VITAMIN D LEVEL IN COMPLEX ADMINISTRATION OF BRONCHIAL ASTHMA IN CHILDREN

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Abstract:

Purpose of study: to evaluate the clinical efficacy of vitamin D supplementation in the complex treatment of bronchial asthma in children.

Materials and methods: the study involved 60 children with bronchial asthma. Of these, 13 (21.6%) had a severe persistent form of asthma (group I), 33 (55%) had a moderate form (group II), and 14 (23%) children were observed with a mild persistent form (group III). One of the criteria for participation in the study was the absence of conditions requiring intensive care. The control group consisted of 50 children with moderate acute obstructive bronchitis and no history of allergic diseases. Informed parental consent was obtained for all study participants. The level of the metabolite 25(OH)D in the blood of children was used to analyse vitamin D status.

Results and discussion: the concentration of vitamin D (25(OH)D) in the blood serum was assessed before and after treatment using an enzyme immunoassay. According to the recommendations of the US Institute of Medicine, a 25(OH)D level below 20 ng/ml indicates deficiency and 21–30 ng/ml indicates insufficiency.

Conclusions: the combination of basic therapy and vitamin D has demonstrated effectiveness, reducing the risk of asthma exacerbations. The inclusion of vitamin D in complex treatment has a positive effect on the course of the disease and its dynamics, which helps to improve treatment and prevention measures.

Keywords: vitamin D, treatment, bronchial asthma, children.

BOLALARDA BRONXIAL ASTMANI KOMPLEKS DAVOLASHDA VITAMIN D DARAJASI

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Annotatsiya:

Tadqiqot maqsadi: bolalardagi bronxial astmani kompleks davolashda vitamin D qo‘shimchasining klinik samaradorligini baholash.

Materiallar va metodlar: tadqiqotga bronxial astma bilan og‘rigan 60 nafar bola jalb etilgan. Ulardan 13 nafari (21,6%) og‘ir persistent shakldagi astma (I guruh), 33 nafari (55%) o‘rta og‘irlikdagi shakl (II guruh), 14 nafari (23%) yengil persistent shakldagi astma bilan kuzatildi (III guruh). Tadqiqotda ishtirok etish mezonlaridan biri jadal yordamga muhtoj holatlarning yo‘qligi edi. Nazorat guruhi o‘rta og‘irlikdagi o‘tkir obstruktiv bronxit bilan kasallangan va allergik kasalliklar anamnezi bo‘lmagan 50 nafar boladan iborat edi. Barcha ishtirokchilarning ota-

onalaridan tushuntirilgan rozilik olindi. Bolalarda vitamin D statusini baholash uchun qonda 25(OH)D metaboliti darajasi aniqlandi.

Natijalar va muhokama: qon zardobidagi vitamin D (25(OH)D) konsentratsiyasi davolanishdan oldin va keyin ferment immunoanaliz usulida baholandi. AQSh Tibbiyot institutining tavsiyalariga ko‘ra, 25(OH)D darajasi 20 ng/ml dan past bo‘lsa yetishmaslik, 21–30 ng/ml bo‘lsa kamlik ko‘rsatkichi hisoblanadi.

Xulosalar: asosiy terapiya bilan vitamin D ning birgalikdagi qo‘llanilishi samarali ekanligini ko‘rsatdi va astma zo‘rayishlari xavfini kamaytirdi. Vitamin D ni kompleks davolashga kiritish kasallikning kechishi va dinamikasiga ijobiy ta’sir ko‘rsatadi, bu esa davolash va profilaktika choralarini yaxshilashga yordam beradi.

Kalit so‘zlar: vitamin D, davolash, bronxial astma, bolalar.

УРОВЕНЬ ВИТАМИНА D В КОМПЛЕКСНОМ ЛЕЧЕНИИ БРОНХИАЛЬНОЙ АСТМЫ У ДЕТЕЙ

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Аннотация:

Цель исследования: оценить клиническую эффективность применения витамина D в комплексном лечении бронхиальной астмы у детей.

Материалы и методы: в исследование были включены 60 детей с бронхиальной астмой. Из них 13 (21,6%) имели тяжёлую персистирующую форму астмы (I группа), 33 (55%) — среднетяжёлую форму (II группа), 14 (23%) детей наблюдались с лёгкой персистирующей формой (III группа). Одним из критериев участия в исследовании было отсутствие состояний, требующих интенсивной терапии. Контрольную группу составили 50 детей со среднетяжёлым острым обструктивным бронхитом без аллергических заболеваний в анамнезе. Для всех участников исследования было получено информированное согласие родителей. Для оценки уровня витамина D использовался метаболит 25(OH)D в крови детей.

