The importance of environmental factors in the development of pneumonia in children

I.A. Karimjanov[1*] and *U.R.* Faizieva[2]

[1]Tashkent medical academy, 2nd Shifokorlar street, 2, 100109, Tashkent, Uzbekistan
[2]Termez branch of the Tashkent Medical Academy, Islam Karimov street, 64, 132000, Surkhandarya region, Termez city, Uzbekistan

Abstract. This article is devoted to modern innovative diagnostics, immunological tests for community-acquired pneumonia in young children. The main points for improving the diagnosis and differential diagnosis of pneumonia in children is the timely detection of a sick child with complicated course of the disease. According to the authors of the article, the content of cytokines IL 1 and IL4, interferons in the blood serum of sick children with community-acquired pneumonia depends on the period of the disease and the severity of the pathological process.

1 Introduction

The problem of pneumonia in early childhood - still remains one of the most urgent problems of pediatrics. Pneumonia is one of the most common human infectious diseases. About 155 million cases of pneumonia in children are registered annually in the world. This pathology the whole is the single most important cause of infant mortality worldwide. Every year died from pneumonia about 1.4 million children under the age of five. In Europe, the incidence of CAR ranges from 2 to 15 cases per 1000 people per year. According to studies conducted in Russia under the control of chest x-ray , the incidence is 4-17 per 1000 children aged 1 month to 15 years. However, with broader criteria for diagnosing pneumonia, a wider study of morbidity is required [1-5].

Assessment of the role of adverse effects on the human body caused by environmental pollution is the most important task of medicine and is of great not only medical, but also social significance [1,5]. This task is importane for pediatrics, which deals with a growing organism that clearly responds to any environmental influences. It has been established that among the causes that negatively affect the health of the population, the environmental component exceeds 20%. Most researchers associate to a large extent with environmental pollution (atmospheric air, water, soil with chemical compounds). In Uzbekistan, studies have not been conducted to identify the prevalence of pneumonia and other bronchopulmonary pathologies, on risk factors and the impact of air pollution on an increase in the incidence of the disease among children living in rural and industrial regions [3,4-13]. The main sources of indoor air pollution, in addition to outdoor air and new

* Corresponding author: article_01@mail.ru

building materials, are tobacco smoking, the use of gas stoves for cooking and room heating, and gas water heaters. According to researchers, the sources of anthropogenic pollution of the atmosphere are transport, thermal power engineering, nuclear fuel cycle enterprises, industrial and agricultural enterprises. Despite the variety of substances emitted into the atmosphere by these sources, the most common emissions can be indicated: ash, dust, oxides of sulfur, nitrogen, hydrogen sulfide, hydrocarbons, ammonia, carbon oxides, etc. Italian scientists assessed the prevalence of asthma and associated risk factors in children and adolescents living in the industrial area of Termoli, Molise, South-Central Italy.

Literature data also showed that S. pneumoniae remains the main cause of acute pneumonia in children aged 3-15 years . Other types of streptococci, Haemophilus influenzae, mycoplasmas, etc. have a much smaller etiology . The relationship between various features of the dynamics of the inflammatory process in children with pneumonia of various etiologies was statistically confirmed .

In recent years, there has been an increase in the incidence of CAR in children, and this is mainly due to mortality from complications of the disease in children at an early age. In etiology, pneumococcal, hemophilic bacillus, staphylococcal infection and, in recent years, covid-19 infection are mainly observed [7, 8, 12]. Community-acquired pneumonia in young children, characterized by severe course and complications, reduces the quality of life of children. One of the urgent scientific problems is the formation of mechanisms of immune and molecular genetic development of community-acquired pneumonia in young children, the identification of prognostic risk factors of the disease, the improvement of diagnostic criteria through modern innovative clinical diagnostic research methods, the development of effective methods of treatment and rehabilitation of the disease. Pneumonia of viral-bacterial etiology also requires study [10, 13-24].

Goncharova T. according to scientific research, regardless of the severity of pneumonia in children, mitochondrial metabolic transport is reduced. In severe forms and complicated course of pneumonia , carnitine deficiency predominates, in most cases it is accompanied by perinatal lesions of the central nervous system [25].

Chigishtev A.N. on the basis of scientific research and investigation of the disease in the diseaseengeloy Formoy pneumoniae, the deficiency of the cell in the extravehicular mechanism, unbalance of the non-motor urgench cytokine. In the undeclared one of the main empiric factors determining current pneumonia, characterized by T-cell reactivity disturbance, cytokine status imbalance. [18, 20].

Cytokines associated with inflammatory processes in pneumonia may be important biomarkers reflecting the effectiveness of treatment and the general property of the patient.

In the study of the pathogenesis of infective diseases in children, there is atmospheric air and determination of quantities of cytokine and particular interest in pediatricians. They control a lot of biochemical and immuniumshe system service processes in the organism [6, 14, 8, 19, 26-32].

Scientists of Uzbekistan have proven that prolonged infections lead to secondary immunodeficiency, which causes the activation of pathogens and frequent relapses of the disease. It has been shown that disturbances in the production, secretion and uptake of pro-inflammatory cytokines lead to profound defects in protection against infection, the development of "immunological paralysis", and an increase in the direct damaging effect of microorganisms and their toxins on the lung tissue. It has been established that secondary immunodeficiency, leading to exacerbation, closes the circle of pathological reactions with the development of a chronic course of pneumonia. Despite the current changes in the diagnosis, treatment and rehabilitation of children with community-acquired pneumonia, there are many debatable issues on the use of new effective approaches in the diagnosis and treatment of these patients [26-28, 32].

Determination of changes in clinical and anamnestic, biochemical, immunological, molecular genetic analyses of community-acquired pneumonia in young children, reduction of pneumonia exacerbation by correcting methods of treatment of the disease taking into account the mechanisms of pathogenetic development of pneumonia, as well as reduction of morbidity and mortality among young children, can provide the younger generation with a full active life. From this point of view, unfavorable climatic conditions, existing risk factors, diagnosis and treatment of the disease, improvement of rehabilitation methods for the development of community-acquired pneumonia in young children from a practical point of view are considered the most important and urgent problems of modern pediatrics.

The aim of the study is to study the clinical and immunological mechanisms of CAP development in young children.

