therapy of caries includes the regulation of nonspecific resistance of the body and should be aimed at increasing the body's resistance to the effects of unfavorable environmental factors. Clinical observations indicate that the rapid form of enamel demineralization in most cases is observed in patients with severe suppression of the immune system [6, 12].

Cariogenic flora. One of the most important etiological factors in the development of caries are acid-forming microorganisms in the oral cavity. At the birth of a child, the normal microflora is represented by lactobacilli, non-hemolytic streptococci, and non-pathogenic staphylococci [8].

The colonization of the oral cavity with cariogenic flora occurs in everyday life through saliva from the mother, father or other people who surround and care for the child [4]. Transmission of microorganisms can occur through "tasting" food, wetting and "cleansing" pacifiers, nipples, toys, and kissing with saliva. This happens more often at an early age through the so-called "window of infection", but it is possible at an earlier or later date [9]. The leading role in the occurrence of caries, including in children, belongs to acid-forming microorganisms, in particular *Streptococcus mutans* (*Str. Mutans*) [14]. Possessing a number of virulent characteristics, *Str. mutans* determines the cariogenicity of dental plaque or biofilm due to the production of extra - and intracellular polysaccharides that contribute to the deposition of plaque matrix and further plaque growth [6]. *Streptococcus mutans* possesses a unique transport system for the transfer of sugars (phosphoenolpyruvate phosphotransferase) and, unlike most microorganisms of dental plaque, it is tolerant to an acidic environment, supporting sugar metabolism under conditions of lowering the pH of the

environment [6].

However, initially acid-forming microorganisms have a low cariogenic potential (low virulence), while the individual remains caries-resistant. When the homeostasis of the oral cavity changes, there is a shift in the balance between cariogenic bacteria and factors that determine the acid susceptibility or stability of dental hard tissues (plaque and saliva). P. D. Marsh and S. Percival (2006) called this condition "violation of microbial homeostasis". Due to the imbalance, the cariogenic potential of the microflora increases, which inevitably leads to the initiation of the carious process [15].

Besides *Str. mutans*, an important role in the pathogenesis of early childhood caries is attributed to lactobacilli. Their increase in the child's oral cavity may be associated with the frequent consumption of carbohydrates. At the same time, at the stage of plaque retention and demineralization of the enamel layer in saliva, *Str. Mutans* [14, 8]. With the progression of caries and the onset of clinical manifestations of the disease with the formation of a cavity defect, dominance will pass to lactobacilli [14, 36].

Lactobacillus have rather low adhesive properties, fixing in the depressions of the teeth only mechanically. However, due to coaggregation with various other symbiont microbes, in particular, with peptostreptococci and microaerophilic streptococci of the oral cavity, lactobacilli can adhere rather tightly to the surface of the teeth and in the thickness of dental plaque [15]. In the presence of carbohydrate squeaky lactobacilli abundantly produce lactic and other acids, contributing to the progression of the carious process. At the same time, lactobacilli act as an important stabilizing factor in the formation of oral microbiocenosis: they synthesize vitamins of groups B and K, which are necessary for the development of other bacteria and the body as a whole [16].

Given the complex and changing composition of dental plaque, it should be noted that other microorganisms contribute to the development of caries, albeit to a lesser extent: *Streptococcus sanguis*, *Streptococcus salivarius*, *Streptococcus milleri*, *Actinomyces viscosus*, *Streptococcus wiggsiae*.

For early childhood caries, the age at which the child became infected with these microorganisms is extremely important, since the earlier it happened, the higher the risk and intensity of the carious process [2].

Starting from the age of 3, and sometimes even earlier, the child's social circle expands, he begins to attend preschool institutions. Communication with peers, common toys, dishes lead to the exchange of microflora within the team, which is also a risk factor for the development of dental caries [13].

Oral fluid. The state of the hard tissues of milk teeth is largely determined by the characteristics of the oral fluid. Being an integrative environment for the organs of the oral cavity, saliva can promote or inhibit the action of cariogenic factors [16]. According to modern concepts, saliva has a micellar structure (Leont'ev V.K., 1991) and contains calcium and phosphate ions in a supersaturated state. Mechanisms that prevent the release of its constituent components (Ca and  $HP04^-$ ) from the enamel and promote the entry of those from saliva into the enamel underlie its mineralizing function. Ensuring the state of dynamic equilibrium of the enamel composition and the surrounding biological fluid is maintained at a certain level due to the equilibrium of the processes of re- and demineralization. This property provides its mineralizing function, which is especially important during the period of enamel maturation immediately after the eruption of milk teeth [6, 14].

