Advances in Bioresearch
Adv. Biores., Vol 16 (2) March 2025: 102-106
©2025 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.16.2.102106

Advances in Bioresearch

ORIGINAL ARTICLE

Immune Status in Patient Children Chronic Bronchitis of Various Etiology

[1]Khalimbetov G.S., [2]Masharipova M.S., [3]Nurmukhamedova R. A.

[1-3]Center for the Development of Professional Qualifications of Medical Workers, Tashkent, Uzbekistan
Email: khalimbetovgulomjan@gmail.com; mamlakat7929@gmail.com and Rochat2713@gmail.com
[1]ORCID(s): 0009-0001-6894-1515; [2]ORCID(s): 0009-0003-6593-9617; [3]ORCID(s): 0009-0006-0147-1850

ABSTRACT

It is known that the cause of the development and transition of the inflammatory process into a chronic form in the bronchopulmonary system is various immune disorders that cause a decrease in the body's resistance to infection in Uzbekistan. Study indicators of immune status and factors of nonspecific resistance in children with chronic bronchitis of various etiologies. We examined 53 children with bronchopulmonary pathology aged 3-7 years (average age 4.9 years), who were in the pulmonology department of the Republican Scientific and Practical Center of Pediatrics of the Ministry of Health of the Republic of Uzbekistan. The results of studies of the state of systemic immunity in sick children showed that the depth of immunological disorders depends on the etiological factor that caused diseases of the bronchopulmonary system. All sick children had a reduced level of CD3+ cells, due to the helper-inducer subpopulation. The most profound changes were observed in the groups of children with CHOB and CHBPI. In children with AB, CHOB and CHBPI, the level of CD16+ lymphocytes were significantly increased, and in children with CHBAC it was significantly reduced. In children with chronic bronchitis of humoral immunity was noted, which is expressed in increased expression of CD20+ receptors and low production of IgG and IgA. The highest levels of C-reactive protein were observed in the group of children with AB, CB and CHBPI. In children with CHBPI, the level of IgE was the highest, compared with data from other groups, which confirms that parasitic infestations have an impact on the course of diseases of the bronchopulmonary system.

Key words: *children, bronchitis, immune status, C-reactive protein, lactoferrin, immunoglobulin E.*

Received 04.02.2025 Revised 26.02.2025 Accepted 16.03.2025

How to cite this article:
Khalimbetov G.S., Masharipova M.S., Nurmukhamedova R. A. Immune Status in Patient Children Chronic Bronchitis of Various Etiology. Adv. Biores. Vol 16 [2] March 2025. 102-106

INTRODUCTION

It has been established that some clinical forms of bronchopulmonary pathology affect the infant mortality rate, while others, starting in early childhood, take a chronic course, leading to a limitation of working capability and disability [3].

At present, there is practically no doubt that the increased frequency of inflammatory diseases and the presence of chronic inflammatory processes of the respiratory tract accompany disorders of immunological reactivity [6].

The inferiority of the immune response contributes to the penetration of infections into the epithelial cells of the respiratory tract and the development of dystrophic changes in them. The outcome of this process is a violation of the integrity of the respiratory epithelium, disorganization of immunological response, activation of saprophytic microflora, development of new infection areas [5].

It is known that the cause of the development and transition of the inflammatory process into a chronic form in the bronchopulmonary system is various immune disorders that cause a decrease in the body's resistance to infection [3,9].

The purpose of this study was to study indicators of immune status and factors of nonspecific resistance in children with chronic bronchitis of various etiologies.

MATERIAL AND METHODS

We examined 53 children with bronchopulmonary pathology aged 3-7 years (average age 4.9 years), who were in the pulmonology department of the Republican Scientific and Practical Center of Pediatrics of the Ministry of Health of the Republic of Uzbekistan. Diagnoses were verified based on complaints, objective examination, laboratory and x-ray studies. The control group consisted of 16 children of the same age who did not have respiratory pathologies.

When analyzing bronchitis, it was found that 13 children (24.5±5.9%) were diagnosed with acute bronchitis (AB), 16 children (30.2±6.3%) with chronic obstructive bronchitis (CHOB), 15 children (28.3±6.2%) with chronic bronchitis with parasitic invasion (CHBPI), and 9 children (17.0±5.2%) had an asmoid component (CHBAC) against the background of chronic bronchitis. From the anamnesis it was revealed that bacterial infection was detected in 24.5±5.9% (n=13), viral in 32.1±6.4% (n=17), fungal (candidiasis) in 11.3±4.0% (n=6), combined bacterial-viral-parasitic infection in 32.1±6.4% (n=17) of children.