2 The materials and methods of the study

Examined 200 sick children with community-acquired pneumonia who were hospitalized in the department of pulmonology and pediatric resuscitation of the clinical base of the Termez branch of the Tashkent Medical Academy.

3 Research methods

The study used general clinical, biochemical, immunological (ELISA), functional - instrumental and statistical methods of examination.

In this research, prospective studies were conducted in 2019-2021 in the departments of pulmonology, the department of pathology of young children, pediatric resuscitation of the Surkhandarya Regional Children's Multidisciplinary Medical Center, the clinical base of the Termez branch of the Tashkent Medical Academy.

The collection of clinical material was carried out in the departments of pulmonology, resuscitation, pathology of infants of the Surkhandarya Regional Children's Multidisciplinary Medical Center, the clinical base of the Termez branch of the Tashkent Medical Academy (2019-2021). Special laboratory studies were carried out in 172 children, of which 72 patients were carried out in 50 children - immunological analysis - before and after therapy., the control group were practically healthy children, 100 healthy children were observed in the 2nd, 3rd, 4th family clinics in Termez.

The methods of clinical, laboratory and instrumental examination included the study of anamnesis, general clinical examination, percussion, auscultation, radiological, ultrasound examinations, complete blood count, urine, feces, biochemical studies. The diagnosis of CAP was established in accordance with the International Classification of Diseases, Injuries and Causes of Death 10 -th revision (ICD-10) and "Classification of clinical forms of bronchopulmonary diseases in children" classification in 1992. Methods of clinical examination: anamnesis, general clinical, special immunological laboratory examination, cytokines IL -1 and IL - 4 in blood serum, profile of interferons α, β, γ. The immunological study was carried out in the laboratory of the Scientific and Diagnostic Center of the Institute of Immunology and Human Genomics of the Academy of Sciences of the Republic of Uzbekistan. Serum levels of IL1β, IL4 interferon were studied: INF-α, INF β, INFγ. Used the method of enzyme immunoassay "ELISA-4 IL ". Immunological study of cytokines - concentrations of IL 1 β , IL 4 and INF - α, β, γ - were carried out by enzyme immunoassay (separate reagents, biopreparations of the Scientific Research Institute LLC "Cytokin"), DRG-Diagnostica (Germany). We used the method of enzyme immunoassay "ELISA-4IL" The principle of operation of the "Sandwich" package - a method based on a variant of enzyme- linked immunosorbent assay was used.

4 Results and discussion

Retrospective analysis patients with CAP conducted an analysis of statistical data to determine the prevalence of CAP in the region. Based on a retrospective study of 1000 case histories of children with CAP, an analysis of statistical data on the prevalence of CAP in the region was carried out. In the five-year dynamics, that is, in 2014-2018 (according to the data of the Surkhandarya Regional Statistical Center), as a result of studying the prevalence of CAP by the structure of the population (age of patients), an uneven distribution of incidence was established.

The diagnosis of CAP was made on the basis of clinical and radiological signs of the disease. The number of cases of the disease was studied depending on the age of the examined patients. According to the results of a retrospective analysis, the incidence of CAP is more common in young children. In the five-year dynamics, i.e. in 2014-2018 (according to the Surkhandarya regional center of statistics), the study of the prevalence of CAP in accordance with the composition of the population (age of patients) revealed an uneven distribution of incidence over the years.

In 2014-2018 there was an uneven, but fairly steady growth of this indicator. The highest incidence was observed in 2014 and 2016. Such a variety of incidence rates requires a deeper study of its prevalence by region. The results of the spread of pneumonia in children living in hot areas of the Surkhandarya region, the features of the ecological situation are clearly indicated. According to the results of studying the main symptoms of pneumonia in young children in the Surkhandarya region, the prevalence of the disease among young children depends on the age, gender and region of the child's residence, living conditions, nutrition, premorbid, comorbid conditions. It is shown that the prevalence of pneumonia among young children does not correspond to the official data of medical institutions. The results of a clinical and anamnestic study of the course of pneumonia in young children are also described . The prevalence of pneumonia and its clinical manifestations in children under 3 years of age in ecologically disadvantaged districts of the Surkhandarya region was significantly higher (Sariasi, Uzun, Denau, Termez, Sherabad districts) than in Baysun and Altinsai districts. The presence of underdiagnosis of CAP in children under 3 years of age has been proven, which is associated with an underestimation of the condition of sick children, poor housing and material conditions, etc. A total of 1000 were retrospectively analyzed, including 500 outpatient cards and 500 case histories.

According to the results of a general retrospective analysis of focal pneumonia in children from 3 months to 1 year, more were identified, which is associated with frequent morbidity, poor living conditions, poor health of parents, lack of care and feeding of children. According to the results of a retrospective analysis in the analysis of the anamnesis, children were hospitalized mainly with a focal form of the disease, focal-confluent, segmental, moderate, severe forms. In young children, the immune system is very weak, frequent respiratory diseases, unreasonable use of antibiotic therapy leads to an increase in the incidence of CAP.

According to the results of a retrospective analysis (Figure 1), according to a 5-year history, in 33 (32.4%) children aged 3-6 months, 36 (35.3 %), 6-12 months was 22 (21.6%), and in 11 (10.7 %) patients aged 2-3 years were diagnosed with complicated acute pneumonia. According to the 5-year history, with an uncomplicated type of disease, according to the results of a retrospective analysis, in 60 (25.0%) children aged 3-6 months, in 68 (28.2%) children aged 6 months. -12 months, 66 (27.3 %) children aged 1-2 years , and 47 (19.5%) children aged 2-3 years had uncomplicated acute pneumonia . In patients aged 2-3 years, a complicated form of CAP had a statistical value of $p<0.05$. According to the results of a retrospective analysis, the incidence of CAP is more common in young children.

