# Clinical epidemiological characteristics of pneumonia caused by *Mycoplasma pneumoniae* at Hai Phong International Obstetrics and Pediatrics Hospital in 2024

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**ABSTRACT**

***Objectives:*** The objective was to describe the clinical and epidemiological features of pediatric pneumonia due *to M. pneumoniae* in the Respiratory Department at Hai Phong International Obstetrics and Paediatrics Hospital. ***Methods:*** We retrospectively analyzed medical records of 192 children aged 2 months to under 15 years, hospitalized with community-acquired pneumonia and PCR-confirmed *M. pneumoniae* infection from July to December 2024. ***Results:*** The mean age was 43.57 ± 29.54 months. The majority of cases (highest incidence) were in children aged 1 month to under 3 years. Most patients (69.8%) experienced symptoms for 7 days prior to admission, with an average duration of illness of 8.2 ± 8.5 days. Nearly all children presented with productive cough, and moderate to high fever was common. Wheezing was frequently noted, while extrapulmonary symptoms were rare. Age-appropriate tachypnea was observed in 93.8% of cases. Pulmonary rales were a prominent clinical finding. Chest indrawing was seen in only 4.2% of cases, and pleural effusion occurred in just one patient. ***Conclusion:*** These findings underscore the typical respiratory presentation of M. pneumoniae pneumonia in children in Haiphong city, with relatively mild extrapulmonary involvement.

***Keywords:*** *pneumonia, children, Mycoplasma pneumoniae*

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## INTRODUCTION

Pneumonia is a common disease in children, especially in young children. It is one of the leading causes of both morbidity and mortality among children in Vietnam as well as worldwide. Pneumonia is the leading cause of death from infectious diseases in children under 5 years of age, accounting for nearly 20% of all cases (1). The causes of pneumonia can include viruses, bacteria, parasites, and fungi. Among these, *Mycoplasma pneumoniae* (*M. pneumoniae*) is an important pathogen, accounting for 8% of all causes of pneumonia across all age groups, and 16–23% among children over 5 years old (2). *M. pneumoniae* can cause a wide range of clinical manifestations. While common symptoms such as fever, headache, and cough may appear prominently, physical signs may be minimal or nonspecific. In addition to pulmonary involvement, *M. pneumoniae* can also cause extrapulmonary clinical manifestations such as hemolytic anemia, Guillain-Barré syndrome, polyarthritis, skin lesions, and electrolyte imbalances, etc. (3). With nonspecific clinical symptoms unlike typical pneumonia, the symptoms of *M. pneumoniae* pneumonia are easily overlooked, leading to delayed diagnosis and patients being admitted in worse condition (4). Therefore, accurate

diagnosis of the causative agent of *M. pneumoniae* pneumonia is very important, as it reduces the rate of severe complications, facilitates effective treatment, and lowers the burden of treatment costs.

Hai Phong International Obstetrics and Paediatrics Hospital is a major pediatric center in the city and has implemented diagnostic techniques for *M. pneumoniae*. However, there is still limited information about pneumonia caused by *M. pneumoniae* in children in this region. Therefore, we conducted this study with the objective of describing the clinical epidemiological characteristics of pneumonia caused by *Mycoplasma pneumoniae* at Hai Phong International Obstetrics and Paediatrics Hospital in 2024.

## METHODS

**Study subjects**

All medical records of patients aged from 2 months to under 15 years, diagnosed with community-acquired pneumonia and with a positive Mycoplasma IgM test result for *M. pneumoniae* (performed at the time of hospital admission), who were treated in the Respiratory - Cardiology Department at Hai Phong International Obstetrics and Paediatrics Hospital from July 1, 2024, to December 31, 2024, were included.

*Inclusion criteria*

Patients who met the diagnostic criteria for community-acquired pneumonia according to the World Health Organization (WHO) standards (5). These include symptoms such as: the child having a cough, increased respiratory rate according to age or difficulty breathing, and auscultation revealing coarse or fine moist rales, possibly accompanied by wheezing or snoring sounds. In addition, chest X-rays show scattered patchy opacities of varying sizes in both lung fields, concentrated around the pulmonary hilum and both sides of the heart, possibly localized to one lobe or a lung segment. The child underwent a Mycoplasma IgM test at the time of admission to the Respiratory – Cardiology Department at Hai Phong International Obstetrics and Paediatrics Hospital, which was positive for *M. pneumoniae (6).*

*Exclusion criteria*

Children diagnosed with *M. pneumoniae* pneumonia whose families do not consent to participate in the study or whose medical records do not contain sufficient data required for the research.

