

Indicators of Immune Status in Children with Respiratory Allergies Living in the Area of Environmental Distress

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Abstract – Respiratory diseases are an important problem in the structure of morbidity in children at an early age. Environmental factors, in particular air, soil and water pollution, are of great importance in the development of respiratory allergoses. Causes of respiratory allergies in children are very different and numerous. Environmental conditions play an important role in the occurrence of respiratory allergies. The spread of this pathology strictly depends on the environmental favourable conditions of the of the residence areas. Children from such areas are at risk groups. High frequency of respiratory infections in children is due to a variety of pneumotropic microflora, susceptibility of children to viral infections and weak immune system, peculiarities of maturation of the immune system of the child, immaturity of the thermoregulation system, as well as reduced resistance of the child's organism to changing climatic factors. Respiratory allergoses contribute to social maladjustment of the child due to the restriction of his communication with peers, potentially dangerous for the development of pedagogical problems (poor academic low grades,

lagging behind educational programs), worsens the psychological microclimate in the family. The importance of early diagnosis and timely immunocorrecting therapy of respiratory allergoses in children and the identification of persistent violations in the system of local and systemic immunity is high.

Key words – *immunity, children, respiratory allrgis, environmental distress*

I. INTRODUCTION

Scientific and technological progress and exploitation of nature have led to significant changes in the environment. Anthropogenic pollution of nature is particularly dangerous for the growing child's organism, which IS due to age-related characteristics are highly sensitive to them. Xenobiotics, which are released into the environment in large amounts, adversely affect the state of the child's organism. Chemical agents can change the cells of the organism that are

recognized by the immune system as "foreign bodies", which is the basis of cytotoxic and autoimmune reactions of the organism.

Over the past decade, there has been a clear trend towards an increase in the number of patients with respiratory allergies. According to the literature of recent years, there has been an increase in patients with more severe forms and course of allergic diseases [1–4], as well as an increase in the proportion of patients resistant to standard therapy [5–8], a change in the profile of clinical manifestations of allergy [9–11], hypodiagnosis of a number of nosologies [4]. The material costs associated with the provision of full care to patients also increase, etc. All this determines the urgency of the problem, which means deep study of immunological disorders in children with allergic diseases. Researchers' interest in this problem of children's allergology is reflected in the dynamic growth of publications [1, 4, 8]. Adverse environmental factors that have a negative impact on the health of the child population are important for respiratory allergoses. Research in the field of clinical allergology involves the necessary evaluation of laboratory data in children with allergoses, including the determination of hypersensitivity to specific allergens. On the basis of received data, children with respiratory allergoses will be evaluated as the state of the local and systemic immunity with their comparative characteristics and in the future will be offered effective methods of immunorehabilitation.

II. PURPOSE OF RESEARCH

The aim of the study was to establish on the basis of clinical and laboratory data the change in indicators of local and systemic immunity condition as a risk factor for respiratory allergoses in children living in the area of unfavourable environment.

III. CHARACTERISTICS OF CHILDREN AND RESEARCH METHODS

We had examined 84 children with respiratory allergies, who received in-patient treatment at the SBIH of the Ministry of health of North Ossetia – Alania. It was necessary to establish the clinical and diagnostic significance of a complex study of clinical, laboratory and immunological parameters in patients, as well as to conduct a study of local and systemic immunity in children suffering from respiratory allergies. Carrying out this work, General clinical methods of research were used, there was carried out work with medical documentation. A comprehensive study of immunological parameters had been conducted In examined children with respiratory allergoses: CD cell parameters by monoclonal antibodies of serum immunoglobulin by immunoenzyme analysis.

Statistical processing of the results was performed BY using the Statistica software package using student's t-test.

Anamnesis study revealed that in 62 % of cases, relatives of children suffered from allergic diseases, which indicates predisposition of children to respiratory allergoses in children from families with allergopathology.

Of all children examined, the main diagnosis of obstructive bronchitis was made in 65 % of cases, and the process of observation in 35 % of cases – bronchial asthma.

The examined children were diagnosed concomitant pathology: allergic rhinitis was diagnosed in 35 % of cases, atopic dermatitis in 10 %, allergic conjunctivitis in 1 %.

When examining children for the presence of parasitic invasion, positive results were noted in 61 % of cases. Of these cases, ascariasis was diagnosed in 19 %, toxascaris in 5 % and giardiasis in 74 %.

All children had an increase in the level of total Ig E, which indicates the presence of allergic inflammation in the examined patients. The average level of Ig E is 111.3 units +5,8.

In future, all children were divided into two groups depending on the nosology and area of residence. The group of children diagnosed with bronchial asthma included 30 children and the group of children with the diagnosis of obstructive bronchitis included 54 children who lived in the zone of ecological trouble.

A total of 84 children, including the younger group – 38, the older – 46.

The number of children with obstructive bronchitis was 54, of which the younger group – 33, the older – 21 children.

Children with a diagnosis of bronchial asthma were 30, of them the younger group of 5 children, the older is 25 children. All examined children lived in the zone of ecological trouble. 20 lived in a relatively favourable area.

To assess the immune status indicators, children of each nosological group were divided according to age. So children with bronchial asthma from 2 years to 6 years were 5 and it was younger age group, from 7 to 14 years – 25. Children diagnosed with obstructive bronchitis from 2 years to 6 years were 33 and from 7 years to 14 were 21. The above distribution by group was due to the stages of immune system formation in children and, therefore the differences in the indicators of the immune system state.