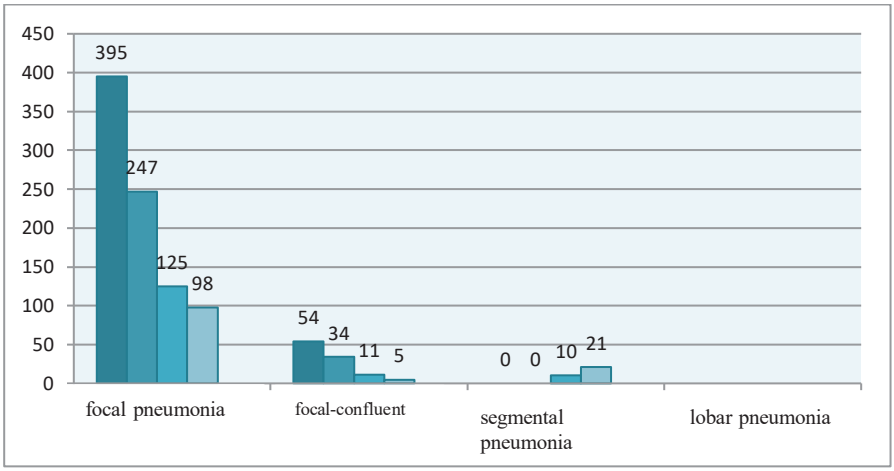

Fig.1. Results of the general retrospective analysis.

Also in this chapter, according to the information from the Center for Sanitary and Epidemiological Control (CSEC) of the Surkhandarya region, the city of Termez, Termez, Sariasi, Uzun, Denau, Sherabad districts are classified as zones of severe pollution. The ecological environment of the region was analyzed on the basis of statistical data of the Kumkurgan, Dzharkurgan, Shurcha, Muzrabod, Angorsk districts, Baysun and Altynsai districts with relatively satisfactory.

Table 1. The results of the study of fluorine compounds in soil, open water bodies, tap water and atmospheric air in the Surkhandarya region in 2017 (in disadvantaged areas).

No.	Indicators	1st area			2nd district			p_1	p_2
		Number of samples	abs.	%	Number of samples	is defined			
						abs.	%		
1.	Tap water water	35	27.6±4.0	0	0	45	29.6±3.7	>0.05	>0.05
2.	Soils	26	20.5±3.4	0	0	thirty	19.7±3.2	>0.05	>0.05
3.	Atmospheric air: Including hydrogen fluoride	22	17.3±3.4	fourteen	63.6±10.5	28	18.4±3.2	>0.05	>0.05
4.	including _Sulfur dioxide (anhydride)	23	18.1±3.4	12	52.2±10.6	26	17.1±3.1	>0.05	>0.05
5.	including _dioxide nitrogen	21	16.5±3.3	nine	42.9±11.1	23	15.1±2.9	>0.05	>0.05

Note: p- is a statistical value

Table 1 shows that in 2017 the most unfavorable areas of the region, where air pollution does not exceed the standard concentrations. Thus, the number of samples studied was 127, and 14 (63%) samples of hydrogen fluoride, 12 (52%) samples of sulfur dioxide and 9 (43%) samples of nitrogen dioxide were found in the atmospheric air, in total 152 samples were tested in 9 months, of which 20 (71%) samples of hydrogen fluoride, 18 (69%) of sulfur dioxide and 13 (57%) of nitrogen dioxide were found in the atmospheric air, but these indicators did not exceed the MPC. The detection of hydrogen fluoride, sulfur dioxide

and nitrogen dioxide in the atmospheric air had a negative impact on the health of the population. Thus, according to the indicators of a retrospective analysis in these disadvantaged regions of the region, a high level of respiratory disease was determined. Unfavorable environmental conditions also had a negative impact on the physical development of children (insufficient body weight, short stature, improper position and caries of the teeth, etc.).

Criteria for inclusion of patients in research studies:

Age of patients - from 3 months to 3 years 11 months 29 days ;

- X- ray examination of lung tissue infiltrate iv definition of dead time;

- one of the following symptoms:

in the presence of severe cough , fever and local auscultatory symptoms typical of CAR in the lungs ;

Medical limited patients ;

- patients with any immunodeficiency state;

- Patients who have been hospitalized within 4 weeks prior to the onset of this infection or have received antimicrobial chemotherapy drugs within the previous 3 months ;

Patients born with congenital anomalies

- Children with suspected cancer

- Patients are vaccinated against pneumococcal infection .

Research materials. When writing the dissertation , the following research materials were used :

General blood analysis - blood taken from the patient 's stomach

General urine analysis - patient urine

General analysis of feces - patient's faeces

Biochemical analyzes (alanine transaminase (alt), aspartate the blood of sick children was taken for the transfer of transaminases (AST), total protein, calcium, urea, nitrogen balance , creatinine.

For immunoassays - Blood sera from children with CAP were taken .

Research methods. General clinical studies, biochemical analysis, special research methods - molecular genetic, immunological research methods, statistical processing of data was carried out according to Student's criterion .

The following methods were used to examine patients:

I. _ General clinical:

Anamnesis of illness and life;

2. Physical examination;

3. Clinical blood test with leukocyte count ;

II. Instrumental research methods:

1. X-ray of the chest;

2. Pulse oximetry ;

3 . Immunological study :

Determination of the level of interleukins (IL-1, IL-4) in blood serum.

Pulse oximetry examination was carried out in the admissions department of the clinic, in the departments of pulmonology, pediatric resuscitation, and pediatric pathology.

We conducted a sample survey of 200 patients as part of a retrospective study to determine the risk factors for developing CAR. In the children of the main group (main group, n=200) , CAR developed against the background of other diseases, for example, in 86 (43%) of 200 children pneumonia developed against the background of ARVI , 53 (26.5%) developed CAP after acute bronchitis: 35 (17.5%) people developed acute bronchitis after acute obstructive bronchitis, 12 (6%) were diagnosed with acute bronchiolitis, 12 (6%) developed acute bronchitis -8 (4%) children developed pneumonia against the background of tonsillitis in 14 (7%) children. Allergic diseases, including

exudative catarrhal diathesis 17 (8.5%), allergic diathesis - 11 (5.5%) , maternal risk group for bronchial asthma 8 (4%), paternal allergic diseases 6 (3%) have bronchial asthma from their father, 12 (6%) have children whose parents have bad habits, 16 (8%) have children living in unfavorable environmental conditions, 392 (78.4%) out of 500 children, 275 (55%) patients living in unfavorable microecological conditions, 37 (18.5%) children were born with perinatal pathology, 12 (6 %) - other risk factors. The control group included practically healthy children who did not suffer from broncho-pulmonary diseases (control group, n=50).

