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ТИББИЁТДА ЯНГИ КУН НОВЫЙ ДЕНЬ В МЕДИЦИНЕ NEW DAY IN MEDICINE

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SPECTRUM OF SENSITIZATION IN CHILDREN WITH BRONCHIAL ASTHMA AND CONSEQUENCES OF PERINATAL CENTRAL NERVOUS SYSTEM DAMAGE

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✓ Resume

The aim of the study was to evaluate the features of sensitization in children with bronchial asthma in children who have suffered perinatal pathology of the central nervous system. Material and methods of the study: a comprehensive examination of 221 children suffering from bronchial asthma was conducted. The average age of the examined children was 11.4 ± 2.9 years. Results of the study: an in-depth allergen-specific analysis of children with bronchial asthma was carried out in two observation groups: the main group (114 children with bronchial asthma with concomitant neurological symptoms) and the comparison group (107 neurologically healthy children with a similar disease). A reliable difference in the level of total IgE was found in children of the main group and the comparison group, on average 1.3 times higher in children with bronchial asthma against the background of remote consequences of perinatal damage to the central nervous system.

Key words: bronchial asthma, consequences, perinatal damage, central nervous system, atopy, immunoglobulin E.

СПЕКТР СЕНСИБИЛИЗАЦИИ У ДЕТЕЙ С БРОНХИАЛЬНОЙ АСТМОЙ И ПОСЛЕДСТВИЯМИ ПЕРИНАТАЛЬНОГО ПОРАЖЕНИЯ ЦЕНТРАЛЬНОЙ НЕРВНОЙ СИСТЕМЫ

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✓ Резюме

Цель исследования – оценить особенности сенсibilизации у детей с бронхиальной астмой у детей, перенесших перинатальную патологию центральной нервной системы. Материал и методы исследования: проведено комплексное обследование 221 ребенка, страдающего бронхиальной астмой. Средний возраст обследованных детей составил $11,4 \pm 2,9$ лет. Результаты исследования: проведен углубленный аллерген-специфический анализ детей с БА в двух группах наблюдения: в основной (114 детей с бронхиальной астмой с сопутствующей неврологической симптоматикой) и сравнения (107 неврологически здоровых ребенка с аналогичным заболеванием). У детей основной группы и группы сравнения была обнаружена достоверная разница по уровню общего IgE, в среднем в 1,3 раз выше у детей с БА на фоне отдаленных последствий перинатального поражения центральной нервной системы.

Ключевые слова: бронхиальная астма, последствия, перинатальное поражение, центральная нервная система, атопия, иммуноглобулин E.

БРОНХИАЛ АСТМА ВА МАРКАЗИЙ НЕРВ ТИЗИМИНИНГ ПЕРИНАТАЛ ШИКАСТЛАНИШИ ОҚИБАТЛАРИ БЎЛГАН БОЛАЛАРДА СЕНСИБИЛИЗАЦИЯ СПЕКТРИ

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✓ Резюме

Тадқиқотнинг мақсади марказий асаб тизимининг перинатал патологиясини бошдан кечирган бронхиал астма билан оғриган болалардаги сенсибилизация хусусиятларини баҳолашдан иборат. Тадқиқот материали ва усуллари: бронхиал астма билан оғриган 221 нафар бола комплекс текширувдан ўтказилди. Текширилган болаларнинг ўртача ёши $11,4 \pm 2,9$ ёшни ташкил этди. Тадқиқот натижалари: БА билан оғриган болаларнинг икки қузатув гуруҳида чуқурлаштирилган аллерген-специфик таҳлил ўтказилди: асосий гуруҳ (114 та ҳамроҳ неврологик симптоматикаси билан бронхиал астма билан оғриган болалар) ва таққослаш гуруҳи (107 та аналогик касаллиги бор, аммо неврологик жиҳатдан соғлом болалар). Асосий ва таққослаш гуруҳидаги болаларда умумий IgE даражаси бўйича сезиларли фарқ аниқланди. Марказий асаб тизимининг перинатал шикастланишининг узок муддатли оқибатлари фонида БА билан оғриган болаларда бу кўрсаткич ўртача 1,3 баравар юқори эканлиги аниқланди.

Калит сўзлар: бронхиал астма, оқибатлар, перинатал шикастланиш, марказий асаб тизими, атопия, иммуноглобулин E.

