

## **EVALUATION OF THE EFFECTIVENESS OF RICKETS PREVENTION BY STUDYING THE LEVEL OF VITAMIN D<sub>3</sub> METABOLITE.**

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**Abstract:** It was found that the formation of rickets is facilitated by a low level of the main metabolite of vitamin D, calcium and phosphorus in the blood serum. This was evidenced by the study of the biochemical parameters of the main indicators of calcium-phosphorus metabolism and the content of 25(OH)D<sub>3</sub> in the examined children before vitamin D prophylaxis when compared with the data of healthy children. Treatment with vitamin D<sub>3</sub>, along with general restorative therapy, has significantly improved the effectiveness of preventing rickets. At the same time, there was a decrease in alkaline phosphatase, an increase in the content of 25(OH)D<sub>3</sub> in blood serum, as well as the level of calcium and phosphorus.

**Keywords:** rickets, vitamin D, calcium, phosphorus, alkaline phosphatase, 25(OH)D<sub>3</sub> content.

**The relevance of the problem.** An important role in the formation of rickets is played by insufficient provision of vitamin D, calcium and phosphorus, in this regard, it is of interest to study its level in blood serum in comparison with the level of calcium and phosphorus [2,5,13]. Although to date there is no consensus on the optimal level of 25 (OH) D, most experts determine vitamin D deficiency at its level of less than 20 ng/ml (50 nmol/L) [8,10,14]. The level of 25 (OH) D from 21 to 29 ng/ml (52 to 72 nmol/L) is considered as vitamin D deficiency, and the normal concentration of vitamin D should reach 30 ng/ml or higher [1,7,15]. The reasons for the decrease in blood Ca levels are numerous. These include vitamin D deficiency associated with insufficient intake from food, impaired absorption in the intestine, suppression of the biosynthesis of active forms, as well as an unbalanced content of inorganic phosphates and magnesium in food, and other factors [3,6,9].

The high prevalence of rickets in young children and their polyethologicity determine the need for a differentiated approach to the diagnosis, treatment and prevention of rickets at the pediatric site [4,10]. It has to be stated that practical medicine cannot withstand the rapid spread of this pathology among children, meanwhile, missed opportunities for timely prevention of the observed deviations determine the expansion of the scale of the process at subsequent age stages [11]. The active appeal of doctors to this topic, the identification of risk groups, the introduction of modern methods of diagnosis and treatment will allow us to solve this problem qualitatively [12].

In this regard, we consider it necessary to determine the level of 25(OH)D<sub>3</sub> in the blood serum to find out the true causes of rickets in children of the first year of life. Only such an in-depth examination makes it possible to identify children at risk for rickets, clarify the etiology, and most importantly, carry out differentiated prevention. That is why it is of interest to study its serum levels in comparison with the levels of calcium and phosphorus.

**The purpose of the work:** To evaluate the effectiveness of rickets prevention carried out at the site by studying the levels of 25(OH)D<sub>3</sub>, calcium, phosphorus, alkaline phosphatase and to justify the methods of correction.

**Materials and methods of research.** 40 children aged from 1 to 12 months were under our supervision. The examination of children was conducted on the basis of clinical examination, questionnaires and analysis of outpatient records in the children's department of the polyclinic No. 2 in Samarkand. Parents were explained the purpose of the study and received written consent. All children diagnosed with diseases, given the effect of inadequate amounts of vitamin D or someone receiving vitamin D supplements at least a month before the visit, were excluded.

All children were considered practically healthy and were examined physically to establish the clinical features of rickets (delayed closure of the large fontanel, rickety rosary, wide wrist, muscle weakness, dystrophy, pale skin, excessive sweating, delayed teething, psychomotor development).

As a result, the children were divided into 2 groups: group 1 (healthy) - (20 children – 50%), group 2 - children with signs of rickets (20 infants - 50%), who did not receive rickets prevention. There were 6 (30%) children with rickets under the age of 6 months, 10 (50%) under 12 months. The number of children under the age of 3 months was 4 (20%). There were 11 boys (55%), while the number of girls was 9 (45%).

To complete the tasks and clarify the diagnosis, we conducted biochemical studies: determination of the level of 25 (OH)D<sub>3</sub>, alkaline phosphatase, calcium and phosphorus in blood serum. All children were consulted by a pediatrician, a neurologist and doctors of other narrow specialties.

**Discussion of the results obtained.** The conducted studies have shown that the main factors in the development of rickets in young children, when questioning mothers about the course of pregnancy, were: lack of vitamin D intake during pregnancy (78%), iron deficiency anemia (82%), unbalanced nutrition (64.5%), the young age of the mother during the 1st pregnancy (55%). In less than 50% of cases, low maternal education and complicated childbirth were determined, and toxicosis of pregnant women amounted to only 43%. When assessing the risk factors for rickets in children, we found that the most important are the low content of 25(OH)D<sub>3</sub> in blood serum and insufficient prevention of rickets at the 1st year of life. Factors such as insufficient outdoor exposure - less than 20 minutes a day (69.25%), acute respiratory viral infections (72.5%), time of birth (autumn-winter period) (66.75%), perinatal factors (58.75%), IDA (67.5%) played a significant role.