Результаты и обсуждение: концентрация витамина D (25(OH)D) в сыворотке крови оценивалась до и после лечения методом иммуноферментного анализа. Согласно рекомендациям Института медицины США, уровень 25(OH)D ниже 20 нг/мл свидетельствует о дефиците, а 21–30 нг/мл — о недостаточности.

Выводы: сочетание базисной терапии и витамина D продемонстрировало эффективность, снижая риск обострений астмы. Включение витамина D в комплексное лечение оказывает положительное влияние на течение заболевания и его динамику, что способствует совершенствованию мер лечения и профилактики.

Ключевые слова: витамин D, лечение, бронхиальная астма, дети.

INTRODUCTION

Among the known risk factors for the development of bronchial asthma in children, such as a family history of allergies, manifestations of atopy, eosinophilia, leading to frequent episodes

of bronchial obstruction, the role of vitamin D (25(OH)D) and the significance of its deficiency in the predisposition to frequent respiratory diseases are currently being actively studied. In recent years, the interest of a number of researchers has increased in the possible role of vitamin D and disturbances in its metabolism in the pathogenesis of pulmonary diseases [6, 7]. The studies revealed a statistically significant correlation between vitamin D deficiency and the prevalence of a number of chronic diseases, including bronchopulmonary pathologies. It is important to note that rickets is 2.5 times more common in children with chronic bronchitis. In general, vitamin D stimulates specific immune defence mechanisms, including phagocytosis, production of superoxide radicals, activity of natural killer cells, and suppresses the antigen-specific immune response [11, 12]. Global statistics show that today there is a continuing trend towards an increase in the incidence of bronchial asthma among the population of most countries, including Uzbekistan.

Various groups of medications are used to treat children with bronchial asthma (BA) during periods of exacerbation and remission. The most effective in the treatment of allergic diseases are systemic or topical glucocorticosteroids.

The aim of the study is to evaluate the clinical effectiveness of vitamin D in the complex treatment of bronchial asthma in children.

MATERIALS AND METHODS

The study included 60 children with bronchial asthma. Of these, 13 (21.6%) had persistent severe bronchial asthma (Group I), 33 (55%) had moderate asthma (Group II), and 14 (23%) had persistent mild asthma (Group III).

One of the inclusion criteria for the study was the absence of conditions requiring intensive care. The control group consisted of 50 children with moderate acute obstructive bronchitis who had no history of allergies at the time of examination and medical history collection. Informed consent was obtained from parents in all groups. Children with bronchial asthma and acute obstructive bronchitis ranged in age from 5 to 17 years. To assess vitamin D status, serum levels of the metabolite 25(OH)D were determined.

Serum vitamin D (25(OH)D) levels were analysed before and after treatment using an enzyme-linked immunosorbent assay. Vitamin D levels were assessed according to the Institute of Medicine guidelines. Vitamin D deficiency is defined as a serum 25(OH)D level below 20 ng/ml, vitamin D insufficiency is diagnosed at 25(OH)D levels between 21–30 ng/ml, and 25(OH)D concentrations between 31–85 ng/ml are considered within the normal range.

The diagnosis of asthma was established using the classification adopted by the National Program “Bronchial Asthma in Children: Treatment Strategy and Prevention” in Russia in 1997, which was supplemented in 2014 by the GINA program. The diagnosis was based on complaints, anamnesis data, and the results of general clinical and functional examinations. The data were processed using the Fisher–Student t-test using personal computers and an application package.

RESULTS

A clinical efficacy study showed that before treatment, children with severe persistent asthma had a mean 25(OH)D level of 9.8±1.4 ng/ml. In children with moderate persistent asthma, the mean 25(OH)D level was 12.6±1.2 ng/ml, and in children with mild persistent asthma, the mean 25(OH)D level was 19.2±1.5 ng/ml. In children from the control group, the average 25(OH)D level in the blood serum was 21.6±1.2 ng/ml. When comparing the 25(OH)D level in children of groups I and II, a reliable difference was found ($p<0.05$), between groups II and III ($p<0.05$), when analysing the data of group IV ($p<0.01$). Children of all three groups were

prescribed vitamin D (Akvadetrim) in combination with basic therapy in a dosage depending on the vitamin D content in the blood serum.