CAR in young children depends on the background diseases of the parents, the pathological course of pregnancy, early and late gestosis, the risk of miscarriage, the place of work of the parents, professional bad habits, the child's living conditions, the presence of background diseases, the state of the child before the disease, also depends on the functional state child's body . The results obtained, with the development of CAP in young children, it is necessary to collect a complete history, find out background diseases, take into account whether the child is breastfed or artificial, mixed feeding, study the state of the microclimate and make additional diagnostics.

The following Table 2 shows the test results.

Table 2. Analysis of history data in the development of CAR in young children.

No.	Data	Main group (n=200)		Control group (n=50)		R
		abs.	%	abs.	%	
1.	Mother's age: from less than 18 to more than 35 years.	32	16.0± 2.6	6	12.0±4.6	>0.05
2.	Father's bad habits: smoking and drinking alcohol	76	38.0±3.4	13	26.0±6.3	>0.05
3.	professional bad habits of the father (works in the field, at a construction site, on the railway, at a brick factory, at a cotton factory, at a combine)	27	13.5±2.4	sixteen	10.3±4.3	>0.05
4.	Occupational bad habits in the mother (work in the field, adverse effects of cotton dust, rice, vegetables, crops)	35	17.5±2.7	8	16.0±5.2	>0.05
5.	Extragenital pathologies in the mother (renal, broncho-pulmonary, heart, joint diseases)	86	43.0±3.5	6	12.0±4.6	<0.001
6.	Risk of miscarriage (first or second trimester)	38	19.0±2.8	1	2.0±2.0	<0.001
7.	Early pregnancy (first trimester)	22	11.0±2.2	3	6.0±3.4	>0.05
8.	Late preeclampsia (after three months)	44	22.0±2.9	four	8.0±3.9	<0.05
9.	Turbidity, abundance of amniotic fluid	23	11.5±2.3	2	4.0±2.8	<0.05
10.	Chronic fetal hypoxia	37	18.5±2.8	five	10.0±4.3	>0.05
11.	intrauterine growth retardation	five	2.5±1.1	0	0.0	<0.05
12.	Operation caesarean section	12	6.0±1.7	1	2.0±2.0	>0.05
13.	preterm birth	8	4.0±1.4	1	2.0±2.0	>0.05
14.	Entanglement of the umbilical cord	13	6.5±1.7	2	4.0±2.8	>0.05
15.	Prolonged labor	eleven	5.5±1.6	3	6.0±3.4	>0.05
16.	Birth weight less than 2500 g.	22	11.0±2.2	2	4.0±2.8	<0.05
17.	Birth weight 2500-4000 gr.	174	87.0±2.4	43	86.0±5.0	>0.05
18.	Birth weight 4000 gr.	8	4.0±1.4	five	10.0±4.3	>0.05
19.	The interval between births is 1-2 years.	23	11.5±2.3	four	8.0±3.9	>0.05
20.	There is no pathology of the perinatal period .	24	12.0±2.3	15	30.0±6.5	<0.05

Application: * $p < 0.05$.

According to Table 1 , the health of children living in this region is negatively affected by several factors: perinatal factors , somatic diseases of parents , bad habits, pathologies of pregnancy. Based on the analysis of the table, extragenital pathology in the mother of patients (renal, broncho-pulmonary, heart, joint diseases) $p < 0.001$, risk of miscarriage (in the I or II trimester) , $p < 0.001$, preeclampsia (after three months) $p < 0$, 05 , statistical value of water turbidity, abundance was equal $p < 0.05$. Fetal growth retardation $p < 0.05$, birth weight less than 2500 g, statistical significance level $p < 0.05$. It can be predicted that these six indicators will exceed the indicators of other risk factors for the occurrence and development of CAP.

Thus, pathologies of the antenatal, intranatal, perinatal periods, risk factors in parents, maternal nutrition, pregnancy with pathologies have a negative impact on the development of CAP in young children.

Today, one of the urgent problems for general practitioners is the prevalence of bronchopulmonary diseases, including COPD, among young children. Early diagnosis of bronchopulmonary diseases and rational treatment based on the standard is one of the important problems of pediatric practice. According to the World Health Organization, pneumonia is the leading cause of death in children worldwide. Respiratory diseases are one of the important problems of pediatrics.

The studies were conducted in children aged 3 months to 3 years, 11 months and 29 days. The clinical course of CAP made it possible to obtain new statistical data - the most common clinical and morphological form of pneumonia, pneumonia with foci and foci, and children were ill much less frequently than the segmental form of CAR. Clinically pneumonia both forms are mild and severe, characterized mainly by damage to the alveoli of the lungs , bilateral localization and swelling of the segments involved in the pathological process . In many cases, comorbidities developed against the background of acute respiratory infections , allergic diseases, and in many cases, background diseases were associated with allergic diseases and recurrent respiratory diseases .

According to the information of the center for sanitary and epidemiological control of the Surkhandarya region, the city of Termez, Termez district, Sariasi, Uzun, Denau, Sherabad districts are classified as a highly polluted ecological environment. The ecological environment of the region was analyzed on the basis of statistical data of Kumkurgan, Dzharkurgan, Shurcha, Muzrabad, Angarsk districts, Baysun and Altynsoy districts with a relatively satisfactory environmental situation.

Collected and analyzed information on the average level of air pollution in the region. On their basis, the air pollution index (API) was calculated. During the study, a comparative analysis of the main environmental pollutants was carried out: dust (solid suspended particles), carbon monoxide (carbon monoxide), nitrogen dioxide, sulfur dioxide and nitrogen oxide, the composition of the soil, the composition of drinking water were studied.

According to the analysis of the obtained results, atmospheric air pollution was high in the city of Termez, Termez region, Sherabad, Sariosi, Denau, Uzun regions.

The indicator of environmental pollution from year to year is higher than the maximum permissible concentrations(MPC), in 2015 it was 4.15, in 2016 - 4.82, in 2017 - 5.11, which corresponds to level II, that is, a high level of atmospheric pollution air, which led to an exacerbation of pulmonary diseases and the occurrence of various complications in children.

It can be seen from the data that the WAI exceeded the allowable concentration in all the studied territories. For example, compared with the data of 2017, the number of AIIs in Termez increased by 1.5 times, in the Sariasiya district - by 1.6 times, and in the Uzun district - by 1.4 times.

Therefore, the allocation of thick, purulent sputum in diseases of the lower respiratory tract (bronchitis, pneumonia) requires the use of antibacterial, mucolytic drugs in the complex treatment of these diseases.

