

LABORATORY INVESTIGATION OF COMMUNITY-ACCOMPANIED PNEUMONIA IN CHILDREN

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Annotation: Respiratory diseases occupy one of the leading places in the structure of morbidity and mortality in children. Pneumonia plays an important role among them. This is due to both the high frequency of respiratory tract lesions in children and the severity of the prognosis of many late diagnosed and untreated pneumonia [1,2]. In Uzbekistan, the incidence of pneumonia in children is in the range of 6.3-11.9% [1]. One of the main reasons for the increase in the number of pneumonia is a high level of diagnostic errors and late diagnosis. The proportion of pneumonia, in which the clinical picture does not correspond to the X-ray data, has significantly increased, and the number of low-symptom forms of the disease has increased [1,3]. There are also difficulties in the etiological diagnosis of pneumonia, since over time the list of pathogens is expanded and modified. More recently, community-acquired pneumonia was associated mainly with *Streptococcus pneumoniae*.

Keywords: Pneumonia, mycoplasma, segmental, lymphocyte, phagocytosis, immunoglobulins.

ЛАБОРАТОРНОЕ ИССЛЕДОВАНИЕ ВНЕБОЛЬНИЧНОЙ ПНЕВМОНИИ У ДЕТЕЙ

Аннотация. Болезни органов дыхания занимают одно из ведущих мест в структуре заболеваемости и смертности детей. Важную роль среди них играют пневмонии. Это связано как с высокой частотой поражений респираторного тракта у детей, так и с серьезностью прогноза многих поздно диагностированных и нелеченных пневмоний [1,2]. В Узбекистане заболеваемость детей пневмонией находится в пределах 6,3-11,9% [1]. Одной из основных причин увеличения числа пневмоний, является высокий уровень диагностических ошибок и поздняя диагностика. Значительно увеличился удельный вес пневмоний, при которых клиническая картина не соответствует рентгенологическим данным, увеличилось число малосимптомных форм заболевания [1,3]. Также имеются сложности в этиологической диагностике пневмоний, так как со временем происходит расширение и модификация перечня возбудителей. Еще относительно недавно внебольничная пневмония связывалась главным образом со *Streptococcus pneumoniae*.

Ключевые слова: Пневмония, микоплазма, сегментар, лимфоцит, фагоцитоз, иммуноглобулины.

INTRODUCTION

At present, the etiology of the disease has expanded significantly, and in addition to bacteria, it can also be represented by atypical pathogens (*Mycoplasma pneumoniae*, *Chlamydia pneumoniae*), fungi, and viruses (influenza, parainfluenza, metapneumoviruses, etc.), the role of the latter is especially large in children under 5 years [2-4]. All this leads to

untimely correction of treatment, aggravation of the patient's condition, prescription of additional drugs, which ultimately affects the prognosis of the disease. Thus, despite a fairly detailed study of the problem of childhood pneumonia, there is a need to clarify the modern clinical features of pneumonia, to study the significance of various pathogens, including pneumotropic viruses, in this disease.

MATERIALS AND METHODS

A comprehensive examination of 70 children with community-acquired pneumonia aged 1 to 15 years, who were treated in the pediatric department of the children's hospital of the Samara State Medical University, a multidisciplinary center, was carried out. Among the examined children there were 37 boys (52.9%) and 33 girls (47.1%). All patients were divided into 2 groups according to the morphological forms of pneumonia (patients with focal pneumonia and segmental pneumonia) and into 4 groups by age - young children (1-2 years old), preschoolers (3-6 years old), younger schoolchildren (7-10 years old) and older students (11-15 years old). All patients underwent the following examination: clinical blood count, general urinalysis, biochemical blood test with the determination of the level of C-reactive protein (CRP), chest x-ray, microscopic and bacteriological examination of sputum for flora and sensitivity to antibiotics. To detect respiratory viruses and *S. pneumoniae*, 40 patients underwent a study of tracheobronchial aspirates by real-time polymerase chain reaction (PCR) in order to detect ribonucleic acid (RNA) of respiratory syncytial virus, rhinovirus, metapneumovirus, parainfluenza virus 1, 2, 3, 4 types, deoxyribonucleic acid (DNA) adenovirus and pneumococcus.

RESULTS OF THE STUDY AND THEIR DISCUSSION.

Patients with focal pneumonia predominated among the examined - 47 children (68.57%), children with segmental pneumonia were 2 times less - 23 (31.93%). Most of the hospitalized patients were young children - 30 (42.8%), as well as preschoolers - 22 (31.4%) (Table 1). The mean age of the patients was 5.05 ± 3.93 years.

