

INDICATORS OF CALCIUM METABOLISM IN PRESCHOOL CHILDREN DEPENDING ON THE TYPE OF FEEDING, AT AN EARLY AGE

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Relevance. Defining health policy in the field of nutrition and promotion of maternal and child health in the XXI century, WHO pays priority attention to breastfeeding. Breast milk is the "gold standard" of the ideal nutrition of young children necessary for normal growth and development. Breastfeeding is an unparalleled way to provide ideal nutrition to infants for their full growth and development. It has a unique biological and emotional impact on the health of both mother and child. With artificial feeding, the consumption of a large amount of carbohydrate food, feeding with sweet dairy and fermented milk products contribute to the development of caries in children up to a year old and subsequently lead to premature removal of milk teeth.

Natural feeding has a biological advantage over artificial feeding and ensures proper and full-fledged development of the child. Children who were breastfed for up to a year have a higher intellectual development compared to children whose breast-feeding was stopped before 2 months. The development of the doctrine of natural feeding went in parallel with the intensive search for ways to abandon it. Artificial formula feeding has become so simple and safe that the problem of breastfeeding has ceased to exist, and this has been one of the reasons for the catastrophic decline in the duration and prevalence of breastfeeding in most developed countries. The problem of the low prevalence of natural feeding is of particular relevance in the works of a number of authors who are devoted to the study of the reasons for the transfer of children to artificial feeding. These include late application to the breast of the child after birth, as well as the separate maintenance of mother and child in maternity hospitals, feeding children by the hour, night breaks in feeding, bottle feeding. However, they reflect individual reasons for early refusal of breastfeeding, while the significance of risk factors is poorly understood. Based on the above, it seems very relevant to study the causes and significant risk factors contributing to the early transfer of children to artificial feeding. In this regard, the scientific substantiation of new approaches to breastfeeding support is of particular importance, an important place among which is occupied by programs aimed at eliminating risk factors for early transfer of children to artificial feeding [13.17.19.21.23.24.25.26].

Dental caries is an important problem of childhood in all countries of the world. The prevalence of this disease in the world ranges from 25% to 72%. At the World Summit on Early Caries in Bangkok in 2018, it was noted that caries of temporary teeth is on the 10th place among the 291 most common diseases, and is also a condition that significantly affects the quality of life of children and their families. The main measures for the prevention of caries for all preschoolers assume: the exclusion of sugars from the diet of children under the age of 2 years; restriction of sugar consumption by children over the age of 2 years; daily double brushing of teeth with fluoride-containing paste (at least 1000 ppm) in an amount appropriate to age [Shakovets N.V., Antonenko A.N. 2019].

Last year, the average level of exclusive breastfeeding in our country was 54.4%, the highest rates were noted in the Bukhara region and Karakalpakstan. During discharge from maternity hospitals, the prevalence of this type of feeding is a high proportion, but decreases in the following months. It is believed that applied oral hygiene is a publicly available, relatively reliable and highly effective way of preventing not only dental pathologies, but also diseases of internal organs (Alimova R. G., 2004; Aliev Zaur Uzeyir Ogly, 2016). The connection between flowering caries and the habit of falling asleep with a bottle, juice, compote or water with honey has been proven (Ishanova M.K., Yuldashkhanova A.S., 2016; Makhsumova S.S. et al., 2021).

Temporary teeth erupt earlier in breastfed children than in children receiving artificial breast milk substitutes. In a number of studies, a large activity of the masticatory muscles has been proven when sucking the breast by a child, which obviously affects the formation of the maxillofacial apparatus in early childhood, Galaktionova M.Yu., Izmestyeva O.V., 2012). Refusal of natural feeding is a risk factor for the development

