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RECURRENT BRONCHITIS IN CHILDREN: CLINICAL FEATURES AND IMMUNOLOGICAL PREDISPOSITION

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Summary. The aim of the study was to identify the features of the clinical course and immune status in children with recurrent bronchitis. The studies were conducted in 117 children aged 4 to 6 years who were undergoing inpatient treatment at the Department of Pulmonology of the Republican Specialized Scientific and Practical Medical Center of Pediatrics with a diagnosis of recurrent bronchitis during the period of exacerbation of the disease. Among those hospitalized: boys – 65 (55.5%) and girls – 52 (44.4%). The main clinical features and immunological parameters were studied in all children.

Key words: recurrent bronchitis, children, clinic, immunology.

Relevance. Frequent respiratory tract diseases in children remain one of the pressing problems in pediatrics, among which recurrent bronchitis has gained significant importance at the present stage [1,2,8]. Despite significant successes in the treatment and prevention of inflammatory and allergic respiratory diseases in children, issues of bronchopulmonary pathology require further study both in terms of improving diagnosis and treatment, as well as in-depth theoretical research.

Recurrent bronchitis (RB) is diagnosed in 23% of children under 3 years old, 7.1% of preschoolers, and 2.5% of school-aged children. The widespread use of antibiotics by general practitioners, often without specific indications, leads to an exacerbation of the immunological imbalance in the child's body, an increase in allergic reactions, and the development of intestinal dysbiosis, which contributes to the formation of recurrent processes in the bronchopulmonary system. Despite the significant number of works dedicated to recurrent bronchitis (RB), there are currently no unified criteria for diagnosing this disease in children, a clear understanding of the disease's pathogenesis, or criteria for assessing the effectiveness of various therapeutic and preventive complexes, which creates difficulties in both therapy and rehabilitation [4,5,7].

Thus, the role in the development of bronchial obstruction and the trend of increasing acute respiratory diseases (ARD) in children lead to a high risk of recurrent obstructive bronchitis and the possibility of developing bronchial asthma. The variety of immune disorders in this pathology determines the relevance of studying risk factors and mechanisms of bronchial obstruction syndrome formation in children with respiratory tract infections [6,8,9].

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Objective of the work: identify the features of clinical course and immune status in children with recurrent bronchitis.

Materials and methods. The studies were conducted on 117 children aged 4 to 6 years who were hospitalized in the pulmonology department of the Republican Specialized Scientific and Practical Medical Center of Pediatrics with a diagnosis of recurrent bronchitis during the exacerbation period. Exclusion criteria included the presence of severe somatic diseases, refusal of parents to participate in the study, and socially disadvantaged groups. The diagnosis of recurrent bronchitis was established according to approved criteria—recurrent episodes of acute bronchitis 2–3 times or more within a year. General clinical and biochemical studies were conducted; chest X-rays, electrocardiography (ECG), and ultrasound diagnostics (USD) of the abdominal organs were performed as needed.

Results of the study and their discussion. The conducted study revealed that among patients with recurrent bronchitis, children (64.9%) living in urban areas predominated. Among the hospitalized: boys – 65 (55.5%) and girls – 52 (44.4%). The number of frequently ill children was 82.0%, of which 71.8% attended preschool institutions (PSI), and 28.2% were unorganized. Among the life history features of the children we observed – 14.5% were born prematurely, 1.7% had aspiration pneumonia, anemia was found in 59.8% of the observed children, atopic dermatitis in 25.6%, manifestations of food allergies in 12.8%, and they also noted early mixed, and then artificial feeding, vitamin D deficiency in 11.9%. In the first year of life, 62.3% of the observed were treated for acute respiratory viral infections, about 5.1% of children had community-acquired pneumonia. The majority (53.8%) of the children were "passive smokers." The parents of most children with recurrent bronchitis had foci of chronic infection (rhinitis, pharyngitis, tonsillitis, bronchitis). The analysis of the frequency of disease exacerbation showed that in children with acute respiratory diseases, exacerbations occurred 4 to 6 times a year (80.9% of cases).

In the clinical picture of recurrent bronchitis in all children (100%), signs of intoxication were observed: subfebrile temperature in 38 (32.5%) children, fever (above 38.1 °C) in 14.5%, weakness, adynamia in 90 (76.9%), decreased appetite in 86 (73.5%), emotional lability in 57.3% of children. Nasal breathing difficulties were noted in 72.6% of children, mucous nasal discharge in 47.9%. In 100% of children, the dominant symptom was cough, of which 45.3% were non-productive, and the rest were productive. Signs of expiratory breathing difficulties, noisy or wheezing in nature, were observed in 25.6% of children, involvement of accessory muscles in the act of breathing in 9.4%, and nasal flaring in 23.9%. Additionally, pallor of the skin was found in 62.4% of children, dry skin in 19.6%, and perioral cyanosis in 39.3% of children.

The clinical picture in 95.7% of patients with recurrent bronchitis was characterized by the enlargement of lymph nodes in various groups, hypertrophy of the tonsils in 79.5%. On percussion over the lungs, a boxy tone of the percussion sound was determined in 25.6%. Auscultation revealed scattered dry rales in 45.3% of children, moist, varied in caliber in 44.5%, 8.5% had muffled heart sounds, and 11.9% had a systolic murmur at the apex of the heart. Hepatomegaly was observed in 52.9% of patients, and hepatosplenomegaly in 32.7%.

