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## CORRECTION OF VITAMIN D LEVELS IS THE KEY TO PREVENTING HYPOCALCEMIC CONDITIONS

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### ANNOTATION

**Objective:** Determination of the level of 25(OH)D<sub>3</sub> in blood serum and its effect on the prevention of rickets in Uzbekistan.

**Methods:** There were 466 children under observation, aged from 1 to 12 months, the children were considered practically healthy and did not receive vitamin D within a month before blood sampling. The level of vitamin 25(OH)D<sub>3</sub> less than 30 mmol/l was considered an existing biochemical deficiency.

**Results:** Despite the traditional prevention of rickets, 27.8% had mild and moderate severity, while 72.1% had no clinical signs of rickets. In 86.1% of children with rickets, a low level of 25(OH)D<sub>3</sub> in the blood serum was detected. Thus, after the modified prevention of rickets, only in 9.2% of the examined children with signs of rickets, did the level of 25(OH)D<sub>3</sub> remain low, while in 90.7% it returned to normal. At the same time, in children without signs of rickets, 14.3% had a low content of 25(OH)D<sub>3</sub> in the blood serum, and in 85.7% of children, the level returned to normal. As a result, the correct administration of vitamin D makes it possible to reduce severe forms of rickets and improve the psychomotor development of the child.

**Conclusions:** The proposed correction with vitamin D allows us to normalize the level of 25(OH)D<sub>3</sub>, reduce severe forms of rickets, improve psychomotor development in the 1st year of life and can be recommended in the conditions of Uzbekistan.

**Key words:** rickets, 25(OH)D<sub>3</sub> in blood serum, prevention, children, vitamin D.

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Самаркандский государственный медицинский университет**КОРРЕКЦИЯ УРОВНЯ ВИТАМИНА D – КЛЮЧ К ПРОФИЛАКТИКЕ  
ГИПОКАЛЬЦИЕМИЧЕСКИХ СОСТОЯНИЙ****АННОТАЦИЯ**

**Цель:** Определение уровня 25(OH)D<sub>3</sub> в сыворотке крови и его влияние на профилактику рахита в Узбекистане.

**Методы:** Под наблюдением находилось 466 детей в возрасте от 1 до 12 месяцев, дети считались практически здоровыми и не получали витамин D в течение месяца до забора крови. Уровень витамина 25(OH)D<sub>3</sub> менее 30 ммоль/л расценивали как имеющийся биохимический дефицит.

**Полученные результаты:** Несмотря на традиционную профилактику рахита, 27,8% имели легкую и среднюю степень тяжести, а 72,1% не имели клинических признаков рахита. У 86,1% детей с рахитом выявлен низкий уровень 25(OH)D<sub>3</sub> в сыворотке крови. Так, после проведения модифицированной профилактики рахита только у 9,2% обследованных детей с признаками рахита уровень 25(OH)D<sub>3</sub> оставался низким, а у 90,7% возвращался к норме. В то же время у детей без признаков рахита у 14,3% было выявлено пониженное содержание 25(OH)D<sub>3</sub> в сыворотке крови, а у 85,7% детей уровень нормализовался. В результате правильный прием витамина D позволяет уменьшить тяжелые формы рахита и улучшить психомоторное развитие ребенка.

**Выводы:** Предлагаемая коррекция витамином D позволяет нормализовать уровень 25(OH)D<sub>3</sub>, уменьшить тяжелые формы рахита, улучшить психомоторное развитие на 1-м году жизни и может быть рекомендована в условиях Узбекистана.

**Ключевые слова:** рахит, 25(OH)D<sub>3</sub> в сыворотке крови, профилактика, дети, витамин D.

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**D VITAMINI DARAJASINI TUZATISH GIPOKALSEMIK HOOLLARNI OLDINI OLISH  
KAROIDIR****ANNOTATSIYA**

**Maqsad:** Qon zardobida 25(OH)D<sub>3</sub> miqdorini aniqlash va uning O'zbekistonda raxit kasalligining oldini olishga ta'siri.

**Material va metodlar:** Nazorat ostida 466 nafar 1 oydan 12 oygacha bo'lgan bolalar bo'lib, ular deyarli sog'lom deb topilgan va qon olishdan bir oy oldin D vitamini olmagan. 25(OH)D<sub>3</sub> vitaminining 30 mmol / l dan past bo'lishi mavjud biokimyoviy tanqislik sifatida qabul qilindi.