An indirect indicator of the mineralizing function of the oral fluid is its ability to microcrystallize. With a high degree of structuring, saliva can form larger patterns with the correct organization, which indicates a significant mineralizing potential of the oral fluid and is especially important during the period of active maturation of hard dental tissues after eruption. A decrease in the degree of formation and size of crystals up to their complete disappearance indicates a decrease in the ability of saliva to saturate the hard tissues of the tooth with mineral components, which reduces their resistance to external influences and this can be considered a risk factor for the development of early childhood caries [9, 2].

The role of fluorine compounds. Among other factors, fluorine compounds play an important role. Recent studies have shown that fluoride ions, which are active in the oral fluid, play a more significant role in preventing the development of caries than their high content on the tooth surface; a significant effect is achieved in the enamel maturation phase [1].

An important role of fluorine belongs to the inclusion in the process of ionic scillation, when remineralization occurs at a pH close to 7.0. Fluorine enters into association with hydroxyapatite of the enamel layer with the formation of a stable form of fluorapatite -  $[Ca_{10}(PO_4)_6F_2]$ .

There are several concepts explaining the anti-cariogenic effect of fluorine compounds [14]:

- during the formation of hard tissues of teeth, fluoride - ions can replace hydroxyl - ions, thereby making crystals more acid-resistant; S formation on the enamel surface of "labile" fluoride - calcium fluoride ( $CaF_2$ ), which is insoluble in acids.
- fluorides reduce the growth of bacteria in dental plaque and prevent the glycolysis

chain from progressing by inhibiting the enzyme enolase;

- Fluorides prevent adhesion and colonization of cariogenic microorganisms on the enamel surface;

- Fluorine ions inhibit the transport of glucose into the cells of pathogenic bacteria and the formation of extracellular polysaccharides (levanes and dextrans);

- Fluoride changes the bioelectric potential on the enamel surface;

- Fluoride ion enhances microcirculation in the salivary glands and activates the function of macrophages in the oral fluid;

- Fluoride solution on the tooth surface can inhibit the demineralization process.

Socio-demographic reasons. For the development of the child as a whole and the social environment plays an important role in dental caries. Stronger this influence is manifested in preschoolers than in older children [2].

There is a link between caries in primary teeth and the age of the child: the prevalence of the disease increases in proportion to the growth of children. The gender of the child has little effect on the development of dental caries. Most studies confirm either the absence of a significant relationship between caries and gender, or this relationship is insignificant [14].

The socio-economic situation of the family, namely the low level of education of parents, especially the mother, and low incomes contribute to a higher prevalence of caries in primary teeth in children. There are studies showing that families with low socioeconomic status consume more sugar-sweetened beverages and food than those with a higher status [9].

The presence of older brothers and sisters in the child's family, living with relatives (grandmother, grandfather, etc.), visiting public preschool institutions (where the number of children is greater than in private ones) inevitably leads to an exchange of microflora within the group and, as a result, to higher incidence and intensity of caries [3].

Family characteristics. The important role of parents in the risk of developing early childhood caries has already been noted, but it should be reversed

Attention to this factor. So, a special place in this issue is played by the mother of the child, since the prenatal period plays an important role in the formation of the resistance of dental tissues in children: the state of health of the mother, habits and lifestyle, the nature of the course of pregnancy and childbirth. Children born to mothers with chronic diseases (pyelonephritis, diabetes mellitus, hypertension, infectious hepatitis, etc.) who continue to smoke during pregnancy, lead a sedentary lifestyle, violate oral hygiene, the risk of developing caries, both milk and permanent teeth [15, 12].

The intensity and prevalence of dental caries is higher in premature infants due to

insufficient mineral saturation of the enamel than in those born on time [4].

Children of parents who have untreated carious cavities have a higher risk of infection with cariogenic microflora, therefore the parents' own dental health is directly related to the presence of caries in babies [11].

Negative attitudes and attitudes towards dental care from parents can be passed on to children. Lack of knowledge in matters of dental health, lack of interest in moms and dads, lack of conviction in maintaining dental health inevitably leads to an increase in the risk of dental caries in children. If parents monitor the child's oral hygiene, limit the child's consumption of sweets, notice the first pathological changes on the teeth early and seek dental care in a timely manner, this significantly reduces the risk of the prevalence and intensity of caries in their children [13].

### **Conclusion.**

Thus, it is important to control caries in children from an early age. However, the assessment of all risk factors for the development of early childhood caries, the influence of which has been proven in the literature, is difficult in the practice of a dentist. At the same time, not all factors are equal in strength and degree of influence in the indication of a pathological process; there is a difference in their combination of factors, as well as in the degree of their manifestation in different age periods of the child.

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