of common diseases of the maxillofacial region in children. Artificial feeding increases the risk of distal occlusion by 2.5–3 times. This is influenced by the shape, size, and material of which the nipple is made. Many manufacturers produce many variants of physiological nipples for feeding children. However, the factor of artificial feeding still negatively affects the movements of the tongue and chewing muscles of the child, which changes the adequate growth and development of the dental system. This anomaly not only violates the appearance of the child, which is a powerful psychological factor, but also affects the state of the digestive system (Yanushevich O.O. et al., 2017; Kazantseva I.A. et al., 2020). In a number of studies, a large activity of the masticatory muscles has been proven when the baby is sucking the breast, which obviously affects the formation of the maxillofacial apparatus in early childhood. Retrospective studies have shown that malocclusion is 1.84 times more common among bottle-fed infants, and the effect increases with an increase in the duration of this type of feeding (Galaktionova M.Yu., Izmestyeva O.V., 2012).

Thus, artificial feeding of children of the first year of life implies an earlier eruption of their temporary teeth, thereby exposing the hard tissues of the tooth to the development of caries, tooth loss, and also negatively affects the formation of a permanent bite. Active promotion of breastfeeding should be carried out not only by pediatricians, but also by pediatric dentists, since the nature of breastfeeding affects not only the timing, pairing and sequence of eruption of temporary teeth, but also the health of the whole organism.

The purpose of the study: Optimization of methods of prevention of dental diseases in children, taking into account the type of feeding at an early age.

Material and methods of research: There were 1066 children aged 3 to 7 years with dental diseases who were in preschool institutions of the Bukhara region, and 30 children who were not diagnosed with dental diseases were involved as a control group. **Results and discussion:** To study the significance of risk factors for the development of dental diseases in children, depending on the type of feeding at an early age, a survey and objective dental examination of 1066 preschool children organized in preschool institutions of the city of Bukhara and the Bukhara region were conducted № 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 16, 19, 20, 24, 25, 26, 50, 51, 52, 61. As a result of the survey and dental examination of 1066 children, 884 (82.9%) children were diagnosed with dental diseases.

Among all the examined children, pupils of preschool institutions (n=1066), 170 children were selected for the study, 140 of them were children with various dental diseases and 30 healthy children with normal dental status.

According to the biochemical status indicators, the children were divided into 3 groups:

1-control group - 30 healthy children;

2-the main group – 70 children who were on artificial and mixed feeding with dental diseases;

3-comparative group – 70 children who were naturally fed with dental diseases;

Parameters of calcium metabolism in the blood (parathyroid hormone, serum calcium, vitamin D3 (25ON)) were studied in all selected children. The material for the study was blood serum. The concentration of calcium was determined by photometric method on the Mindray BA-88A analyzer, quantitative determination of paratharmon by enzyme immunoassay on the Mindray MR 96A apparatus, vitamin D3 (25ON) by immunochemiluminescence on the Vondfo sinicare apparatus.

The analysis of the materials of the primary examination by age, gender and place of residence showed the predominance of children aged 3-7 years of boys - 457 (51.8%) children living in rural areas - 638 (72.3%) children. The results obtained show a connection with the low hygienic index of the oral cavity of this contingent of children and the peculiarities of dental medical education of parents.

According to the results of the survey, the predominance of mixed breastfeeding in infants was revealed in 463 children (43.4%), while 357 (33.5%) children were artificially fed, 246 (23.1%) children received natural feeding.

For the convenience of assessing the duration of breastfeeding, the following frequency was used in the questionnaire: up to 3 months 119 (13.5%), up to 6 months 225 (25.4%), up to 9 months 96 (10.9%), from 9 months to 1 year 145 (16.5%), 1-1.5 years 105 (11.9%), 1.5-2 years 127 (14.3%), more than 2 years 46 (5.2%), from birth 19 (2.3%) children were exclusively on artificial feeding.