**Natijalar:** Raxitning an'anaviy profilaktikasiga qaramasdan, 27,8% engil va o'rtacha og'irlikda bo'lgan va 72,1% raxitning klinik belgilari yo'q edi. Raxit bilan og'rigan bolalarning 86,1 foizida qon zardobida 25(OH)D<sub>3</sub> ning past darajasi aniqlangan. Shunday qilib, raxitning o'zgartirilgan profilaktikasidan so'ng, raxit belgilari bo'lgan tekshirilgan bolalarning atigi 9,2% 25(OH)D<sub>3</sub> darajasi pastligicha qoldi va 90,7% normal holatga qaytdi. Shu bilan birga, raxit belgilari bo'lmagan bolalarda 14,3% qon zardobida 25(OH)D<sub>3</sub> miqdori kamaygan va 85,7% bolalarda bu daraja normal holatga qaytgan. Natijada, D vitaminini to'g'ri qabul qilish raxitning og'ir shakllarini kamaytirishi va bolaning psixomotor rivojlanishini yaxshilashi mumkin.

**Xulosa:** D vitamini bilan tavsiya etilgan korreksiya 25(OH)D<sub>3</sub> darajasini normallashtirish, raxitning og'ir shakllarini kamaytirish, hayotning 1-yilida psixomotor rivojlanishni yaxshilash imkonini beradi va O'zbekistonda tavsiya etilishi mumkin.

**Kalit so'zlar:** raxit, qon zardobida 25(OH)D<sub>3</sub>, oldini olish, bolalar, D vitamini.

**Introduction.** Rickets has been dealt with for decades, but the frequency does not tend to decrease and averages 30% [4,5]. Rickets belongs to a group of deficient diseases, the main etiological factor in the development of which is insufficient intake of food or the formation of vitamin D in the skin in growing children [2,17].

Despite the abundance of sun in our country, rickets is widespread. In Uzbekistan, rickets occurs in 27% of children's first year of life [6,16]. This dictates the need to develop and improve methods of its prevention, taking into account current situations, and environmental and ethnic characteristics.

If early diagnosis is carried out and the correct treatment is prescribed, then the disease proceeds without complications. And in the absence of treatment for moderate and severe rickets, flattening and deformities of the pelvis, chest deformities, flat feet, myopia, and multiple caries are often formed. Children under one-year-old is very often prone to respiratory diseases, and pneumonia, and thus the inflammatory process has a protracted course, leading to gastrointestinal upset [10,14]. For girls who have suffered rickets due to lumbar lordosis, the size of the entrance and exit from the small pelvis may be narrowed, and thus have to resort to caesarean section during childbirth [11,12].

Consequently, with rickets, there is a violation of phosphorus-calcium metabolism. This is a consequence of changes in the rate of absorption, utilization and elimination of these minerals [1,7]. Determination of the content of calcium and phosphorus in the blood is used by many researchers as a diagnosis of rickets and to monitor the effectiveness of therapy for this disease [8,13]. Of course, this method is much cheaper, but for the diagnosis of rickets, it is necessary to use a more accurate indicator - to determine the active metabolites of vitamin D in the blood.

It should be said that to determine the dosage of vitamin D to adequately carry out prevention and treatment in many countries, the level of 25 (OH) D<sub>3</sub> is determined.

Many authors give different levels of vitamin D in serum: 20-40 ng/ml; 10-30 ng/ml; 36.2 ng/l [5,10]. But at the same time, some authors [3,9,15] believe that the normative values are subject to fluctuations depending on race, age, season and diet. And they also depend on the peculiarities of the method by which the level of vitamin D is determined.

Studies to determine the active metabolite of vitamin D, which is a direct indicator of deficiency, have not been conducted in Uzbekistan.

**Purpose of the study:** determination of the level of 25(OH)D<sub>3</sub> in blood serum and its effect on the prevention of rickets in Uzbekistan.

**Material and methods of research:** 466 children, aged from 1 to 12 months, were under observation, whose parents considered them to be practically healthy and did not receive vitamin D within a month before blood sampling. Children under the age of 6 months were 35.6%, up to 12 months - 43.7%, up to 3 months - 20.6%.

The predominance of boys was noted - 258 (55.3±2.3%), while the number of girls was 208 (44.6±2.3). The determination of 25(OH)D<sub>3</sub> in blood serum was carried out in the laboratory of the Santa Clara Hospital in Rotterdam, Holland, using the radioimmunoassay method.

Each child took 2 ml of venous blood. The Serum was separated by centrifugation at 3000 rpm for 10 minutes, and stored at -200C. Children with 25(OH)D<sub>3</sub> less than 30 nmol/l were considered as an existing biochemical deficiency.