**Research design:** This is a case-series study.

**Sample size and sampling method:** Convenience sampling was used, with the sample size including all patients who met the inclusion criteria during the study period.

**Data collection methods:** Research data were collected through clinical examinations of cases by experienced pediatric respiratory specialists and by extracting information from medical records that met the study criteria, using a pre-designed data collection form.

**Data analysis:** Data were processed and analyzed using SPSS 23.0 software (IBM®, USA). Percentages, means, and standard deviations were calculated. Percentage comparisons were made using the *Fisher* exact test, and p-values were determined. Differences were considered statistically significant when $p < 0.05$.

**Research ethics:** All collected information will be used solely for research purposes. This study has been approved by the Scientific and Technological Research Proposal Review Board at Hai Phong University of Medicine and Pharmacy (approval code: HPMU.ĐTCS.2024.89,

Decision No. 2004/QĐ-YDHP dated September 30, 2024) and has received consent from Hai Phong International Obstetrics and Paediatrics Hospital.

## RESULTS

During the study period, 192 patients met the selection criteria and were included in the study. Some of the main research results are as follows.

**Table 1.** *Some general characteristics of children with pneumonia caused by M. pneumoniae (n=192)*

| Characteristics | | Number of patients (n) | Ratio (%) |
|---|---|---|---|
| **Age** (mean: 43.57 ± 29.54 months) | 2 months – <1 year | 4 | 2,1 |
| | 1 year – <3 years | 86 | 44,8 |
| | 3 years – <5 years | 60 | 31,3 |
| | 5 years – <10 years | 35 | 18,2 |
| | ≥10 years | 7 | 3,6 |
| **Sex** | Male | 101 | 52,6 |
| | Female | 91 | 47,4 |
| **Duration from symptoms onset to hospital admission** | ≤ 7 days | 134 | 69,8 |
| | > 7 days | 58 | 30,2 |

**Comments:** The average age of children in the study was 43.57 ± 29.54 months, with a median age of 36 months. The youngest patient was 6 months old, and the oldest was 171 months old. The age group with the highest number of cases was from 1 month to under 3 years old. Most patients exhibited symptoms for 7 days before hospital admission (69.8%). The average duration of illness prior to admission was 8.2 ± 8.5 days.

**Table 2.** *Symptoms upon admission of children with pneumonia caused by M. pneumoniae (n=192)*

| Symptoms | | Number of patients (n) | | Ratio (%) | |
|---|---|---|---|---|---|
| **Cough** | **Productive cough** | 181 | 191 | 94.3 | 99.5 |
| | **Dry cough** | 10 | | 5.2 | |
| **Fever** | **Mild fever** | 28 | 103 | 14.6 | 53.7 |
| | **Moderate fever** | 41 | | 21.4 | |
| | **High fever** | 30 | | 15.6 | |
| | **Very high fever** | 4 | | 2.1 | |
| **Wheezing** | | 87 | | 45.3 | |
| **Dyspnea** | | 13 | | 6.8 | |
| **Stomachache** | | 1 | | 0.5 | |

**Comments:** Cough was present in almost all cases, mainly productive cough. Among children with fever, moderate and high fever accounted for the highest proportion. Wheezing was also a common symptom in children with pneumonia caused by *M. pneumoniae*. Extrapulmonary symptoms were rarely recorded.

***Table 3.*** *Physical signs of children with pneumonia caused by M. pneumoniae (n=192)*

| Physical signs | Number of patients (n) | Ratio (%) |
|---|---|---|
| **Tachypnea** | 180 | 93.8 |
| **Rales** | 153 | 79.7 |
| **Wheezes/ Rhonchus** | 154 | 80.2 |
| **Chest retractions** | 8 | 4.2 |
| **Pleural effusion** | 1 | 0.5 |

**Comments:** Most children had age-appropriate tachypnea (93.8%). Pulmonary rales were found in a large proportion of cases. Only 4.2% of children had chest indrawing and 1 child had pleural effusion.