Among all the established comorbidities, diseases of ENT organs predominate-(136) 29.4% and helminthiasis-(82) 17.7%. Taking into account the physiological features of the structure and growth, the formation of the dental-jaw system in connection with the functioning of the respiratory system in preschool

children, as well as the increase in cases of helminthiasis at this age shows the risk of demineralization of bones, the dental-jaw system, including. Therefore, it is important to take into account the concentration of calcium in the blood and the state of vitamin D metabolism for the prevention of dental diseases. Consequently, the established data prove the need for an individual approach to the diagnosis and management of patients in this category and taking into account the state of calcium and vitamin metabolism.

Statistical data processing was carried out in two stages:

- 1) preparation for statistical analysis;
- 2) actual statistical analysis.

The results obtained by us were processed using a Pentium-IV personal computer and the Microsoft Office Excel-2012 software package. The methods of variational parametric and nonparametric statistics were used with the calculation of the arithmetic mean parameter (M), the mean square deviation (s), the standard error of the mean (m), relative values (frequency, %). The statistical significance value in the comparative analysis of the average indicators was evaluated by the Student's criterion (t).

In order to determine the main risk factors for dental diseases in children, a survey of parents was conducted.

The questionnaire modified by us (Oral Health Tefal (2009)) on the basis of the questionnaire consists of 40 anamnestic questions to assess the medical and social status of children and identify risk factors for dental diseases and dental and maxillofacial pathologies. The questions concerned the nature of breastfeeding (natural or artificial); the duration of breastfeeding if the child was naturally fed, then it was found out to what age [2.6.8.9.10].

Physical discomfort and functional disorders (questions 1-5), social (questions 6-8) and family (questions 9-11) well-being of the child. In each section of the questionnaire, 5 answers to the question are offered, which are encoded by points: 0 point-never, 1 point-very rarely, 2 points-rarely, 3 points-often, 4 points-very often. The more points received according to the survey results, the worse the dental status of the child.

When recruited on a scale from 0 to 44 points: 0-10 points – low risk, 11-28 points – average risk, more than 29 points were assessed as a high risk of developing dental diseases and the formation of pathology of the dental and maxillary system.

According to the objective examination of the dentist, 17 items were filled out, including the hygienic index (GI), the caries-filling-removal index (CPI), the level of caries intensity (PEC), the tooth enamel resistance index (TER), the dental formula and the condition of the dental-maxillary system as a whole. The remaining 11 questions were aimed at assessing the impact of dental diseases on the quality of life of the child and his family.

As a result of the questionnaire on the questionnaire modified by us “Prevention of dental diseases in children who were on artificial feeding”, the dental status of children was assessed.

In our study, the results of dental examination of preschool children revealed a significantly low oral hygiene index in group 2 in children who were on artificial and mixed feeding 2.6 ± 0.07 ($P < 0.01$) in relation to the control group 1.7 ± 0.07 . The indicators of the 3rd group were at the level of control values of 2.1 ± 0.06 without significant statistical differences.

As a result of the questionnaire, the children who were on artificial and mixed feeding scored 28.9 ± 0.35 and were identified as a high-risk group, and the children who received natural feeding scored 1.9 times less and entered the medium-risk group, which was statistically significant in relation to the control group ($P < 0.001$).

It is known that low hygienic the skills of preschool children in combination with bad habits contribute to the formation of dental caries and its complications and the development of diseases of the oral cavity.

The study of the concentration of parathyroid hormone at the same time showed an increase in its level to 74.5 ± 1.29 mmol / l, against the control - 54.8 ± 2.9 pg/ml. The result obtained is 1.35 times lower than the control values and has a statistical significance of $P < 0.05$.

The high concentration of parathyroid hormone is explained by the development of secondary hyperparathyroidism in children, which is facilitated by diseases of the intestinal tract, in particular changes

in the gastrointestinal tract during artificial and mixed feeding, which can form in the form of dysbiosis, constipation, diarrhea, gastrointestinal dysfunction and other diseases of this system.

At the same time, with prolonged hypocalcemia, a compensatory state is formed, the so-called second hyperparathyroidism, that is, calcium deficiency itself contributes to the development of second hyperparathyroidism.

