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Markers of Liver Damage in Respiratory Allergies in Children

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Abstract Bronchial asthma and respiratory allergies in children are an urgent problem for many countries and its medical and social significance is currently increasing. The article is devoted to the study of the optimal method for diagnosing liver pathologies in respiratory allergies in children, which is very important when organizing a specialized pediatric and allergological service. The proposed method allows early diagnosis and prevention of liver damage in children with respiratory allergies.

Keywords Children, Respiratory allergy, Diagnosis, Immunity, Liver damage

1. Introduction

Globally, it is generally recognized that in most industrialized countries, the three main forms of allergic diseases – asthma, rhinitis and atopic eczema – individually or in various combinations affect up to 20% of the population [3]. Allergic diseases are among the most common in children, and in recent years there has been a significant increase in the frequency and more severe course of allergic diseases, in connection with which they are considered in modern society as a major medical and social problem. The frequency of allergic diseases, according to different authors, varies widely, depending on the diagnostic criteria used and methods of epidemiological research [5]. Thus, the prevalence of bronchial asthma (BA), according to domestic and foreign authors, ranges from 0.2 to 8.1%. According to the generalized data of the ISAAC study (International Study of Asthma and Allergies in Childhood - International Study of Asthma and Allergies in children), the frequency of asthma symptoms ranges from 1.0 to 30.8% [1,4].

Allergic rhinitis and pollinosis in different regions account for 0.2-20%, atopic dermatitis and eczema - 1.6-4.2% [2].

Allergic rhinitis (AR) is one of the most common human diseases affecting from 10 to 50% of the general population. In Russia, from 12 to 24% of the population suffers from allergic rhinitis and more than 600 million people in the world. The widespread, widespread increase in morbidity, the negative impact on the quality of life of patients and the cost of therapy define AR as a medical, social and economic problem [7].

Pollinosis is a frequently registered allergopathology in Uzbekistan (185.95 per 100,000 population), characterized by a 10.4% increase in morbidity over the period 2007-2014. Pollinosis is a risk factor for the formation of bronchial asthma (BA) and precedes its development in 32-64% of cases [6].

Allergic diseases, in particular asthma, also remain an urgent problem in our region. In Uzbekistan, the prevalence of asthma per 1000 population is 4.6 and, according to this indicator, the Republic ranks 19th globally. Among allergic diseases, BA is one of the most common. According to epidemiology data, over the past 10 years, 4-10% (about 300 million people) of the world's population have suffered from this disease. BA is widespread in all countries of the world to varying degrees, due to factors such as climate, geographical location, flora, degree of air pollution, urbanization and the level of culture of the population [8].

The aim of the study development of a method for diagnosing liver damage in respiratory allergies in children and a program for its prevention.

2. Materials and Methods of Research

The study was conducted on the basis of the Department of Allergology and Gastroenterology of the Bukhara Regional Multidisciplinary Medical Center in the periods 2019-2023. Of all the examined (125) aged 2 to 17 years, 45 patients suffering from bronchial asthma (BA), (group 1), 45 patients suffering from respiratory allergosis (RA), (group 2) were selected. The control group consisted of 35 healthy children of the appropriate age (group 3).

All children (125) selected for examination underwent general and biochemical blood tests (glucose, ALT, AST, total bilirubin, alkaline phosphatase (alkaline phosphatase), gammaglutamintranspeptidase (GGT), determination of immunoglobulin E, IL-4, IL-17A, MCP-1, INF-a and

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anti-INF-blood test, blood test for allergenic panels and ultrasound of the liver.

3. Results and Discussion

The study of hepatic transaminases in respiratory allergies allowed to establish an increase in ALT and AST in group 2 patients to 44.42±5.9 u/l and 56.1±11.9 u/L, against the control -25.97±4.15 u/l and 22.69±3.0 u/l, respectively ($p<0.005$), Table 1.

Table 1. Blood counts in children with respiratory allergies, (M ±m)

Indicators	Control group, n=35	1-group, n=45	2-group, n=45
Total bilirubin mmol/l	9,11±0,32	13,5±4,5	9,67±1,0
ALT units/l	25,97±4,15	29,8±8,5	44,42±5,9*
AST units/l	22,69±3,0	25,15±8,12	56,1±11,9*^
Glucose, mmol/l	3,74±0,27	3,37±0,78	3,93±0,74
ALP units/l	181,23±22,85	408,4±58,2*	631,7±72,7*^
GGT units/l	12,54±3,75	62,5±6,0*	71,29±8,32*

Note: * The values are valid relative to the control group
(*P<0,05 - **0,01-***0,001)
^-the values are reliable with respect to the 1-group (^ P<0,05 -^^0,01-^^^0,001)

At the same time, a statistically significant increase in the level of AST in group 2 patients was also found to be 2.23 times higher than in group 1 patients. Consequently, in RA, there is an increase in ALT by 1.5 times, AST by 2.23 times, than in BA. This indicates the involvement of the liver in the pathological process. The mechanism of allergy development depends on the state of liver function, which can be disrupted as a result of taking medications in the treatment of the underlying disease, as well as allergens contribute to liver damage.

To exclude liver pathology, we performed a blood test to determine the level of alkaline phosphatase.

It is known that alkaline phosphatase is a protein enzyme involved in the metabolic reactions of phosphoric acid. It is the alkaline phosphatase that helps to detach phosphate molecules from proteins, nucleotides and other molecules. The increased activity of alkaline phosphatase manifests itself in pH from 8.6 to 10 (alkaline medium). The highest content of the substance is found in young cells of bone and liver tissue, as well as in the human intestinal mucosa and placenta.