For serum vitamin D levels of 20–30 ng/ml, the therapeutic dose was 2,000 IU daily for one month; for levels of 10–20 ng/ml, 3,000 IU daily for one month; and for levels less than 10 ng/ml, 4,000 IU daily for one month. After completing the treatment course, patients were switched to prophylactic doses depending on their age: 1,000 IU daily for children 1–12 months old; 1,500 IU daily for children 1–18 years old. In the control group, vitamin D was not prescribed. In addition to vitamin D, children with bronchial asthma received treatment in accordance with standards of medical care for patients with bronchial asthma. Specifically, children in Group I received basic treatment in the form of a combination of inhaled glucocorticosteroids (IGC) (fluticasone) in high doses and inhaled long-acting β2-adrenergic agonists (salmeterol); children in Group II received a combination of IGC in medium doses and long-acting β2-adrenergic agonists; children in Group III received low-dose IGC; and children in the control group were treated in accordance with standards of medical care for patients with acute obstructive bronchitis. Children with bronchial asthma who were in remission from the disease were prescribed monotherapy with vitamin D (Akvadetrim).

Changes in vitamin D levels in patients with asthma in groups I, II, and III following the treatment showed a significant increase compared to group IV ($p < 0.01$) (Figure).

The results of the study revealed a significant link between vitamin D levels and the course of asthma (Table 1).

In patients with bronchial asthma, combined treatment resulted in shorter relief of attacks and a significant reduction in the duration of dry and wet cough compared to children in Group IV receiving traditional treatment ($p<0.01$). A reduction in the duration of dyspnoea ($p<0.01$), cyanosis of the nasolabial triangle ($p<0.01$), and oral wheezing ($p<0.05$) was observed. Combined therapy resulted in a decrease in lethargy ($p<0.01$) and a normalisation of appetite ($p<0.01$). On percussion, the boxed tone of the percussion sound was detected in patients of groups I, II, and III receiving complex therapy for a significantly fewer number of days ($p<0.05$) than in the control group.

On auscultation, against the background of harsh breathing, wet and dry wheezing were heard in patients with asthma receiving complex therapy for a significantly fewer number of days compared to group IV ($p<0.01$). The length of hospital stay for patients in groups I, II, and III who received complex treatment was reduced ($p<0.01$). Radiographic studies of patients in the control group showed that after basic therapy, improvement in radiographic changes in the lungs was observed in 30 (60.0%) patients, while this figure for children in groups I, II, and III was 48 (80.0%).

Table 1. Dynamics of clinical indicators in study groups before and after complex therapy with vitamin D

Indicator	Group I (n=13)		Group II (n=33)		Group III (n=14)		Control group (n=50)	
	Before	After	Before	After	Before	After	Before	After
Number of exacerbations per year	18±0.3	11±0.5	14±0.1	10±0.5	11±0.2	5±0.4	10±0.3	9±0.2

Number of exacerbations requiring hospitalisation per year	13±0.1	8±0.2	1±0.4	7±0.2	6±0.1	6±0.1	4±0.2	3±0.1
Number of nocturnal attacks per month	9±0.3	6±0.2	5±0.2	4±0.3	3±0.4	1±0.2	2±0.2	1±0.3
Duration of exacerbation, days	12±0.5	7±0.1	10±0.4	10±0.4	10±0.4	4±0.4	8±0.3	7±0.5
Duration of hospital stay, days	14±0.2	9±0.3	11±0.4	7±0.1	8±0.3	6±0.4	7±0.4	6±0.2

Five children in Group I, 12 in Group II, and six in Group III switched to lower doses of inhaled glucocorticosteroids used as basic therapy for bronchial asthma.

DISCUSSION

Along with the alleviation of the underlying disease, an improvement in the general condition of the patients was also noted, manifested by increased physical and mental activity, reduced fatigue and weakness, fewer episodes of headache and dizziness, and improved appetite and sleep. The results of the study confirm a significant link between serum 25(OH)D status and the clinical course of bronchial asthma in children: lower baseline 25(OH)D levels were observed in patients with more severe persistent forms, and supplementation with vitamin D in addition to standard basic therapy was accompanied by faster symptom relief, shorter exacerbations, fewer hospitalisations, and improved radiographic dynamics compared with the control group.

CONCLUSION

1. The combined use of basic therapy and vitamin D demonstrated treatment effectiveness, reducing the risk of asthma exacerbations.

2. The combined use of vitamin D in combination therapy has a positive effect on the clinical course and dynamics of the disease, allowing for improved treatment and preventative measures and the prevention of adverse outcomes.

3. The obtained data indicate sufficient absorption of vitamin D (“Akvadetrim”), which leads to the normalisation of the content of its active metabolites in the blood of children, which, in turn, is accompanied by a decrease in the number of attacks of bronchial obstruction.

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