Vitamin D deficiency can also contribute to the condition of secondary hyperparathyroidism

. Analysis of vitamin D3 (25OH) levels revealed its decrease in the blood of children with dental diseases to 27.9 ± 0.71 ng/ml compared with the control group (40.7 ± 3.3 ng/ml,) ($P < 0.05$).

In general, the obtained results of the study of calcium metabolism in children with dental diseases with artificial and mixed feeding in early childhood confirm the relative deficiency of vitamin D3 in children with pathology of the dental and maxillary system. This condition is assessed as latent calcium deficiency, which does not manifest clinically manifest symptoms of hypocalcemia, but is expressed in insufficient mineralization of bone tissue [1.4.6.9.11.13.15.17.19].

Therefore, when diagnosing dental diseases in preschool children, it is important to study the type of feeding in early childhood. All the findings show the need to improve preventive dental measures, as well as the development of clinical recommendations for improving the health of children with artificial feeding at an early age.

A comparative analysis of calcium metabolism indicators depending on the type of feeding in early childhood in preschool children showed a significant decrease in calcium both against the control and against the indicators of group 2.

At the same time, the concentration of calcium in children of group 3 is 1.04 times lower in relation to the indicators of group 2. This confirms the formation of latent calcium deficiency regardless of the type of feeding in early childhood.

The concentration of PTH was also reduced to 60.8 ± 1.0 pg/ml against the indicators of group 2. In relation to the control values (54.8 ± 2.9 pg /ml), it tends to increase to 60.8 ± 1.0 pg / ml, which shows the compensatory state of the parathyroid hormone, depending on the degree of calcium deficiency in the blood. Consequently, the deeper the calcium deficiency, the higher the concentration of PTH in the blood.

PTH as an inducer of vitamin D synthesis in our studies in children with dental diseases with natural feeding in early childhood was at the level of 31.2 ± 0.58 ng/ml relative to the indicator of the control group (40.7 ± 3.3 ng/ml, $P < 0.05$). The result obtained against the control was significantly 1.3 times lower. At the same time, a significant increase in the level of PTH was also found against the values of the 2nd group of patients - 27.9 ± 0.71 ng/ml ($P < 0.05$) [2.4.6.8.10.12.14.16.18.20.22.24.26].

The state of relative vitamin D3 deficiency in children with pathology of the dental-maxillofacial system is assessed as latent calcium deficiency, which does not manifest clinically manifest symptoms of hypocalcemia, but is expressed in insufficient mineralization of bone tissue, including in the dental-maxillary tissue. All this underlines the importance of taking into account the type of feeding of children, especially during teething and bite formation. In order to develop methodological recommendations for improving preventive measures in pediatric dentistry, taking into account dental diseases in children, the correlation relationship of biochemical indicators of vitamin D metabolism with indices of dental health in the examined children, taking into account the type of feeding in early childhood, was analyzed to predict the outcome of identified oral diseases. The relationship of vitamin D3 with the studied indicators in group 2 children turned out to be highly negative in relation to the compiled questionnaire ($r = -0.52$) and CPU ($r = -0.84$), while a noticeable positive relationship was established between vitamin D3 and PEC- $r = 0.53$ and TER $r = 0.5$.

In children with artificial feeding in early childhood with dental diseases, vitamin D3 has a positive noticeable relationship with GI $r = 0.52$.

At the same time, calcium in the blood has a high negative relationship with CPU $r = -0.84$, with a noticeable positive relationship with GI $r = 0.53$, PEC $r = 0.52$ and questionnaire $r = 0.55$.

At the same time, the tooth enamel resistance index (TER) has a weak positive relationship with the level of calcium in the blood $r = 0.40$. Therefore, according to the levels of calcium and vitamin D3 in the blood, it is possible to assess CP and vice versa, according to the value of CP, it is possible to predict about vitamin D3 and calcium in the blood of children, which allows optimizing preventive dental measures.