In children, alkaline phosphatase is more active than in adults. Because they are characterized by active bone growth, which contains the enzyme.

In our studies, an increase in the level of alkaline phosphatase was found to be 2.25 times in patients with BA and 3.5 times in RA, the latter higher than in children of the control group and with BA, $p<0.05$.

Consequently, the results obtained show the development of systemic inflammation in allergies involving the liver. Therefore, the clinical picture of respiratory allergies very often shows symptoms of liver damage, which served as the basis for this scientific study.

Thus, regardless of the clinical form of manifestation, respiratory allergy occurs against the background of systemic inflammation with liver damage in children. All this shows the importance of controlling the nutrition of children with respiratory allergies.

For a more detailed confirmation of the above conclusion about liver pathology in RA, a deeper thorough study of the anamnesis of the child and mother during pregnancy, the anamnesis of the life of children, taking into account the vaccination status according to the calendar of the Republic of Uzbekistan, was carried out. At the same time, an analysis was performed to determine the level of gammaglutamintranspeptidase in the blood of patients selected for the study, Fig.1.

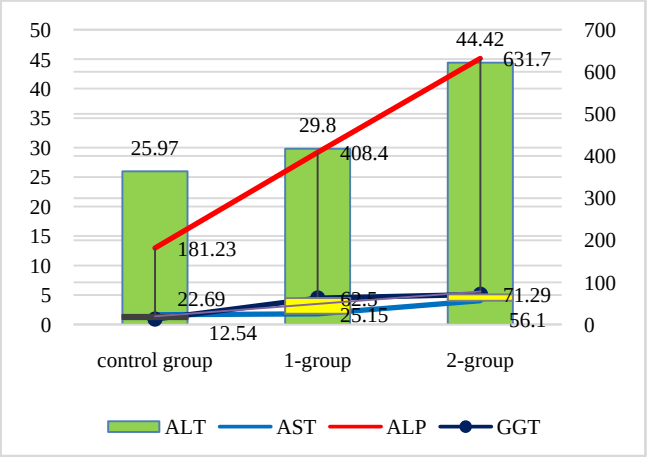

Figure 1. Markers of liver damage in respiratory allergies in children

The results of the analysis showed an increase in the level of GGT in patients of group 1 by 5.0 times, in patients of group 2 by 5.73 times compared to the control-12.54± 3.75 u/l, $p<0.05$. This indicates liver damage in patients with respiratory allergies, regardless of the clinical form of manifestation, and shows the importance of taking into account the condition of the liver when drawing up a treatment and rehabilitation plan for patients of this category. And also, it is important to carefully study the anamnesis of life and illness of children with respiratory allergies in order to make a correct diagnosis and take into account the causal factors of allergy development.

Table 2. Immunity indicators in children with respiratory allergies, (M ±m)

Indicators	Control group, n=35	1-group, n=45	2-group, n=45
IL-4, pg/ml	7,52±0,66	16,1±1,67*	10,97±0,98*^
IL-17A, pg/ml	213,75±54,3	129,8±22,4	282,5±52,7^
MCP-1 pg/ml	352,96±78,0	657,3±63,9*	323,8±86,7^
INF-a	22,0±8,1	8,98±1,8	12,7±3,3
anti INFa	35,98±7,16	25,47±9,98	43,79±18,2

Note: * The values are valid relative to the control group
(*P<0,05 - **0,01-***0,001)
^-the values are reliable with respect to the 1-group (^ P<0,05 -^^0,01-^^^0,001)

To assess the activity of the immune system, including in the development of allergies and chronic conditions, it is important to determine IL - 4 in the blood.

The study found a 2.2-fold increase in IL-4 levels in AD in children, and 1.5-fold in RA, $p<0.05$, Table 2.

It should be noted that there was a significant increase of IL-4 by 1.5 times in patients with BA than in patients with RA, $p<0.05$.

Figure 1 clearly shows the gradations of IL-4 in the examined children, which allows the development of the limit of its informative concentrations in respiratory allergies in children.

Thus, it was established that the peak concentration of IL-4 >2.8 pg/ml predicts the risk of transformation of RA into BA in children.

In our studies, blood tests for the determination of IL-17A have established the dependence of its synthesis on the clinical form of respiratory allergy in children. Thus, in RA, the concentration of IL-17A was increased 2.2 times compared to these groups of children with asthma: 282.5±52.7 pg/ml and 129.8±22.4 pg/ml, respectively, Table 2.

Consequently, the established increase in IL-17A in RA in children indicates the activation of its synthesis by histamine. The latter is released by mast cells as a result of exposure to allergens into the lumen of the respiratory tract.

4. Conclusions

1. It was found that BA in children occurs against the background of anemia and relative lymphocytopenia, there is an increase in the level of alkaline phosphatase by 2.25 times, GGT by 5.0 times, IL-4 by 2.2 times, MCP-1 by 1.86 times than in respiratory allergoses (rhinitis, conjunctivitis, bronchitis).
2. RA is characterized by a course against the background of anemia and relative leukocytosis, an increase in ALT by 1.5 times, AST by 2.23 times, ALP by 3.5 times, GGT by 5.73 times, IL-4 by 1.5 times, IL-17A by 2.2 times, the degree of reactivity to allergens of house dust by 1.37 times ($P<0.001$), to a mixture of meadow grasses - 2.5 times ($P<0.05$), to a mixture of weeds - 2.88 times ($P<0.001$), to a mixture of food products - 1.42 times than in bronchial asthma.

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