Age Group	Total		Foci of pneumonia		Segmental pneumonia	
	n	%	n	%	n	%
1-2 of the year	30	42,8	16	22,86	14	20
3-6 years	22	31,4	18	25,78	4	5,71
7-10 years	11	15,8	7	9,9	4	5,71
11-15 years	7	10	6	8,6	1	1,44
Total	70	100	47	67.14	23	32,86

Table 1. Distribution of children by age groups with focal and segmental pneumonia.

Children were admitted to the hospital on average 8.0 ± 4.7 days from the onset of the disease in case of focal pneumonia and 7.7 ± 4.6 days in case of segmental pneumonia. The right-sided lung lesion was most often noted - in 47 cases (57.23%), the left-sided lesion was almost 2 times less common - 23 cases (30.72%). A similar situation was observed in both groups. Pneumonia with a moderate course prevailed - 155 cases (93.37%). While severe pneumonia was noted only in 11 children (6.63%), and most of them were segmental - 81.8% ($p < 0.001$). Among hospitalized patients, respiratory failure of the 2nd degree was more common - in 81.93% (136), 1st degree - in 17.47% (29). There were no signs of it in 1 case (0.6%).

Index			Pneumonia			
			focal		Segmental	
			n	%	n	%
Leukocytes	Norm	4.0-10.0*10 ⁹ /l	11	23,4%)	7	41,55%
	moderate leukocytosis	10.0-15.0*10 ⁹ /l	25	53.19	9	39.13
	severe leukocytosis	15.1-20.0*10 ⁹ /l	9	19.16	5	10.63
	Severe leukocytosis	>20.0*10 ⁹ /l	2	4.25	2	8.69
	leukopenia	<4.0*10 ⁹ /l	0	0	0	0
Changes in leukocyte formula	Shift left		4	8.51	2	8,69
	neutrophilia		36	76.6	20	86.9
	lymphocytosis		7	14.9	1	4.41
Speed subsidence erythrocytes (ESR)	Norm	10 mm/c	10	21.26	14	60.9
	moderate acceleration	11-15 mm/c	10	21.3	3	13.04
	Pronounced acceleration	16-20 mm/c	2	4.25	1	4.35
	Pronounced acceleration	>20 mm/c	25	53.19	5	21.71
C-reactive protein	Negative		17	36.2	15	65.22
	Slight increase	(6mg/ml)	22	46.8	2	8.7
	moderate increase	(12mg/ml)	5	10.6	4	17.4
	Pronounced increase	(>24mg/ml)	3	6.4	2	8.68

Table 2. Changes in the clinical analysis of blood upon admission to the hospital.

Note: - differences are significant ($p < 0.05$). The average level of leukocytes at admission in the group of focal pneumonia was $9.04 \pm 3.9 \times 10^9/l$, segmental - $10.4 \pm 8.2 \times 10^9/l$. In the group of segmental pneumonias, the ESR value was higher than in focal pneumonias - 19.11 ± 17.36 mm/h versus 12.67 ± 13.1 mm/h, respectively ($p < 0.001$). After the complex treatment, control blood tests compared with blood tests at admission showed a significant decrease in the level of leukocytes from $9.49 \pm 5.7 \times 10^9/l$ to $7.65 \pm 2.1 \times 10^9/l$ ($p < 0.001$), and ESR from 15.05 ± 14.9 mm/h to 6.14 ± 5.2 mm/h ($p < 0.001$). All these patients also underwent bacteriological examination of sputum. Among 30 patients with isolated pneumococcal DNA, in half of 16 (53.3%) bacteriological examination of sputum gave a negative result, in 6 of them (20%) - only *Candida albicans* was isolated, in 4 (13.3%) - *Streptococcus viridans*, in 2 (6.7%) - *Pseudomonas aeruginosa*, in 2 (6.7%) - *Proteus mirabilis* and *Proteus vulgaris* in a non-diagnostic titer. In 10 patients in whom pneumococcus was not isolated by PCR, no growth of bacterial flora was detected during sputum culture. The failure of bacteriological examination of sputum can be explained by the fact that the majority of children (63.3%) received antibiotic therapy on an outpatient basis.

CONCLUSION

1. The most common clinical and morphological form of pneumonia in children at the present stage is focal right-sided pneumonia with a moderate course and localization in the middle lobe (4 and 5 segments of the lungs).

2. Segmental pneumonia is more characterized by a severe course with a long-lasting febrile body temperature, severe local symptoms and severe laboratory changes.

3. In the majority of patients (75%), pneumonia is of pneumococcal etiology. At the same time, the study of sputum by PCR for pneumococcus is more informative than sowing on the flora.

4. An important role in the development of pneumonia is played by respiratory viruses, which were isolated in 30% of patients, and in half of them - in combination with pneumococcus.

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