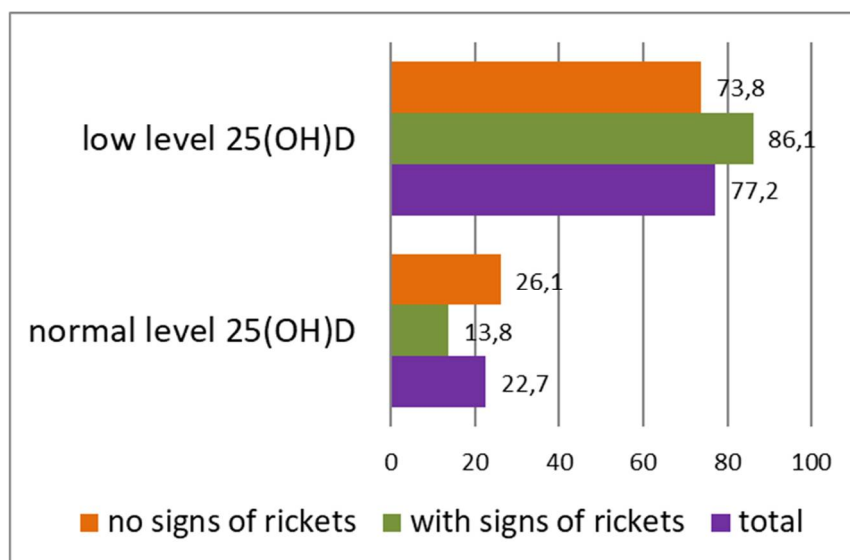
**Results:** Thus, it was found that vitamin D deficiency occurs in 77.2% of children, including clinically pronounced rickets in 27.8% of children in the 1st year of life, which indicates the insufficient effectiveness of traditional methods of preventing rickets.

The effectiveness of measures to prevent the disease significantly depends on the timeliness of the prophylactic administration of vitamin D<sub>3</sub> preparations, taking into account the degree of the adverse effect of risk factors on the child's body.

Because, despite the recommendations of the local paediatrician to give vitamin D<sub>3</sub>, on the one hand, and the obligatory implementation of the doctor's recommendations by parents, on the other hand, the children we observed had signs of rickets.

By collecting personal data, we found that during the standard prevention of rickets, out of the total number of children, only 128 children (27.4%) received vitamin D. It should be said that the local doctor prescribed vitamin D by writing a prescription, but the mother forgot to give the child daily vitamin D.

Consequently, during the traditional prevention of rickets, out of 466 children, 27.8% had mild and moderate degrees, while 72.1% had no clinical signs of rickets. In 86.1% of children with rickets, a low level of 25(OH)D<sub>3</sub> in the blood serum was detected, while in the rest they fluctuated within the normal range. Paradoxically, in 73.8% of children without signs of rickets, we also found a low level of the main metabolite of vitamin D (Fig. 1). This was due not only to the lack of preventive measures but also to the peculiarities of the lifestyle and nutrition of children and their mothers. In 22.7% of children, the level of 25(OH)D<sub>3</sub> in the blood serum was within the normal range, of which 26.1% of children had no signs of rickets, and 13.8% had signs of rickets.

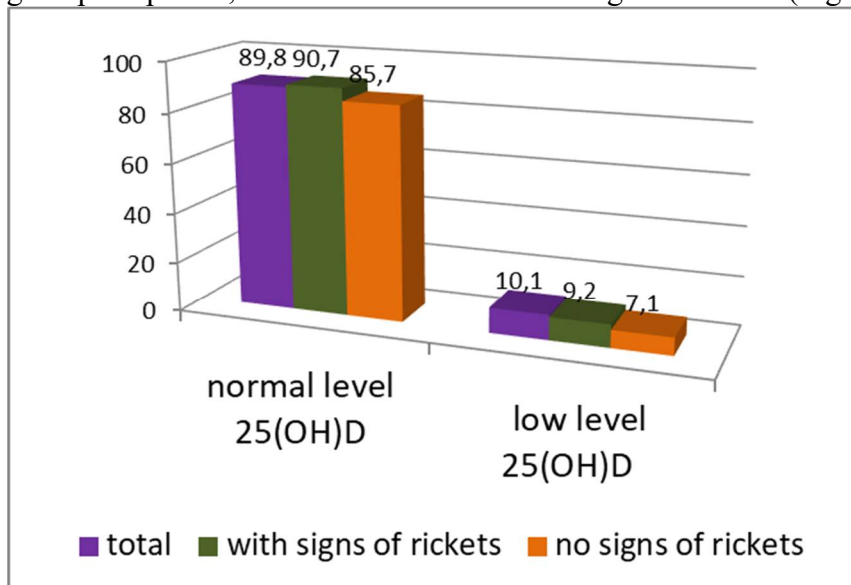


**Fig. 1 The level of 25(OH)D<sub>3</sub> in the blood serum of children at the time of traditional rickets prophylaxis**

Despite the ongoing traditional prevention of rickets, its effectiveness remains low, as evidenced by the high incidence of rickets and low levels of 25(OH)D<sub>3</sub> in the blood serum of children. In our opinion, the constant employment of mothers and the inadequate implementation of preventive measures by mothers are also of no small importance.

