

# Age-Related Features of the Manifestations and Diagnosis of Mycoplasma Pneumonia in Children

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**Abstract** *M. pneumoniae* is one of the most discussed respiratory problems in paediatrics. This is due to the widespread prevalence of mycoplasma infection in children and adolescents and diagnostic errors. The high probability of diagnostic errors when using clinical signs and the lack of an ideal laboratory diagnostic method often lead to the excessive prescription of macrolides and, as a result, to an increase in the resistance of respiratory infection pathogens to antimicrobial drugs. This article presents the results of clinical and laboratory studies of mycoplasma pneumonia in different age groups of children. It has been established that mycoplasma pneumonia most commonly occurs in young children, with no obvious clinical symptoms and a prolonged course.

**Keywords** Mycoplasma pneumonia, Young children, Diagnosis, Immunoenzymatic method

## 1. Introduction

*M. pneumoniae* was first isolated in tissue culture from the sputum of a patient with primary atypical pneumonia. In 1961, it was proven that the 'Eaton pathogen' belongs to the *Mycoplasma* species. In 1963, Chanock succeeded in culturing the Eaton pathogen in a cell-free mammalian medium and proposed the taxonomic designation *M. pneumoniae*. *M. pneumoniae* is a unique organism that does not have a cell wall under any circumstances and does not need a host cell for replication. This organism causes a variety of clinical manifestations, ranging from self-limiting to life-threatening. The severity of the disease appears to depend on the degree of protection provided by the body [2,8].

*M. pneumoniae* accounts for 10.6–17.0% of community-acquired cases and 3.0–20.8% of hospital-acquired cases of community-acquired pneumonia, respectively, and the frequency of hospitalisation in intensive care units is relatively low (2–3.6%). Arnold et al. showed that *M. pneumoniae* is the most common causative agent of atypical pneumonia, accounting for 11–15% of community-acquired pneumonia cases worldwide [5].

*M. pneumoniae* is an important causative agent of community-acquired pneumonia in children, but the epidemiology and clinical manifestations of *M. pneumoniae* infection in infants have been described in only a few studies. Family outbreaks and outbreaks in closed communities — in

barracks, kindergartens, schools, and universities — are often described, lasting several months and recurring every 3–5 years, as prolonged contact creates conditions for the persistence of the pathogen [1,3,5].

Pneumonia caused by *M. pneumoniae* manifests itself in several ways, such as fever, cough, wheezing, diarrhoea, vomiting, and other non-specific symptoms. However, it is impossible to diagnose *M. pneumoniae* based solely on these signs and symptoms, and laboratory analysis is more important for detecting *M. pneumoniae* infection. Community-acquired *M. pneumoniae* epidemics are usually seen in school-aged children and young adults. However, a growing body of research indicates that *M. pneumoniae* infection is common in children aged 1 to 5 years and that the clinical characteristics differ between younger and older patients. *M. pneumoniae* infection in young children is receiving increasing attention. The most common problem faced by paediatricians is the difficulty of differentiating between mycoplasma and mild pneumococcal pneumonia in an outpatient setting [4,6].

For a long time, diagnosing mycoplasma infection was only possible in specialised laboratories due to the difficulties involved in culturing the pathogen that causes mycoplasmosis. The development and use of fundamentally new, modern, and highly sensitive detection methods, such as polymerase chain reaction (PCR) and enzyme-linked immunosorbent assay (ELISA), have contributed to progress in the study of this problem. However, the characteristics of the clinical manifestations of 'atypical pneumonia' in relation to the immunological indicators of the disease in young children have not been sufficiently studied [5,7,8].

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**Research objective:** to study the incidence and clinical and laboratory characteristics of *M. pneumoniae* among the paediatric population.

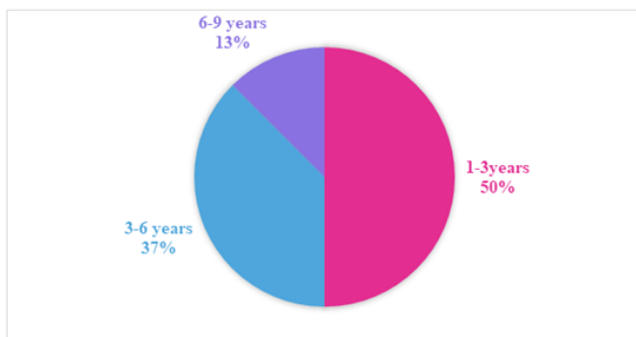
## 2. Materials and Methods

A retrospective study of 124 medical records was conducted to examine the demographic, clinical, and microbiological characteristics of patients with lower respiratory tract infections (LRTI) admitted to the ODMPC during the period 2023-2024. Children were included in the study if they had the following symptoms: (a) fever, cough and shortness of breath (clinical data); abnormal breathing sounds, wheezing or moist rales (auscultatory data); and/or focal/segmental consolidation, interstitial changes or pleural effusion (radiographic data) confirming lower respiratory tract infections. IgM on admission or during follow-up, or  $\geq 4$ -fold increase in IgG titre.