Table 3. Distribution of patients with various bronchopulmonary pathologies and concomitant diseases (by districts of the first group for 2017-2018) (environmentally disadvantaged districts).

Analyzed indicators	Absolute and relative frequency of symptoms in patients								R_{1-2}	R_{1-3}	R_{1-4}	R_{2-3}	R_{2-4}	R_{3-4}
	VP (n=55)		Acute bronchitis (n=35)		Obstructive bronchitis (n=25)		Recurrent bronchitis (n=15)							
	abs.	%	abs.	%	abs.	%	abs.	%						
Frequent acute respiratory infections	10	8	14	40	21	84	5	33	<0.05	<0.001	>0.05	<0.01	>0.05	<0.01
Diseases of the upper respiratory tract (otitis media, sinusitis, tonsillitis)	7	12	6	17	6	24	3	20	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
allergic diathesis	5	9.1	5	14	5	20	2	13	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Infection with worms	8	1 5	6	17	8	32	2	13	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Rickets, spasmophilia	14	26 _	11	31	4	16	6	40	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Dental caries	9	16	8	2 3	7	28	5	33	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
protein-energy malnutrition	6	1 1	3	9	4	16	1	7	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Application: p — statistical value in groups.

Table 4. Distribution of patients with various bronchopulmonary pathologies and concomitant diseases (by districts of the second group for 2017-2018) (environmentally safe districts).

Analyzed indicators	Absolute and relative frequency of symptoms in patients								R_{1-2}	R_{1-3}	R_{1-4}	R_{2-3}	R_{2-4}	R_{3-4}
	VP (n=25)		Acute bronchitis (n= 30)		Obstructive bronchitis (n= 1 5)		Recurrent bronchitis (n=10)							
	abs.	%	abs.	%	abs.	%	abs.	%						
Frequent acute respiratory infections	3	12	8	27	8	53	1	10	<0.05	<0.001	>0.05	<0.01	>0.05	<0.01
airborne infections	5	20	2	7	2	13	1	10	<0.05	<0.001	>0.05	<0.01	>0.05	<0.01
Diseases of the upper respiratory tract (otitis media, sinusitis, tonsillitis)	5	20	6	20	2	13	2	20	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
allergic diathesis	4	14	5	17	3	20	1	10	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Infection with worms	3	12	2	7	3	20	1	10	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
rickets, spasmophilia	14	56	11	37	4	27	6	60	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
protein-energy malnutrition	6	24	3	10	4	27	1	10	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

As can be seen from Table 3, the development of CAP in children was affected by allergic diathesis 4 (16%), airborne infections 5 (20%), rickets, spasmophilia 14 (56%), unfavorable environmental conditions. In 6 (24%) patients, protein-energy insufficiency was accompanied by EP.

In conclusion, it can be said that negative environmental factors directly play an important role in the development of bronchopulmonary diseases (Table 5). The existing qualitative and quantitative changes in metabolism caused by changes in the external environment can cause violations of the growth and structure of the child's body. The results of the study show that the socio-economic lifestyle is low level (14%), poor living conditions (8%), the presence of many children (16%) also increase the growth of bronchopulmonary pathology. It is shown that the increase in CAR (15%) is associated with air pollution in areas adjacent to industrial zones . Another factor causing respiratory diseases in children is passive smoking (22%). Smoking disrupts the function of ciliated epithelium, mucus production, slows down the activity of alveolar macrophages. Toxic substances contained in tobacco smoke cause swelling of the mucous membrane, followed by a violation of the drainage function of the bronchi.

Thus, the growth of almost all categories of diseases of the bronchopulmonary system attracts the attention of pediatricians, pulmonologists, and the improvement of prevention and rehabilitation methods. The clinical and laboratory characteristics of bronchopulmonary pathology were determined, taking into account the negative influence of atmospheric air on the development of the disease. In order to prevent

bronchopneumonic diseases in children, it is necessary to fully carry out sanitary and hygienic and therapeutic and preventive measures to eliminate air pollution.

When analyzing the incidence of broncho-pulmonary diseases in ecologically disadvantaged areas of the region and in ecologically safe areas, it was found that the incidence in ecologically safe areas is 1.5 times lower. The data obtained indicate that the development of a rehabilitation plan for patients with bronchopulmonary pathology can reduce the negative impact of atmospheric air on the pathological process.

Table 5. Indicators of factors negatively affecting the development of CAP in young children.

No.	Influencing factors	CAP moderate, n = 175		CAP heavy, n = 2 5	
		ABC	%	ABC	%
1.	**Biomedical factors:**				
	Pathological course of pregnancy	68	38.8%	7	28%
	large fruit	23	13%	3	12%
	intrauterine growth retardation	17	10.2%	2	8%
	Pathologies of the intranatal period	27	15.4%	4	16%
	frequent respiratory infections in parents or family members;	34	19.4%	5	20%
	Frequent allergies in parents or family members	28	16%	6	24%
	Type of baby food:				
	Natural	72	41%	7	44%
	Artificial	37	21%	8	32%
	mixed	66	37.7%	6	24%
2.	**Socio-hygienic factors:**				
	There are many children in the family (3 or more)	134	76.5%	4	sixteen%
	lives in a cramped house	116	66%	3	12%%
	Lack of children's room	162	92.5%	17	72%
	The child was not taken for a walk at all	22	12.5%	7	25%
	The child walked a little, did not study	134	76.5%	13	52%
3.	**Medical and organizational factors:**				
	Diagnosis of the disease in family clinics is unsatisfactory.	56	32%	11	44%
	Rehabilitation of children after an infection	65	37%	8	32%
	hardening	17	10.2%	3	12%
	massage	12	6.8%	4	16%