Thus, in children with artificial feeding in early childhood, to assess the dental status with a long-term guarantee of outcome, it is important to study the level of parathyroid hormone and vitamin D3 in the blood. In order to optimize preventive pediatric dental measures, it is necessary to introduce a questionnaire compiled by us in preschool institutions.

In order to reduce invasive measures and save financial costs both at the family level and at the state level, taking into account the negative relationship of CP with the level of vitamin D3 and calcium in the blood, it is recommended to limit the assessment of CP of the oral cavity in children.

Consequently, the hygienic assessment of the oral cavity in preschool children shows the state of vitamin D3 metabolism, including the level of calcium in the blood.

Thus, when examining preschool children with artificial feeding in early childhood, it is recommended to conduct a questionnaire survey and evaluate the CPI and PEC indices for early prevention and treatment of oral diseases.

The relationship of calcium with the studied parameters in children with natural feeding in early childhood was interesting. Noticeably positive associations of blood calcium with CPU $r=-0.84$, PEC $r=0.52$ and TER $r=0.42$ were established.

Thus, the study of the correlation between the biochemical parameters of vitamin D metabolism and the indices of dental health in children, depending on the type of feeding in early childhood, allows early prevention and prediction of the outcome of oral diseases.

The introduction of a questionnaire in preschool institutions and the study of parathyroid hormone and vitamin D3 in dynamics expands the range of diagnostics of diseases of the oral cavity and teeth. All the developed recommendations contribute to the optimization of preventive pediatric dental measures.

Based on the obtained correlations of biochemical parameters and indicators of vitamin D3 metabolism with dental health indices, an algorithm for conducting at the level of preschool institutions was developed [1.3.5.7.9.11.13.15.17.19.21.23.25].

At the same time, the use of this algorithm expands the range of thinking of both parents and teachers-teachers on the study of methods for the prevention of caries and other oral diseases in children. And also this algorithm promotes active communication and strengthening of relations of parents and teachers with dentists. The developed methodological recommendations for the prevention of dental diseases in children contribute to improving the quality of preventive dental services and improving the quality of life of the population.

Taking into account the socio-economic nature of morbidity, the program for the prevention of major dental diseases in children with artificial feeding, it is advisable to introduce the developed program in children in primary health care. In each specific case of early detection of dental pathology, the economic efficiency was calculated based on government costs. In the total bill for the treatment of chronic periodontitis, 120.400 soums are spent on the treatment of the 1st tooth.

Analysis of calcium metabolism indicators in high-risk children contributes to the diagnosis of latent calcium deficiency and prevention of dental diseases. It is recommended to co-manage children who were on artificial feeding at the same time with dentists, parents, teachers and pediatricians.

Conclusion:In preschool children, the incidence of dental diseases is 82.9%. Dental caries prevailed in the structure of dental diseases - 71%, chronic periodontitis - 28%, catarrhal gingivitis - 12%, hypertrophic gingivitis - 1%, upper lip frenulum - 37%, tongue frenulum -14%, imperfect amelogenesis - 5%, enamel hypoplasia - 7%, imperfect dentinogenesis - 1%, incorrect incisor position - 22%, physiological diastema and tremors - 23%, distal bite - 25%, mesial bite - 11%, cross bite - 7%.

Dental diseases among children with artificial feeding – 54.3% of children, with natural feeding 40% of cases. The results of dental examination of pre-school children revealed a significantly low oral hygiene index in group 2 in children who were artificially mixed-fed 2.6 ± 0.07 ($P<0.01$) in relation to the control group 1.7 ± 0.07 . The results of the CPU showed a significant increase to 4.5 ± 0.37 in the 2nd group, 4.2 ± 0.30 in the 3rd group of children compared to the control values 0.4 ± 0.37 ($P<0.05$). The resistance of tooth enamel was increased by 9.4 times (up to 16.9 ± 0.15 points) in the 2nd group, by 6.8 times (up to 12.4 ± 0.34 points) in the 3rd group with respect to the control - 1.8 ± 0.37 points.

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