When examining peripheral blood, significant shifts were not characteristic: in 25.6% of cases, the erythrocyte sedimentation rate (ESR) was moderately accelerated, slight leukocytosis was observed in 17.1%, anemia in 32.5%, lymphocytosis in 100%, and lymphomonocytosis in 62.4%.

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Radiologically, bilateral enhancement of the lung pattern was determined in 100%, expansion of the lung roots in 100%, increased transparency of the lung fields in 32.5%, and thickening of the pattern in the root sections in 25.6%. In 10.3% of children, signs of incomplete blockade of the right bundle branch of His were detected on electrocardiography (ECG).

Gastrointestinal disorders manifested as changes in appetite: an increase in 15.0% of children with recurrent bronchitis or a decrease in 51.7% of children with RB. Thirst was increased in 47% (29) of patients with RB, decreased in 51.7% (31) with RB.

Changes in the urinary system in the form of nocturnal enuresis were found in patients with RB in 23.3% (14) of cases.

Clinical manifestations of allergic reactions of various etiologies were observed 9 times more often in children with recurrent bronchitis (3.3%).

Frequent recurrences of the inflammatory process in a child's body, in turn, reduce immunological reactivity, which increases their susceptibility to infectious diseases.

For example, an elevated level of cytokines may indicate active inflammation, which may require the use of anti-inflammatory drugs. Conversely, a decreased level of cytokines may indicate an immune deficiency that requires enhanced immune support. The indicators of humoral immunity in patients are presented in Table 1.

Table 1

Status of humoral immunity in children with RB, (M±m)

Indicators	Practically healthy children (n=20) (I)	RB n=90 (II)	P
IgG, mg/%	938,3±17,6	756,4±7,9	<0,001
IgA, mg/%	107,9±3,6	86,5±2,1	<0,001
IgM, mg/%	90,7±2,8	126,5±3,55	<0,001
IgE, ME/mg	52,6±0,9	222,5±4,42	<0,001

Note: P – reliability of differences in indicators between groups I and II of patients.

In children with recurrent bronchitis, the concentration of IgA decreased to 86.4±1.9 mg/% and IgG to 756.4±7.9 mg/%, while the content of IgM increased to 126.5±3.55 mg/% (normal values being 107.9±3.6 mg/%; 938.3±17.6 mg/% and 90.7±2.8 mg/% respectively).

The level of IgE was elevated in patients with RB - 4.2 times above the norm. The results of the conducted studies once again indicate the predominant influence of Th2 type over Th1 type in patients with RB, which is evidenced by high levels of total IgE.

The results of the cytokine status study are presented in Table 2. Among the pro-inflammatory cytokines, IL-1β and IL-6 are considered classical. Analyzing the presented data, it is worth noting that in RB, the level of IL-1β increased by 3.2 times.

The level of IL-6 increased 4.4 times, averaging 20.2±0.6 pg/ml ($p<0.001$). As shown in the table, we found that children with RB had a significant increase in the level of the anti-inflammatory

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cytokine IL-4.

The level of IL-4 was 11.3 ± 0.7 ng/ml, which was significantly ($p<0.01$) elevated 2.4 times compared to the norm. IL-8 is produced in response to stimulation by bacterial endotoxins and certain cytokines, particularly tumor necrosis factor (TNF).

The production of IL-8 by inflammatory cells, macrophages, and lung epithelial cells contributes to the activation and attraction of neutrophils to lung tissues, which can enhance the inflammatory process and damage in the lungs. When analyzing the IL-8 levels in children with OOB, it was significantly ($p<0.01$) elevated to 36.9±1.17 ng/ml compared to healthy children. In patients with RB and BOS, the IL-8 production level was significantly ($p<0.01$) increased to 45.2±2.5 ng/ml, which was 2.4 times higher compared to the norm.

Thus, in children with RB, the average serum IFNγ level was 19.1±2.4 pg/ml, which is 1.7 times lower than the values of practically healthy children (45.2±2.5, $p<0.01$), indicating a significant decrease in the IFNγ level.

Table 2

Cytokine content in children with recurrent bronchitis, (M±m)

Indicators	Practically healthy children (n=20) (I)	RB n=90 (II)	P
TNFα (pg/ml)	28,4±1,5	62,6±1,73	<0,001
IL-1β (pg/ml)	27,8±1,4	66,1±6,4	<0,001
IL – 4 (pg/ml)	4,6±0,6	11,3±0,7	<0,01
IL – 6 (pg/ml)	6,7±0,9	20,2±0,9	<0,01
IFNγ (pg/ml)	34,3±2,7	19,1±0,85	<0,05
IL – 8 (pg/ml)	19,2±2,4	45,2±2,5	<0,01

Note: P – reliability of differences in indicators between groups I and II of patients.

Thus, TNF and IL-8 play an important role in the network of pro-inflammatory cytokines and have a significant impact on the development and maintenance of the inflammatory process in the body, including the pulmonary system. The analysis of cytokine levels in serum plays an important role in the diagnosis and monitoring of diseases, as well as in determining the state of the patient's immune function. This helps doctors make informed treatment decisions and ensure more effective disease management.

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