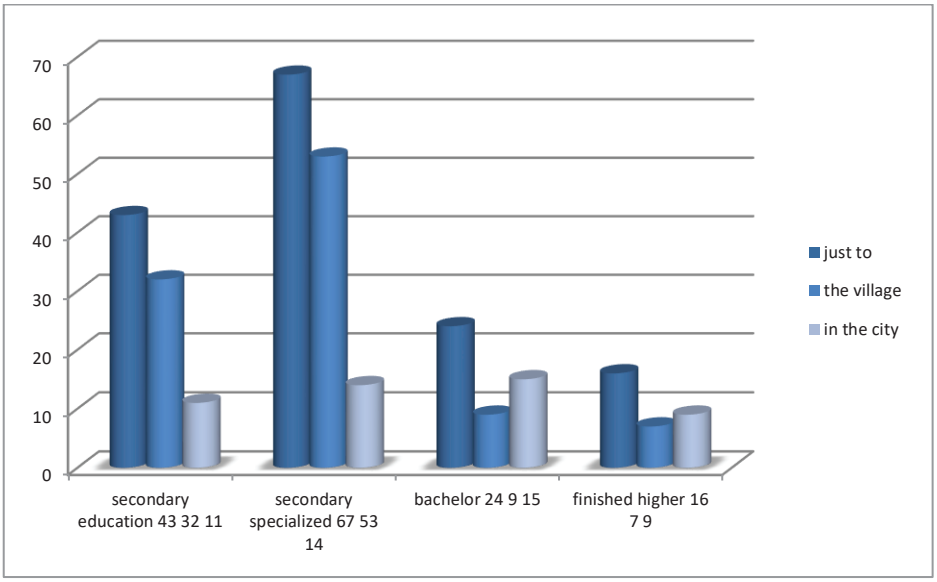

Fig. 2. Socio-economic, household, biological indicators of the anamnesis of the mothers of the examined patients.

As can be seen from this fig.2, 136 (68%) percent of 200 children live in rural areas, 64 (32%) live in cities, mothers of sick children living in rural areas are housewives, their education is secondary or secondary specialized, social factors also influenced the development of the disease. It was found that 18 (9%) sick children lead an unhealthy unhealthy lifestyle (Table 6). The nature of nutrition in children suffering from CAP has been studied. It was found that 37 (18.5%) mothers have a satisfactory balanced diet, 38 (19%) - medium-calorie, 125 (62.5%) - low-calorie. It turned out that the food contains an insufficient amount of vitamins, trace elements, proteins and fats. As a result of the survey, it was found that mothers did not consume enough meat, milk, fish products, wet and dry fruits. It was revealed that more bakery products and pastries are consumed in the diet. The lifestyle of mothers negatively affects the course of pregnancy, causing chronic fetal hypoxia.

Table 6. Analysis of the nature of nutrition in patients with CAP.

T/r	food type	Children 3-12 months			
		VP moderate n = 45		Severe VP n =25	
		ABC	%	ABC	%
1.	natural feeding	33	73	15	60
	Feeding introduction:				
	6-6.5	13	39	3	20
	7-8 months	8	24	3	20
	9-11 months	7	21	5	33
	After 12 months	5	15	4	27
2 .	Artificial feeding	5	12	4	16
	Feeding introduction:				
	6-6.5	2	40	1	25
	7-8 months	1	20	0	0
	9-11 months	2	40	1	25
	After 12 months	0	0	2	50
3 .	mixed feeding	7	16	6	28
	Feeding introduction:				
	6-6.5	3	43	0	0
	7-8 months	2	29	2	29
	9-11 months	1	14	1	14
	After 12 months	1	14	1	14

In the table 4 the nature of feeding and the periods of providing complementary foods in children up to a year were analyzed. As can be seen from the table, out of 25 children with severe CAP, 15 (60%) were breast-fed, 4 (16%) were formula-fed, and 6 (28%) were mixed-fed. 33 (73%) of 45 children with moderate CAP were breast-fed, 5 (12%) were bottle-fed, and 7 (16%) were mixed-fed. The nature of the child's nutrition in moderate and severe CAP is also important, since children fed with natural mother's milk develop innate immunity against various infectious diseases. The nature of nutrition also influenced the mental and physical development of the child. The disease proceeded relatively easily in children who were on a natural diet.

The results of studying the influence of risk factors and immunological studies on the course of CAP in children are shown. The total number of patients in the prospective clinical study was 200 children aged 3 months to 3 years 11 months 29 days. From 2019 to December 2021, patients who were treated in the departments of pulmonology, pathology of infants and intensive care were monitored. The study included 15% of patients not vaccinated against pneumonia. During follow-up, all patients with CAP were analyzed for the presence of predominant clinical signs of pneumonia. Depending on the severity of the disease, the patients were divided into the following groups depending on the severity of the disease.

Group 1 - children with moderate CAP - 146 children, 80 (55%) boys and 66 (45%) girls.

Group 2, children with severe CAP - 54 children, 28 (52%) boys, 26 (48%) girls.

The distribution of children with CAP by sex shows that in the study the number of boys was 108 (54%), the number of girls was 92 (46%), but there was a statistically significant difference by gender (the number of boys was 8 (4%) more) was not observed ($p<0.05$).

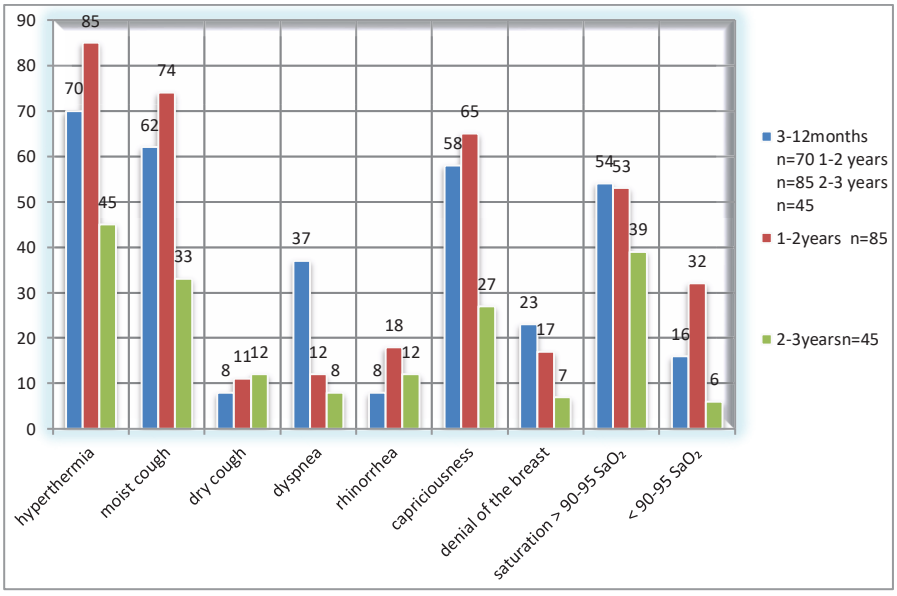

Fig. 3. Indicators of the predominant clinical symptoms of community-acquired pneumonia.