Relevance

In childhood, the atopic (IgE-mediated) type of response is of the greatest importance, which determines the development of allergic diseases [5,6]. One of the reasons for insufficient control of atopic bronchial asthma (BA) may be specific endogenous regulation of intercellular interactions carried out by cytokines, which affects the formation of an allergen-specific immune response. In this regard, the issues of selecting adequate therapy for severe forms of BA remain relevant, since the lack of clinical studies conducted on the pediatric population often leads to an inadequate choice of drugs, their dosages and duration of treatment. In addition, widespread steroid phobia and low adherence to therapy among patients further complicate the task [1,4,7,9].

A number of studies have been conducted that show that sensitization of the child can occur in utero by the entry of allergens in the mother's IgG, which carry food allergens, through the skin of the fetus, the respiratory tract, and through the entry of amniotic fluid into the gastrointestinal tract of the fetus during swallowing movements, as well as the ability of the fetus to synthesize its own IgE already in the early stages of pregnancy. Chronic intrauterine hypoxia of the fetus can contribute to increased entry of allergens into the fetus's body, as well as switch the Th 1 to Th 2 immune response through increased synthesis of the corresponding cytokines [2,3,8].

It is recommended to establish the diagnosis of bronchial asthma not only on the basis of complaints and anamnestic data of the patient, as well as the results of clinical examination and functional examination methods, but also with the help of a specific allergological examination and exclusion of other diseases. In this regard, in children with bronchial asthma in research groups, special attention is paid to studying the level of total immunoglobulin E in the blood and the spectrum of sensitization to antigens of plant, animal and chemical origin.

The aim of the study is to evaluate the characteristics of sensitization in children with bronchial asthma in children who have suffered perinatal pathology of the central nervous system.

Material and methods

A comprehensive examination of 221 children suffering from bronchial asthma was conducted. The average age of the examined children was 11.4 ± 2.9 years. The severity of atopic processes was assessed by determining total IgE (IU/ml) in vitro using the IMMULITE 2000 Total automatic analyzer IgE.

Result and discussions

In the process of assessing the severity of atopic processes by determining the level of total IgE in children in the study groups, it was found that in both groups, during the period of remission of the underlying disease, the values of total IgE fluctuated significantly. Thus, in children of the comparison group, the level of total IgE varied from 28 to 491 IU/ml, averaging 164.42 ± 38.68 IU/ml. In patients of the main group, the level of total IgE changed from 9 to 654 IU/ml, averaging 219.0 ± 40.12 IU/ml. At the same time, a reliable difference in the level of total IgE was found in children of the main group and the comparison group, on average 1.3 times higher in children with BA against the background of remote consequences of perinatal damage (PD) of the central nervous system (CNS) ($p > 0.05$) (Table 1).

Table 1

Total IgE levels in children in study groups

Indicator	Comparison group		Main group		R
	n	%	n	%	
Total IgE level (IU/ml)	107	164.42 ± 38.68	114	219.0 ± 40.12	0.05

A more detailed analysis allowed us to distribute the children of the main group and the comparison group according to the level of total IgE into 3 subgroups: 1st - the IgE level corresponding to the age norm; 2nd - exceeding the age norm by 2 times; 3rd - exceeding the age norm by 3 or more times (Table 2).

Table 2

Characteristics of the examined children according to IgE levels

Total IgE level	Main group		Comparison group		R
	n	%	n	%	
Corresponds to the age norm	28	24.6	23	21.5	0.737
Exceeds the age norm by 2 times	36	31.6	56	52.3	0.245
Exceeds the age norm by 3 or more times	50	43.8	28	26.2	0.150
Total	114	100	107	100	

As the results of the study showed, during the period of BA remission, the majority of patients in both the main ($n=86$) and comparison groups ($n=84$) had a level of total IgE significantly exceeding the age norm (75.4% and 78.5%, respectively). At the same time, in the main group, patients with a level of total IgE 3 or more times exceeding the age norm significantly predominated (43.8%), and in the comparison group - 2 times (52.3%).

To identify causative allergens, individual allergen-specific IgE (kU/l) were determined, in connection with which sensitization to household, pollen and food allergens was studied in children of the main and comparison groups. Analyzing the state of sensitization of patients with bronchial asthma in the period of disease remission to household allergens, it was found that most children in the main group ($n=94$; 82.4%) and in the comparison group ($n=78$; 72.9%) had sensitization to house dust of varying degrees of severity (Table 3). Moreover, in the main group of those examined, 52 (45.5%) children with bronchial asthma had a moderate and high degree of sensitization (33.3% and 12.3%, respectively), while in the comparison group, children with a low degree of sensitization to house dust mites predominated ($n=55$; 51.4%).