A number of concomitant diseases were identified in patients: anemia of I-II degree in 62.3±6.7% (n=33) of cases, retardation in physical development in 24.5±5.9% (n=13), damage to the central nervous system in 5.7±3.2% (n=3), and colon dysbiosis in 54.7±6.8% (n=29) of cases.

Analysis of parasitic infestations showed that in children with the studied pathologies, Lamblia intestinalis was identified in 5 children (33.3±12.2%), Blastocystic hominis in 1 child (6.7±6.4%), Enterobios vermicularis in 3 children (20.0±10.3%), Ascaris lumbricoides in 6 children (40.0±12.6%). The assessment of immune status parameters was carried out by studying the content of CD3+, CD4+, CD8+, CD20+, CD16+, marking the population of natural killer cells, granulocytes, and macrophages.

Serum IgA, IgM and IgG of children of the main and control groups were determined by the method of radial immunodiffusion in a gel.

In addition, we studied the content of lactoferrin (a set of reagents Lactoferrin-strip JSC "Vector-Best"), IgE (test system from BioKhimMak) in the blood serum of sick and healthy children using enzyme-linked immunosorbent assay (ELISA), C-reactive protein - CRP (test system from Olvex Diagnosticum) using the latex agglutination reaction method.

Statistical processing of data was carried out using the Statistica application package; the significance of differences was assessed using the Student's test.

RESULTS AND DISCUSSION

The results of immunological studies showed (Table 1) that all examined children had a reduced level of T-lymphocytes (CD3+), mainly due to cells belonging to the helper-inducer subpopulation (CD4+). But the most profound changes were observed in the groups of sick children with CHOB and CHBPI. As a result of suppression of helper activity, a decrease in the immunoregulatory index was observed in all groups of sick children, with a minimum value in the group with CHOB.

Table 1: Indicators of the subpopulation composition of lymphocytes in children with chronic bronchitis of various etiologies, %

Indicators	Control	Bronchitis			
		AB	CHOB	CHBPI	CHBAC
CD3+	54,8±1,2	47,2±1,1*	46,8± 1,1*	45,4±1,0*	44,7±1,2*
CD4+	32,3±0,9	26,8±0,9*	26,3±0,9*	25,3±0,7*	25,8±1,0*
CD8+	22,4±0,6	21,6±0,7	23,8±0,8*	18,6±0,6	18,9±0,9*
CD16+	14,7±0,5	18,3±0,6*	18,1±0,6*	19,5±0,7*	12,5±0,5
CD25+	17,3±0,5	12,8±0,9*	13,8±1,0*	13,7±0,8*	12,4±0,9*
CD95+	27,6±0,8	32,4±0,9*	32,9±0,7*	34,8±1,0*	33,9±0,8*

Note: * is a sign of reliability in relation to control.

Killer cells (CD16+) perform rapid cytolysis of virus-infected host cells during primary contact. They are important factors of antiviral protection, especially at the early stages of immune processes. Their quantitative study showed that in children with AB, CHOB and CHBPI the level of CD16+ lymphocytes is significantly increased ($P<0.05$), while in children with CHBAC the level of CD16+ cells is significantly decreased ($P<0.05$). Reliably low expression of CD16+ antigens on lymphocytes in children with CHBAC compared to the control indicates weak resistance of the body (the mechanisms of NK cell activation are affected).

In CHOB, the functional activity of the T-system sharply decreases, which is manifested by a decrease in the density of receptors for IL-2. As can be seen from the data in table. 1, the level of CD25+ cells were reduced in all groups of sick children compared to the control group ($P <0.05 – P <0.01$).

It is known that binding of soluble or expressed on the surface of activated lymphocytes Fas-L to the Fas receptor causes apoptosis of cells expressing this receptor [6]. Therefore, it can be assumed that

activation of the Fas/Fas-L system during combined infections may be the cause of damage to mononuclear cells, although the location of this process is not completely clear.
The results of our studies showed that the level of CD95+ cells in all sick children was significantly higher than control values (P <0.001).
The B-immune system is represented by the quantitative content of B-lymphocytes (CD20+) and the level of serum immunoglobulins of classes A, G, M (IgA, IgG, IgM).
It has been established that CD20+ lymphocytes are directly involved in the body's specific immune defense reactions [6]. Comparative characteristics of the content of CD20+ cells in the blood showed (Table 2) that in CHOB the level of these cells significantly increases (P<0.01) with a maximum value in children with CHBAC (P<0.01).