Figure 3 shows that among the primary clinical symptoms, hyperthermia was 70 (100%) in children 1-2 years old, 85 (100%) in children 2-3 years old and 4-5 (100%) in children 3-

12 months old . Two different types of cough syndrome were noted, cough with wet sputum 62(89) at 3-12 months, 74(87) at 1-2 years, 33(73) at 2-3 years, dry cough 8(11%), 1 -2 11(13) in children, 12(27) in children aged 2-3 years, 37(52) in patients with wheezing 3-12 months, 12(14) in children aged 1-2 years, 8(17) %) in children aged 2-3 years, rhinorrhea 8(11) in patients aged 3-12 months, 18(21) in patients aged 1-2 years, 16(36) in patients aged 2-3 years, capriciousness 58(83) in patients aged 3-12 months, 1-2 years 65(76) in patients, 27(59) in patients aged 2-3 years, breastfeeding at 3-12 months 23(33%), 17(20) in patients aged 1-2 years , 7(16) in patients aged 2-3 years %), SaO2 saturation > 90-95, 54(77%) in patients 3-12 months old, 53(62%) in patients 1-2 years old, 39 (87%) in patients 2-3 years old. SaO 2 <90-95 was 16(23%) at 3-12 months, 32(38%) at 1-2 years, 6(13%) at 2-3 years of age.

16 (23%) patients from 3 months to 1 year, in 32 (38%) from 1 to 2 years, in 6 (13%) from 2 to 3 years, in 54 (27%) of the total number of patients the condition is severe, all priority clinical symptoms are manifested, saturation is below 90, 146 (73%) are assessed as moderate. Patients in this group were treated according to the standard treatment protocol in the intensive care unit, they underwent oxygen therapy.

X-ray examination of the chest organs was performed in all 200 children with CAP.

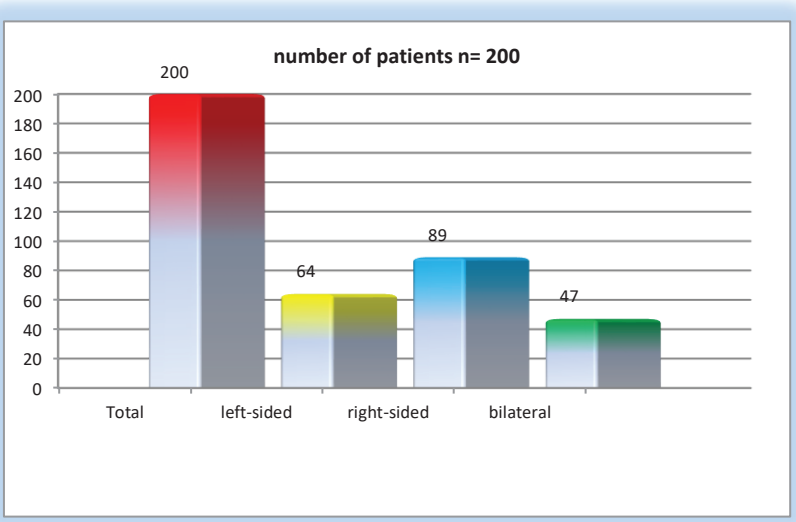

Fig. 4. Lung injury on chest x-ray.

According to the analysis of Fig. 4 in moderate and severe forms of CAP, right-sided lesion was observed in 89 (44.5%) patients, left-sided — in 64 (32%), bilateral lung lesion — in 47 (23%) patients.

Clinical and immunological characteristics of community-acquired pneumonia in young children presents the results of immunological laboratory studies of interleukin a -1 and interleukin- 4 status in children with CAP pneumonia, interferon profiles α, β, γ and their role in the development of the disease. The role of cytokine activation in the development of pneumonia and its interaction with other markers have been studied.

Table 7. Indicators of pro- and anti-inflammatory cytokines in blood serum in patients with CAP.

№	Cytokine indicators					
	groups _	control group	3-6 months (n =1 3)	7-12 months (n = 15)	1 - 2 year (n =88)	2-3 year (n =84)
1.	IL-1 pg/ml	5.8±0.45	7.8±1.2	9.6 ±2.1 *	10.3±1.5 *	9.5 ±1.0***
2.	IL-4 pg/ml	4.7±0.32	4.4±0.74	1 3.2± 1.5 4 ***	1 2.3± 0.63 ***	1 1 .7±0.24 ***
3.	IL1/ IL4	5.50±0.28	9.8 ± 1.2 _ _	1 4 .8 ± 2.5 **	15.8 ± 3.5 ** _ _ _	1 4 , 2 ± 1 , 24
four.	INFα pg/ml	4.8±0.40	1 1 , 6 ±1, 2 ***	1 4 , 9 ±0.7 7 ***	13.1±0.5 0***	*** 12.4±0.60
five.	INF β pg/ml	1.9±0.08	0.32±0.0 5 **	0.26±0.0 9 ***	0.23±0.01 0***	*** 0.27±0.009
6.	INFγ pg/ml	8.5±0.6	7.3±2.0	9.8 ±0.6 1*	8.2±1.3	8.6± 1.2

Note: * - significant compared with the control group (* - p <0.05; ** - p< 0.01; *** - p <0.001).

Table 7 shows that the amount of IL 4 in sick children aged 7-12 months ranges from 1 3 , 2 ±1.54 pg/mL, p <0.001 , INFα concentrations 15.8±3.5pg/ml 7-12 months in children aged 1-2 years, the amount of IL- 4 was 12.3±0.63 pg/ml (in the control group , y - 4.7 ± 0.32 pg / ml) . In the group of practically healthy children, the average ratio of IL-1/IL-4 was 5.50 ± 0.28 pg/ml . In the group of children with pneumonia in the acute phase of the disease, the average ratio of IL1 / IL4 was 14.8 ± 2.5 pg/ml , which is 3.8 times higher than the control values (p <0.01). The following indicators of the composition of interferons: the amount of interferon is 2.5 times higher than normal, INF β amount 1 1.6 ± 1.2 pg/ml , In patients aged 7–12 months, INF β was 0.26 ± 0.99 pg/ml, INF γ - 9.8 ± 0.7 1 pg/ml, p <0.01. Thus, changes in the cytokine index indicate an acute inflammatory process in the body. At the onset of the disease, a regular increase in the concentration of the anti-inflammatory cytokine IL 4 was observed in almost all patients (95.5% of patients with pneumonia and 90% of patients with uncomplicated form), statistically significantly p<0.001.