It was found that, despite the recommendations of the district pediatrician about giving vitamin D<sub>3</sub> on the one hand, and about the mandatory implementation of the doctor's recommendation by parents on the other hand, the children we observed had signs of rickets. Considering this fact, we decided to conduct a control examination of children to substantiate the reliability of our assumptions. In this regard, it became necessary to determine the level of 25 (OH)D<sub>3</sub> in the blood serum to find out the true causes of rickets in children of the first year of life. Only such an in-depth

examination makes it possible to identify children at risk for rickets, clarify the etiology, and most importantly, carry out differentiated prevention.

The level of 25(OH)D<sub>3</sub>, alkaline phosphatase, calcium and phosphorus in the blood serum of 40 children of the first year of life was studied. Children, as indicated above, were divided into 2 groups: group 1 (healthy children) – (20 children - 50%), group 2 – children with signs of rickets (20 infants – 50%), who did not receive rickets prevention.

**The biochemical parameters are presented in Table No. 1:**

№	Indicators	Healthy children		Children who did not receive prevention		P
		M	m	M	m	
1	25 (OH) D	34,16	1,31	19,89	1,97	<0,001
2	Alkaline phosphatase	289,83	10,79	318,46	62,26	>0,5
3	Total calcium	2,371	0,014	1,997	0,019	<0,001
4	Phosphorus	1,205	0,016	0,922	0,011	<0,001

As can be seen from the table, the content of 25 (OH)D<sub>3</sub> in the blood serum of healthy children was on average 34.16±1.31. Whereas in children who did not receive vitamin D<sub>3</sub> prophylaxis, it was equal to 19.89±1.97 mmol/l, which is significantly lower than in healthy children (<0.001). A significant difference was found in the examined groups in terms of calcium and phosphorus levels. Thus, the total calcium content in healthy children was 2.371±0.014 mmol/l, and in children of the second group this indicator was 1.997±0.019 mmol/l (<0.001). In children who did not receive rickets prophylaxis, phosphorus levels were significantly reduced compared with those of healthy children - 0.922±0.011 mmol/l and 1.205±0.016, respectively.

Alkaline phosphatase in children who did not receive vitamin D prophylaxis tended to increase ( $318.46 \pm 62.26$  and  $289.83 \pm 10.79$ , respectively).

The results show that despite the recommendations of the district doctor, parents do not always follow them. As a result, there is a risk of developing rickets in children, as evidenced by low levels of the main metabolite of vitamin D, calcium and phosphorus in the blood serum. All of the above dictates the need for preventive measures by directly instilling vitamin D into the child by a nurse.

It is known that there are different forms of release of this vitamin. Currently, a modern affordable drug has appeared on the pharmaceutical market, which is an aqueous solution of cholecalciferol (Aquadetrim 1 drop contains 500 IU of an aqueous solution of vitamin D3). The vitamin D preparation was prescribed to children in prophylactic doses from 500 to 1000 IU (one or two drops) per day. In children with the initial period of rickets with a normal serum level of 25 (OH)D3, treatment was started with a minimum dose of vitamin D – 500 IU, which, if necessary, was increased to 1000 IU after 7-10 days.

**The biochemical parameters are presented in Table 2:**

№	Показатели	Before the prevention		After the prevention		P
		M	m	M	m	
1	25 (OH) D	19,89	1,97	38,12	2,56	<0,001
2	Alkaline phosphatase	318,46	62,26	267,65	18,50	>0,5
3	Total calcium	1,997	0,019	2,53	0,02	<0,001
4	Phosphorus	0,922	0,011	1,78	0,03	<0,001

In the course of preventive measures, the levels of 25(OH)D3, calcium and phosphorus in the blood serum of children significantly increased to normal values. The level of alkaline phosphatase has also changed. Thus, 25 (OH)D3 increased to  $38.71 \pm 2.56$  (at baseline -  $19.89 \pm 1.97$  mmol/l,  $P < 0.001$ ), alkaline phosphatase

decreased to  $267.65 \pm 18.50$  (at baseline -  $318.46 \pm 62.26$ ), calcium level increased to normal values -  $2.53 \pm 0.02$  (at baseline -  $1.997 \pm 0.019$ ,  $P < 0.001$ ), the phosphorus level also normalized -  $1.78 \pm 0.03$  (at baseline -  $0.922 \pm 0.011$ ,  $P < 0.001$ ). The results obtained indicate the high effectiveness of the proposed treatment regimen for rickets.

**Conclusion.** In general, the presented material once again demonstrates that the formation of rickets is facilitated by a low level of the main metabolite of vitamin D, calcium and phosphorus in the blood serum. In addition, it should be pointed out that of these risk factors on the part of the child, 2 more significant factors have been identified using statistical technologies: lack of vitamin D prophylaxis in the first year of life  $P < 0.00001$ ; iron deficiency anemia in a child  $P < 0.09$ . The data obtained became the basis for preventive measures consisting of prescribing vitamin D preparations. The treatment with vitamin D<sub>3</sub>, along with restorative therapy, significantly increased the effectiveness of preventing rickets. At the same time, there was a decrease in alkaline phosphatase, an increase in the content of 25(OH)D<sub>3</sub> in blood serum, as well as the level of calcium and phosphorus.

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