Also, a higher level of sensitization in the study groups was noted for dog hair. 69 (60.5%) children in the main group and 49 (45.8%) children in the comparison group were sensitized to dog hair. The number of children in the main group with bronchial asthma who were sensitized to cat hair was 2.87 times higher than in the comparison group (53.6% and 18.7%, respectively), while 16.7% of patients in the main group had a high degree of sensitization. Sensitization to pillow feathers in children of the main group was 17.5%, and in the comparison group - 28.9%. Sensitization to domestic cockroach allergens occurred in 35.1% of observations in patients of the main group and only in 13.1% of cases in the comparison group.

When analyzing the spectrum of pollen sensitization, it was found that patients in the main group more often than children in the comparison group had sensitization to tree pollen (46.5% and 42.1%,

respectively) (Table 4). Sensitization to meadow and weed pollen in children in the comparison group was slightly higher (39.3% and 41.1%) than in patients in the main group (37.8% and 40.4%, respectively). At the same time, sensitization to tree and weed pollen in this observation group was of moderate severity (28.9% and 15.8%, respectively).

Table 3

Evaluation of the severity of sensitization to household allergens in children with asthma in study groups

Allergens	Low sensitization				Moderate sensitization				High sensitization				Lack of sensitization			
	Main group		Group comparisons		Main group		Comparison group		Main group		Comparison group		Main group		Comparison group	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
House dust	42	36.8	55	51.4	38	33.3*	18	16.8	14	12.3**	5	4.7	20	17.6	29	27.1
Dog hair	52	45.6	44	41.1	17	14.9**	5	4.7	0	-	0	-	45	39.5*	58	54.2
Cat fur	36	31.6*	19	17.8	6	5.3	0	-	19	16.7**	1	0.9	53	46.4**	87	81.3
Pillow feathers	11	9.6*	21	19.6	9	7.9	10	9.3	0	-	0	-	94	82.5	76	71.1

Note: * - reliability of data in relation to the comparison group (* - $p \leq 0.05$; ** - $p \leq 0.005$)

Table 4

The degree of expression of pollen sensitization in children with bronchial asthma in study groups

Allergens	Low sensitization				Moderate sensitization				High sensitization				Lack of sensitization			
	Main group		Group comparisons		Main group		Comparison group		Main group		Comparison group		Main group		Comparison group	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Tree pollen	17	14.9**	35	32.7	33	28.9**	6	5.6	3	2.6	4	3.7	61	53.5	62	57.9
Pollen of meadow grasses	16	14.1**	37	34.6	17	14.9**	5	4.7	10	8.8*	0	-	71	62.2	65	60.7
Weed pollen	25	21.9*	39	36.4	18	15.8**	0	-	3	2.6	5	4.7	68	59.6	63	58.9

Note: * - reliability of data in relation to the comparison group (* - $p \leq 0.05$; ** - $p \leq 0.005$)

When studying the spectrum of food sensitization, it was found that among the children of the main group, patients with sensitization to food allergens of plant and animal origin prevailed - to cow's milk protein (60.5%), chicken eggs (59.6%), citrus fruits and fruits (53.5%) and fish (36.0%), they were less likely to have sensitization to wheat flour (35.1%) (Table 5). Both in the main and in the comparison groups, a low degree of sensitization to food allergens of plant origin prevailed. However, in the main group, the number of children with sensitization to wheat flour ($n = 40$) was significantly higher than in the comparison group ($n = 14$), which amounted to 35.1% and 13.1%, respectively ($p \leq 0.005$). The incidence of food sensitization to cow's milk protein and citrus fruits in the study groups was reliably high and amounted to 60.5% and 53.5% of children in the main group, respectively, as well as 45.8% and 40.2% of observations in the comparison group.

More pronounced changes in food sensitization were revealed in relation to chicken eggs. Thus, according to the obtained data, 68 (59.6%) children of the main group had sensitization to chicken eggs, of which 35.9% of children had low sensitization, 10.5% - moderate and 13.2% - high. In the comparison group, the number of children sensitized to chicken eggs was significantly lower - 40 (37.4%) children, of which 31 (29.0%) had low, 5 (4.7%) children - moderate and 4 (3.7%) - high sensitization. In both study groups, sensitization to fish of low severity prevailed: in the main group - 24.6%; in the comparison group - 22.4% of children.