5 Conclusion

1. The incidence rate of CAR in children from 3 months to 1 year was 44.9%, which is ½ part. The incidence of CAP in children aged 1 to 3 years was 55.1%. According to a retrospective analysis, the highest incidence was observed in ecologically unfavorable areas with high air pollution in Sariasi, Uzun, Denau, Termez, Sherabad and in the city of Termez.

2. The main risk factors for the development of CAP in children living in ecologically disadvantaged areas were an increase in the air pollution index, excess of the threshold relative humidity. In Sariasi, Uzun, Denau regions (indicators of hydrogen fluoride, nitrogen oxide, sulfur dioxide were above the norm. In Termez, Sherabad regions, and in the city of Termez, indicators of insolation, dust, drinking water, soil exceeded the norm.

3. In children living in ecologically disadvantaged areas, the incidence of CAP and other bronchopulmonary diseases was high. In children with CAP, the identified environmental factors (insolation, dust, wind, drinking water) negatively affect the development of the disease.

4. Indicators of pro-inflammatory and anti-inflammatory cytokines IL - 1β and IFN-α, IFN- β in blood serum in the complicated course of CAP were significantly increased compared to the uncomplicated course. At the same time, pro-inflammatory cytokines prevailed over anti-inflammatory cytokines.

References

1. V.K. Tatochenko, Modern Pediatrics **30(2),** 72-76 (2012)
2. S.L. Tsarkova, Ural Medical Journal **7,** 28-31(2012)
3. T.I. Terekhova, K.A. Mukametzhanova, A.L. Alimbekov, Science and health care **1,** 39-42 (2013)
4. Yu.L. Mizernitsky, Medical Council **1,** 44-46 (2013)
5. *Infections of the respiratory tract. Epidemiological surveillance of community-acquired pneumonia: a method. Instructions.* FBUN Central Research Institute of Epidemiology Ros. n waste. supervision. Inv. No. 3. (Moscow, 2013)
6. V.A. Dobrykh, Pulmonology **1,** 64-67 (2013)
7. N.I. Popkova, *Pneumonia in childhood: modern clinical and laboratory features*. Actual problems of pediatrics : collection of materials of the XVII Congress of Pediatricians of Russia. Moscow (2013)
8. O.A. Gorbich, G.N. Chistenko, O.A. Mazanik, et. al., Zdravookhranenie **6,** 2–6 (2014)
9. Yu.L. Mizernitsky, Russian Bulletin of Perinatology and Pediatrics **59(2),** 4-12 (2014)
10. N.A. Geppe, A.B. Malakhov, I.K. Volkov, Rus. munits magazine **22(3),** 188-193 (2014)
11. O.A. Radaeva, A.S. Simbirtsev, Cytokines and inflammation **13(3),** 31–37 (2014)
12. Yu.L. Mizernitsky, Ros. estn. perinatol and pediatrics **59(2),** 4-12 (2014)
13. A.K. Yuzbekov, Bulletin of Moscow University. Biology **1,** 19-24 (2015)
14. S.A. Mokiya-Serbina, T.V. Litvinova, A.A. Gordeeva, News of medicine and pharmacy in the world **7,** 16-18 (2016)
15. M.V. Kushnareva, T.V. Vinogradova, Russian Bulletin of Perinatology and Pediatrics **3,** 12-20 (2016)
16. T.G. Malanichev, S.S. Mozhgina, Russian Bulletin of Perinatology and pediatrics **4,** 127 (2017)
17. T.G. Malanicheva, Russian Bulletin of Perinatology and Pediatrics **62(5),** 139-143 (2017)
18. D.V. Evdokimova, Bulletin of new medical technologies, electronic j. **4,** 27-31 (2018)
19. A.A. Perina, A.A. Zaplatnikov, Pediatrics **97(2),** 51-54 (2018)
20. Zh.K. Alieva, Bulletin of KSMA im. I.K. Akhunbaev **5-6,** 94-102 (2018)
21. A.T. Sultanov, U.R. Fayzieva, N.R. Satibaldieva, et. al., Eur. Bull. of Pediatrics. Tashkent **1(1),** 85-89 (2019)
22. T.A. Goncharova, Status and correction of energy-metabolic disorders in acute bronchitis and community-acquired pneumonia in young children with perinatal CNS damage. Dissertation.r work. Donetsk (2019)
23. U.R. Fayzieva, Tibbiyotda yangi kun. Bukhoro **2(30),** 240-244 (2020)
24. E.P. Zinina, S.V. Tsarenko, et. al., Bulletin of Intensive Care. A.I. Saltanov **1**, 77–89 (2021). DOI: 10.21320/1818-474X-2021-1-77-89
25. I.A. Karimdzhanov, U.R. Fayzieva, Bulletin of the Tashkent Medical Academy. Tashkent **3,** 104-108 (2021)
26. I.A. Karimdzhanov, D.T. Abdullaeva, U.R. Fayzieva, Pediatrics. Tashkent **1,** 363-372 (2022)

27. T.Y. Chiang, T.D. Tzeng, H.D. Lin, C.J. Cho, F.J. Lin, Int. J. Mol. Sci. **13(3),** 2763-2768 (2012)
28. R. Maizels, J.P. Hewitson, K. Smith, Current Opinion in Immunology **24,** 459-466 (2012)
29. Y.J. He, C.Y. Mai, L. Chen, et. al., Zhonghua Fu Chan Ke Za Zhi **53(12),** 842-848 (2018)
30. M. Liu, H. Li, C.X. Xue, et. al., Clin. Respir. J. **12(3),** 974–985 (2018). DOI: 10.1111/crj.12614
31. S. Awasthi, K.K. Yadav, M. Pandey, A.A. Mahdi, N. Awasthi, Pediatr. Pulmonol. **53(9),** 1276-1283 (2018)
32. K. Prawin, et. al., Indian Pediatrics **58(11),** 1036-1039 (2021)