In this regard, we decided to modify the intake of vitamin D, and assign all responsibility for the implementation of modified prophylaxis to visiting nurses. This was because daily intake of vitamin D is inconvenient, and sometimes, parents simply forget. In this regard, to increase the reliability of the ongoing prophylaxis, it was decided to change not only the scheme but also the method of administering this drug. An analysis of the condition of the children proved the truth of our assumption. In this regard, for 3 months, all children were given vitamin D directly by the district nurse according to the following scheme: vitamin D (aqua trim, devon) 4000 IU once a week from the age of one month until the end of the 1st year of life with patronage observation of the child (course dose 160000-180000 ME).

It should be noted that the implementation of modified prophylaxis made it possible to normalize the level of 25(OH)D3 in the blood serum in 89.8% of children. 82.2% had initial rickets and rickets during the peak period, and 17.7% had no clinical signs of rickets (Fig. 2).



**Fig. 2. The level of 25(OH)D3 in the blood serum of children during modified rickets prophylaxis**

After the modified prevention of rickets, only in 9.2% of the examined children with signs of rickets, did the level of 25(OH)D3 remain low, while in 90.7% it returned to normal. At the same time, in children without signs of rickets, 14.3% had a low content of 25(OH)D3 in the blood serum, and in 85.7% of children, the level returned to normal.

In children, there was an improvement in well-being, normalization of appetite and sleep, cessation of profuse sweating during feeding, and improvement in weight gain. The general condition of the children during the examination after the course of preventive measures was satisfactory. We have not identified the development of side effects and overdose from the drug used.

During the traditional and modified prevention of rickets in the city of Samarkand and the Akdarya region, they showed their results. In the Akdarya region, rickets occurred in children in 56.7% of cases, and in Samarkand - 28.5%.

At the time of the study, we determined the level of 25(OH)D3 in the blood serum of children, depending on the place of residence. The data obtained showed that in the Akdarya region, the low level of 25(OH)D3 in the blood serum of children with signs of rickets was 80.2%, and the normal level of 25(OH)D3 in the blood serum was 19.7%. In the city of Samarkand, a low level of 25(OH)D3 in the blood serum of children with signs of rickets was noted at 82.9%, and a normal level of 25(OH)D3 in the blood serum was 17%.

At the time of the traditional prevention of rickets in the Akdarya district, the level of 25(OH)D3 in the blood serum was low in 96.4% of children, and normal - 3.4%. A similar situation was in the city of Samarkand. The low level of 25(OH)D3 in the blood serum of children with signs of rickets was 80%, normal - in 20% of children.

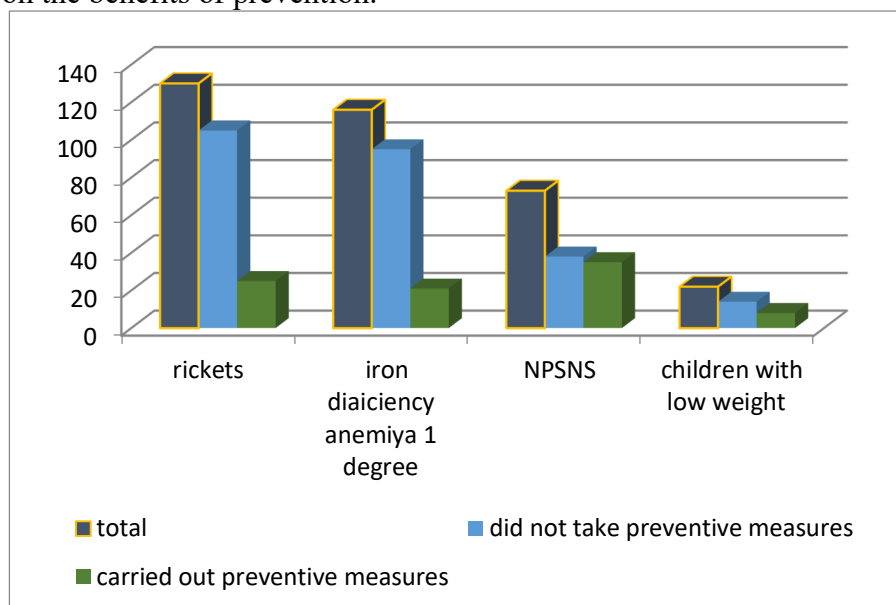
After carrying out modified prophylaxis according to the scheme proposed by us, the studies showed an excellent result. So in the Akdarya district, only 9.5% of children had a low level, while in 90.5% this level returned to normal. In the city of Samarkand, a low level was also observed in 16.6% of children with signs of rickets, and a normal level of 25(OH)D3 in the blood serum was in 83.4% of children.