Table 5

The degree of expression of food sensitization in children of the main group and the comparison group

Chicken egg	Fish	Citrus	Cow's milk	Allergens		comparison group											
						Low sensitization		Moderate sensitization		High sensitization		Lack of sensitization					
						Main group		Group comparisons		Main group		Comparison group		Main group		Comparison group	
n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
41	28	41	43			19	16.7*	9	8.4	7	6.1	8	7.5	45	39.5*	58	54.2
35.9	24.6	36.0	37.7			17	14.9	12	11.2	3	2.6	0	-	53	46.5*	64	59.8
31	24	31	32														
29.0	22.4	29.0	29.9			3	2.6*	10	9.3	10	8.8	9	8.4	73	64.0	64	59.8
12																	
10.5*																	
5																	
4.7																	
15																	
13.2**																	
4																	
3.7																	
46																	
40.4 **																	
67																	
62.6																	

Note: * - reliability of data in relation to the comparison group (* - $p \leq 0.05$; ** - $p \leq 0.005$)

The analysis of trigger factors in the period of bronchial asthma remission revealed a reliable difference in the observation groups. The prevalence of household (house dust 82.4%, dog hair 60.5% and cat hair 53.6%, cockroaches 35.1%), food (chicken egg 59.6%, cow's milk 60.5%, citrus fruits 53.5%) and pollen (weed pollen 40.4%, meadow grass pollen 37.8%, tree pollen 46.5%) sensitization was established in patients in the main group (Table 6). In the comparison group, the prevalence of pollen (weed pollen 41.1%, meadow grass pollen 39.3%, tree pollen 42.1%), food (chicken egg 37.4%,

cow's milk 45.8%, fish 41.1%, citrus fruits 40.2%) and household (house dust mites 72.9%, dog hair 45.8%) sensitization was established. It should be noted that the most frequent triggers in patients of the main group, along with stress and physical activity, were food allergens (49.1%), then pollen allergens (37.7%), and in third place - household allergens (26.3%), while in the comparison group bronchospasm in patients often developed after contact with pollen (54.2%), food (35.5%), and then with household allergens (21.5%).

Table 6

Analysis of the presence of sensitization to the studied allergens in children in the study groups

Allergens	Presence of sensitization				Lack of sensitization			
	Main group		Comparison group		Main group		Comparison group	
	n	%	n	%	n	%	n	%
Household allergens								
House dust mites	94	82.4	78	72.9	20	17.6*	29	27.1
Cat fur	61	53.6	20	18.7	53	46.4**	87	81.3
Pillow feathers	20	17.5	31	28.9	94	82.5*	76	71.1
Cockroach	40	35.1	14	13.1	74	64.9**	93	86.9
Pollen allergens								
Tree pollen	53	46.5	45	42.1	61	53.5	62	57.9
Pollen of meadow grasses	43	37.8	42	39.3	71	62.2	65	60.7
Weed pollen	46	40.4	44	41.1	68	59.6	63	58.9
Food allergens								
Cow's milk	69	60.5	49	45.8	45	39.5*	58	54.2
Citrus	61	53.5	43	40.2	53	46.5*	64	59.8
Fish	41	36.0	44	41.1	73	64.0	64	59.8
Chicken egg	68	59.6	40	37.4	46	40.4**	67	62.6

Note: * - reliability of data in relation to the comparison group for the parameter absence of sensitization (* - $p \leq 0.05$; ** - $p \leq 0.005$)

The presence of allergies, observed significantly more often in children with BA against the background of remote consequences of PCNSD in comparison with the comparison group, is explained by the formation of neurosomatic pathology in them. The observed hereditary predisposition only facilitates the development of sensitization in children with BA against the background of neurological symptoms.

Conclusions

Thus, it can be concluded that the conducted analysis of the sensitization spectrum and the degree of its severity in patients with bronchial asthma in the remission period showed a reliable increase in the level of total IgE by 1.3 times in patients of the main group than in the comparison group. Most patients of both the main (n=86) and comparison groups (n=84) had a level of total IgE significantly exceeding the age norm (75.4% and 78.5%, respectively). At the same time, in the main group, patients with a level of total IgE 3 or more times exceeding the age norm significantly prevailed (43.8%), and in the comparison group - 2 times (52.3%).

The most frequent triggers in patients of the main group, along with stress and physical activity, were food allergens (49.1%), then pollen allergens (37.7%), and in third place - household allergens (26.3%), while in the comparison group bronchospasm in patients often developed after contact with pollen (54.2%), food (35.5%), and then with household allergens (21.5%). At the same time, children of the main group were characterized by the presence of a high degree of sensitization to cat hair, which occurred in this group of patients 2.8 times more often than in the comparison group. Patients of the main group were significantly more likely than children of the comparison group to have sensitization to tree pollen, while sensitization to tree and weed pollen in children of the main group was higher, since it was of moderate severity. When studying the spectrum of food sensitization, it was found that among

the children in the main group, patients with sensitization to chicken eggs (moderate and high severity), cow's milk and citrus fruits (low and moderate severity) predominated.

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