The exclusion criteria were children with severe concomitant diseases, such as neoplasms, renal or hepatic dysfunction, immunosuppression, chronic lung or cardiovascular diseases, genetic or neurological disorders, and chronic metabolic diseases. Serum IgG and IgM levels for *M. pneumoniae* were determined using a commercial kit (Virion-Serion, Germany). The result was considered positive if the IgM titre was  $\geq 1:1$  or if the IgG titre exceeded 4 times the normal level.

## 3. Results and Discussion

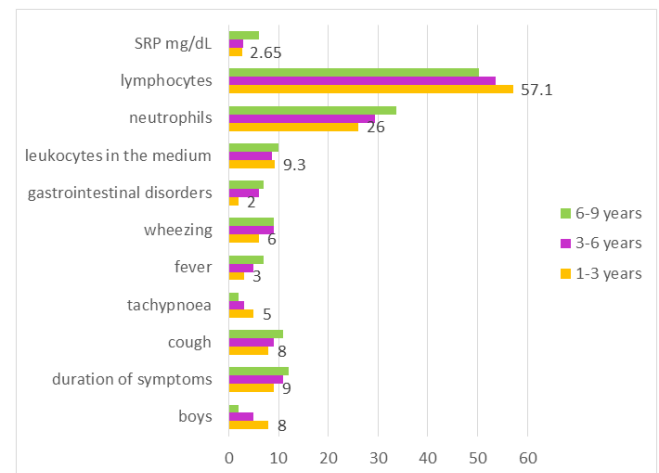
Of the 124 individuals examined, 24 were diagnosed with *M. pneumoniae* infection. The test results showed that 12 of them were aged 1 to 3 years; 9 were aged 3 to 6 years; and 3 were aged 6 to 9 years. *M. pneumoniae* infection mainly occurred in September-October. The presence of fever with a maximum temperature  $>39.0^{\circ}\text{C}$  for  $\geq 3$  days was more common in the 1-3 age group ( $P < 0.05$ ). Laboratory tests showed that infants aged 6-9 years had higher peripheral white blood cell counts ( $P = 0.04$ ) and neutrophil counts ( $P = 0.02$ ) and higher CRP levels ( $P = 0.05$ ). Furthermore, the median length of hospitalisation for infants aged 1-3 years was shorter than in the other two groups.



**Figure 1.** Prevalence of mycoplasma pneumonia among the study group of children

In the 1-3 year old group (OR = 8.67, 95% CI = 4.69–16.04,  $P < 0.001$ ), it was significantly higher than in the other groups; this result indicates that young infants were more susceptible to *M. pneumoniae* infection.

A study of seasonal incidence showed that the peak incidence of *M. pneumoniae* infection occurred in October, with a total of 15 (62.5%) cases recorded in the study group ( $n=24$ ) during that month. Seasonal distribution of *M. pneumoniae* infection in the study group of children: from January to March, there were no cases; from April to June, 2 (8.4%) children were infected with *M. pneumoniae*; and from July to September, 4 (16.6%) children were infected. From October to December, 18 (75%) children were infected with *M. pneumoniae*. These data showed that the prevalence of *M. pneumoniae* infection in children was higher in the fourth quarter of the year.



**Figure 2.** Average clinical and laboratory parameters in the study groups

The results of clinical analysis showed that fever (maximum temperature  $> 39.0^{\circ}\text{C}$  for  $\geq 3$  days) was more common in the 1- to 3-year-old group ( $P < 0.05$ ). However, other symptoms and signs, such as cough, tachypnoea, wheezing, and gastrointestinal symptoms, did not differ significantly between groups ( $P > 0.05$ ).

The concentration of immunoglobulin IgM was significantly elevated, confirming the fact of infection ( $p < 0.01$ ), while the level of IgG was significantly reduced ( $p < 0.05$ ).

## 4. Conclusions

*M. pneumoniae* respiratory tract infection is characterised by mild clinical manifestations, the leading symptom of which is cough. Its diagnosis and treatment require non-standard, non-routine approaches. These features necessitate increased attention from specialists, careful collection of medical history, detailed physical examination, and knowledge necessary for the selection of antimicrobial therapy effective against both typical and atypical pathogens.

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