One of the indicators of the effectiveness of therapeutic and preventive measures is the medical activity of the family. The medical activity of the family is the actions of parents that are aimed at the health of the family and the child. According to our data, the prevalence of rickets among children determined the need for an analysis of the family activity in the implementation of preventive



measures for the development of rickets with the controlled implementation of current recommendations based on the informed consent of parents. On fig. 3. presents the results of the frequency of certain diseases in groups with the different medical activities of the family during the traditional prevention of rickets.

The results of controlled preventive observation of 466 children aged 1 to 12 months showed that more than 90% of mothers ignore doctors' prescriptions for the mandatory intake of vitamin D by children in the first year of life. At the same time, in families where rickets was prevented, the incidence of anaemia, NPSNS and rickets was 2 times lower than in families where rickets was not prevented. This indicates the need for patronage nurses to work with families, and to conduct explanatory work on the benefits of prevention.



**Fig. 3 Influence of medical activity of the family in the development of certain diseases during the traditional prevention of rickets.**

Usually, the evaluation of the effectiveness of a particular treatment or preventive measure is carried out after 6-12 months from their start, i.e. in catamnesis. When conducting a follow-up examination of children, it turned out that the repeated determination of the level of Ca in the blood after 12 months showed that out of 466 children examined earlier, the level of Ca in the blood below 2.0 mmol / l remained low only in 20 (4.2 ± 0, 92%) children. The data obtained prove the need for repeated determinations of 25(OH)D3 in the blood serum, or at least the level of calcium and phosphorus in these children, which makes it possible to correct the dose of vitamin D3 promptly.

Therefore, an individual approach is needed in the selection of the dose and duration of vitamin D3 administration. All of the above proves that it is necessary to carry out timely prevention not only by writing prescriptions but also by nurses themselves should administer vitamin D to children.

Together with the doctors of the polyclinic, a follow-up observation of these children was carried out. It should be noted that children began to develop better, get sick less, and parents gained confidence in the high reliability of preventive measures. Moreover, according to them, they informed their acquaintances about the effectiveness and the need for the timely appointment of vitamin D3. In our opinion, the chain of the effectiveness of preventive measures will be lengthened precisely due to an increase in the number of women who are convinced of the reliability of preventive measures in general, and rickets, according to our methodology, as well.

It can be concluded that a woman shares more about the growth and development of her child with her friends and acquaintances who have older children. In this regard, if we can specify, based on not only clinical but also laboratory data (in particular, 25 (OH) D3 in blood serum in rickets), show the result of our work to a certain group of mothers, then they, in turn, contribute to the emergence of confidence in the treatment, even more parents.

It was found that only the appointment of prophylactic doses of vitamin D does not prevent the development of severe forms of rickets. The modified method of preventing rickets contributes to a significant reduction in the number of children suffering from respiratory and diarrheal diseases.

**Conclusions:** It was found that among the surveyed, rickets occurs in 27.8% of young children, including in urban children in 19.8%, and rural children in 37.7% of cases. Latent deficiency of 25(OH)D<sub>3</sub> was detected in 77.2% of children, while clinical rickets was determined only in 27.8% of children, although these children received traditional rickets prophylaxis. Modification of methods of prevention and differentiated treatment of rickets contributes to a significant reduction in latent vitamin D deficiency by 4 times and recovery. For prophylactic purposes, children should be given vitamin D<sub>3</sub> directly by the district nurse with the participation of parents according to the following scheme: vitamin D (aqua trim, devon) 4000 IU once a week from the age of one month until the end of the 1st year of life.

Thus, significant achievements in the prevention of rickets in young children, the elimination of its social causes, and the expansion of our knowledge of the essence of the disease have allowed us to approach the issue of the significance of rickets in the pathology of young children from a new perspective. The proposed correction with vitamin D allows us to normalize the level of 25(OH)D<sub>3</sub>, reduce severe forms of rickets, improve psychomotor development in the 1st year of life and can be recommended in the conditions of Uzbekistan.

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