Table 2: Indicators of humoral immunity in children with chronic bronchitis of various etiologies

Indicators	Control	B	HOB	HBPI	HBAC
CD20+, %	18,5± 0,4	2,6± 1,0*	5,4± 0,9*	6,4± 0,5*	7,3± 0,6*
IgG, мг/%	911,2±37	20,4±25,9*	67,3±12,5*	12,5±12,5*	97,2±12,5*
IgA, мг/%	165,0±7,2	30,7±6,4*	12,7±4,8*	20,4±4,8*	18,3±4,8*
IgM, мг/%	85,5±4,9	4,3±6,3	7,2±3,2	2,8±3,2	6,8±3,2

Note: * is a sign of reliability in relation to control.
The results obtained suggest that bronchitis is characterized by activation of the B-cell component of the immune system against the background of an imbalance in the population of T-lymphocytes.
A study of the concentration of immunoglobulins showed that in the blood serum of sick children the level of IgG and IgA was significantly reduced compared to the control group (P <0.05). Consequently, in children with diseases of the bronchopulmonary system, there is an imbalance in the functioning of the humoral immunity, which is expressed in increased expression of CD20+ receptors and low production of IgG and IgA.
It has been revealed that pathological disorders in the immune system contribute to the protracted course of the disease, the development of complications, and a decrease in the body's resistance. In this regard, the problem of correcting immunological disorders is becoming increasingly important.
Analysis of the results of immunological studies showed that the level of one of the acute phase proteins, lactoferrin, was ambiguously and significantly increased in sick children compared to the value in the control group (table 3).

Table 3: Comparative indicators of nonspecific protective factors in children with bronchopulmonary pathology

Groups of examined children	Lactoferrin, ng/ml	CRP, mg/l	IgE, IU/ml
Control group, n=16	561,8±58,6	3,8±0,2	30,8±1,0
AB, n=13	1027,6±62,7*	9,3±0,5	45,6±1,1*
CHOB, n=16	439,7±56,9*	6,7±0,3*	48,5±1,0*
CHBPI, n=15	873,5±53,2*	5,8±0,3*	87,8±2,3*
CHBAC, n=9	385,4±46,5*	4,6±0,2*	77,3±2,5*

Note: * is a sign of reliability in relation to control.
It is known that lactoferrin is one of the components of the body's immune system, takes part in the system of nonspecific humoral immunity, regulates the functions of immunocompetent cells and is a protein of the acute phase of inflammation [1].
Analysis of the study results showed that the level of lactoferrin in AB was significantly increased by 1.8 times compared to the data in the control group (P<0.001), and in the presence of CHBPI, an increase in the level of lactoferrin was observed by 1.6 times (P<0.001). In children with CHOB, the content of lactoferrin is reduced by 1.3 times (P<0.05), and the lowest value was recorded in children with CHOBA - 1.5 times (P<0.001).
It has been established that CRB binds a wide range of ligands - components of microorganisms, particles of damaged tissue, toxins, preventing their spread [8]. The products of this interaction activate the complement system along the classical pathway, activating the processes of phagocytosis and the removal of toxic products.
CRP interacts with T lymphocytes, phagocytes and platelets, regulating their functions during inflammation [4]. An increase in the content of this acute phase protein is an early sign of an infectious process.

In our studies, the highest levels of CRP were observed in the groups of children with AB, CHOB and CHBPI (P <0.01), which indicates an increased level of endogenous infection.
It has been revealed that IgE is an indicator of immediate allergic reactions. Elevated IgE levels are more often detected in children with allergies and hypersensitivity to a small number of allergens than in children whose "target organs" are not involved in the allergic process [1,11].
As can be seen from our results, in children with CHBPI the level of IgE was the highest, compared with data from children in other groups (P <0.01). Research results confirm that parasitic infestations affect the clinical course of diseases of the bronchopulmonary system.
Parasites can disrupt the functioning of the human immune system by using host cytokines as growth factors. This effect of parasitic invasion on the immune system is a phylogenetically formed complex set of mechanisms that ensure long-term survival of the parasite in the host body [2,4].
All sick children had a reduced level of CD3+ cells, due to the helper-inducer subpopulation. The most profound changes were observed in the groups of children with CHOB and CHBPI. In children with AB, CHOB and CHBPI, the level of CD16+ lymphocytes were significantly increased, and in children with CHBAC it was significantly reduced. In children with chronic bronchitis of various etiologies, an imbalance in the activity of humoral immunity was noted, which is expressed in increased expression of CD20+ receptors and low production of IgG and IgA.
Lactoferrin is significantly increased in AB and CHBPI, and in children with CHOB and CB against the background of the asmoid component, the concentration of lactoferrin is significantly reduced in relation to the control. The highest levels of C-reactive protein were observed in the group of children with AB, CB and CHBPI. In children with CHBPI, the level of IgE was the highest, compared with data from other groups, which confirms that parasitic infestations have an impact on the course of diseases of the bronchopulmonary system.