IV. RESULTS AND DISCUSSION

After evaluating the data obtained in the course of the work, the distribution on nosologies for statistic comparison and evidence did not matter. According to this, statistic data were made for children OF two age groups. Immunological parameters obtained in healthy children were taken from the data of previous studies by the Laboratory of pediatric pathology of IBMR VSC RAS. Thus, the comparative indicators for children suffering from respiratory allergies and healthy children of older and younger age categories are provided below.

After evaluating the immunoglobulin A, M and G values, there was revealed an increase in the level of IgA in the younger group, a decrease in the level of IgG in both younger and older children, as well as a decrease in IgM in the groups of sick children, more distinctly marked in the younger group. The comparative data are shown in table 1.

During the study the state of nonspecific resistance of the organism was investigated. In the study of the phagocytosis system, which included the determination of levels of indicators such as Phagocytic number, Phagocytic index and lysozyme activity. Assessing the results of this process, a decrease in the phagocytic index and lysozyme activity in patients of both age groups was revealed, while significant differences were noted in the group of older children. Phagocytosis activity rates were significantly increased in the younger group of sick children and decreased in the older group compared to the group of healthy children. Comparative data are given in table 2.

TABLE I. IMMUNOGLOBULIN LEVELS IN CHILDREN

Indicator	Junior group from 2 to 6 years n=38	Healthy children from 2 to 6 years n=10	Senior group from 7 to 14 years n=46	Healthy children from 7 to 14 years n=10
IgA, (g/l)	0,52±0,06 p<0,05	1,74±0,43	0,70±0,02 p<0,05	1,90±0,04
IgG, (g/l)	7,67±0,75 p<0,05	10,87±0,81	9,12±0,11 p<0,05	12,0±0,2
IgM, (g/l)	0,44±0,12 p<0,05	0,8±0,05	1,02±0,15 p<0,05	1,45±0,06

^a p-reliability of differences in indicators in relation to the group of healthy children

TABLE II. INDICATORS OF NONSPECIFIC FACTORS OF PROTECTION OF CHILDREN

Indicator	Junior group from 2 to 6 years n=38	Healthy children from 2 to 6 years n=10	Senior group from 7 to 14 years n=46	Healthy children from 7 to 14 years n=10
Activity of phagocytosis, (%)	52,17±2,83 p<0,05	48,6±2,1	52,6±2,17 p<0,05	69,12±2,8
Phagocytic index	4,48±0,07	4,67±0,4	5,24±0,36 p<0,05	6,48±0,07
Lysozyme activity (%)	26,08±0,38 p<0,05	30,88±1,1	30,88±1,12 p<0,05	36,95±0,13

^b p-reliability of differences in indicators in relation to the group of healthy children

TABLE III. INDICATORS OF LYMPHOCYTE SUBPOPULATIONS IN CHILDREN

Lymphocyte subpopulation	Junior group from 2 to 6 years n=38	Healthy children from 2 to 6 years n=10	Senior group from 7 to 14 years n=46	Healthy children from 7 to 14 years n=10
CD3 (%)	42,76±0,56 p<0,05	57,8±1,88	57,7±0,98 p<0,05	71,3±0,56
CD4 (%)	30,25±0,34 p<0,05	32,1±0,37	33,03±0,71	33,90±0,31
CD8 (%)	21,87±0,33 p<0,05	29,27±1,79	25,04±0,62 p<0,05	27,55±0,45
CD19 (%)	14,89±0,42	12,07±1,16	18,23±0,32	19,80±0,40

^c p-reliability of differences in indicators in relation to the group of healthy children

The results of the study of lymphocyte subpopulations showed a decrease in the percentage of CD3-, CD4-, CD8-lymphocytes in patients of both age groups. Younger children

have increased the content of CD19 lymphocytes and abnormal reduction in the group adult children, indicating that the inhibition of bactericidal functions of neutrophils. The results are presented in table 3.

The analysis of CIC data revealed an increase in the level of circulating immune complexes in comparison with the values in healthy children. A significant difference was noted in younger group. Results in table 4.

TABLE IV. INDICATORS OF CIRCULATING IMMUNE COMPLEXES IN CHILDREN

Indicator	Junior group from 2 to 6 years n=38	Healthy children from 2 to 6 years n=10	Senior group from 7 to 14 years n=46	Healthy children from 7 to 14 years n=10
CIC (units)	35,76±3,56 p<0,05	26,83±2,07	39,74±4,98	36,4±2,26

^d p-reliability of differences in indicators in relation to the group of healthy children

V. CONCLUSION

Revealed violations in indicators of phagocytosis activity, lysozyme, immunoglobulins, as well as lymphocyte subpopulations indicate the presence of pathological reactions in the processes of nonspecific protection of the organism, reducing local and systemic immunity, which also determines the severity of the course of the diseases and causes introduction of additional methods of this pathology correction in children.

The severity of children with respiratory allergies aggravated by environmental conditions and the presence of helminths and dysbiotic disorders in the intestine.

Due to the data presented above, the clinical and diagnostic significance of a comprehensive study of clinical, laboratory and immunological parameters has been established, which will allow further inclusion of immunocorrection and immunorehabilitation methods in the complex treatment.

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