ACKNOWLEDGEMENT
I thank the following centers: the children's diagnostic center, the department of pulmonology of the Republican Specialized Scientific Practice Medical Center of Pediatrics of the Ministry of Health of the Republic of Uzbekistan, the immunological laboratories at the Institute of Human Immunology and Genomics of the Republic of Uzbekistan for their assistance in all aspects of our research and for their assistance. In addition, Musakhodzhaeva D.A, head of the immunological laboratory at the Institute of Human Immunology and Genomics of the Republic of Uzbekistan for their experience in writing the manuscript.

CONFLICT OF INTEREST
The study was conducted in the absence of any commercial or financial relationships, and the authors have no conflicts of interest.

REFERENCES
1. Song DJ, Song WJ, Kwon JW, Kim GW, Kim MA, Kim MY, Kim MH, Kim SH, Kim SH, Kim SH, Kim ST, Kim SH, Kim JK, Kim JH, Kim HJ, Kim HB, Park KH, Yoon JK, Lee BJ, Lee SE, Lee YM, Lee YJ, Lim KH, Jeon YH, Jo EJ, Jee YK, Jin HJ, Choi SH, Hur GY, Cho SH, Kim SH, Lim DH. KAAACI (2018). Evidence-Based Clinical Practice Guidelines for Chronic Cough in Adults and Children in Korea. Allergy Asthma Immunol Res. Nov;10(6):591-613.
2. Mejza F, Gnatiuc L, Buist AS, Vollmer WM, Lamprecht B, Obaseki DO, Nastalek P, Nizankowska-Mogilnicka E, Burney PGJ., BOLD collaborators. (2017). BOLD study collaborators. Prevalence and burden of chronic bronchitis symptoms: results from the BOLD study. Eur Respir J. 50(5): 908
3. Reddel HK, Gerhardsson de Verdier M, Agustí A, Anderson G, Beasley R, Bel EH, Janson C, Make B, Martin RJ, Pavord I, Price D, Keen C, Gardev A, Rennard S, Sveréus A, Bansal AT, Brannman L, Karlsson N, Nuevo J, Nyberg F, Young SS, Vestbo J. (2019). Prospective observational study in patients with obstructive lung disease: NOVELTY design. ERJ Open Res. Feb;5(1): https://doi.org/10.1183/23120541.00036-2018
4. William Macnee MB, ChB, MD, Jørgen Vestbo DMSc, Alvar Agusti MD, PhD. (2016). Pathogenesis and Natural History. Murray and Nadel's Textbook of Respiratory Medicine Book • Sixth Edition . Volume 1, 2016, Pages 751- 766.e7 https://doi.org/10.1016/B978-1-4557-3383-5.00043-9.
5. Richard L. Kradin M.D., D.T.M. & H. (2017). Diseases of the Airways. Understanding Pulmonary Pathology. Applying Pathological Findings in Therapeutic Decision Making, Pages 59-94. https://doi.org/10.1016/B978-0- 12-801304-5.00005-8.
6. Rakesh Ghosh,Irva Hertz-Picciotto. (2014). The Epidemiology of Air Pollution and Childhood Lung Diseases. The Lung (Second Edition).Development, Aging and the Environment 2014, Pages 423-437. https://doi.org/ 10.1016/B978-0-12-799941-8.00024-9
7. Masharipova M.S., Nuralieva Kh. O., Fayzullaeva N.Ya. (2019). Study and evaluation of the immune status in children with chronic bronchitis. MEDICUS International Medical Scientific Journal №3 (27), Volgograd 109-

119
8. Poole P, Sathananthan K, Fortescue R. (2019). Mucolytic agents versus placebo for chronic bronchitis or chronic obstructive pulmonary disease. Cochrane Database Syst. Rev ; 5(5): CD001287.
9. Jingwen Zhang, Danielle F Wurzel, Jennifer L Perret, Caroline J Lodge 1, E Haydn Walters, Shyamali C Dharmage. (2024). Chronic Bronchitis in Children and Adults: Definitions, Pathophysiology, Prevalence, Risk Factors, and Consequences. 20;13(8):2413. doi: 10.3390/jcm13082413
10. Ruffles T.J.C., Marchant J.M., Masters I.B., Yerkovich S.T., Wurzel D.F., Gibson P.G., Busch G., Baines K.J., Simpson J.L., Smith-Vaughan H.C., et al. (2021). Outcomes of protracted bacterial bronchitis in children: A 5-year prospective cohort study. Respirology. 26:241–248. doi: 10.1111/resp.13950.
11. Peleneva E.S., Potapova I.A. (2018). Characteristics and functions of class E immunoglobulins. // Medical sciences. International Student Research Bulletin № 4, C.286-288.