***Table 4.*** *Paraclinical characteristics of children with pneumonia caused by M. pneumoniae (n=192)*

| Paraclinical characteristics | | Number of patients (n) | Ratio (%) |
|---|---|---|---|
| **White blood cell count** (average: 12.47±5.49 G/l; lowest: 3.18 G/l; highest: 33.6 G/l) | Increased | 82 | 42.7 |
| | Normal | 107 | 55.7 |
| | Decreased | 3 | 1.6 |
| **Serum CRP quantification** (average: 11.96±22.71 mg/l, highest: 184.31 mg/l) | Increased | 69 | 35.9 |
| | Normal | 123 | 64.1 |
| **Lesions on chest X-ray** | Thickening of bronchial walls | 144 | 75 |
| | Alveolar infiltration | 108 | 56.3 |
| | Unilobular infiltration | 12 | 6.2 |
| | Unilateral multi-lobar infiltration | 2 | 1 |
| | Consolidation lesions | 1 | 0.5 |
| | Pleural effusion | 1 | 0.5 |

**Comments:** Peripheral leukocytosis and elevated serum CRP and alveolar infiltration are quite common symptoms. Infiltrative lesions in the lobe or segment of the lung account for a small proportion (15 cases, equivalent to 7.7%).

***Table 5.*** *Distribution of patients with lobar pneumonia by age group*

| Lesions / Age | Lobar pneumonia (n=12) | | Pneumonia (n=180) | | p |
|---|---|---|---|---|---|
| **≥5 y/o** | 7 | 58.3% | 35 | 19.4% | 0.005 |

| | | | | |
|---|---|---|---|---|
| **<5 y/o** | 5 | 41.7% | 145 | 80.6% |

**Comments:** The proportion of lobar pneumonia lesions in children aged ≥5 years was significantly higher than in those under 5 years old (p = 0.005; *Fisher*'s exact test).

## DISCUSSION

The present study highlights important epidemiological and clinical characteristics of *Mycoplasma pneumoniae* (*M. pneumoniae*) pneumonia in pediatric patients. The mean age of affected children was 43.57 ± 29.54 months, with a median age of 36 months (3 years). These findings are consistent with previous reports indicating that *M. pneumoniae* infections, although more common in school-aged children and adolescents, can also significantly affect younger age groups, particularly under five years old (7, 8). Interestingly, the most affected age group in our study was children aged 1 month to <3 years, and 78.1% of all cases occurred in children under 5 years old. This suggests a possible shift in the age distribution or increased recognition of *M. pneumoniae* in younger children, which aligns with recent observations from several studies showing that atypical pneumonia pathogens are increasingly identified in younger age groups due to improved diagnostic modalities (9, 10). The youngest patient in our cohort was 6 months old, highlighting that even infants are not exempt from *M. pneumoniae* infection. Dispite traditionally considered a pathogen of older children, increasing reports suggest that infants and toddlers can also be susceptible to *M. pneumoniae*, particularly during epidemic periods or in settings with high transmission rates (Atkinson et al., 2008). The clinical course before hospital admission was relatively prolonged in many patients. The average duration of illness prior to admission was 8.2 ± 8.5 days, and nearly 70% of the patients had been symptomatic for at least 7 days before seeking care. This delayed presentation is characteristic of *M. pneumoniae* infection, which typically has a gradual onset with nonspecific symptoms that can mimic viral respiratory illnesses in the early stages (11). The prolonged pre-admission duration may also reflect challenges in early diagnosis, especially in younger children who may present with milder or atypical symptoms initially. These findings underscore the importance of considering *M. pneumoniae* as a potential causative agent of community-acquired pneumonia (CAP) even in children under five, particularly those with persistent symptoms unresponsive to first-line antibiotics targeting typical bacteria. Early identification and appropriate antibiotic therapy (e.g., macrolides) may help reduce the duration of illness and hospitalization in such cases.

The clinical presentation of *M. pneumoniae* pneumonia in children can be highly variable, ranging from mild respiratory symptoms to more severe manifestations. In our study, cough was present in nearly all cases, with productive cough being the predominant type. This finding is consistent with prior studies, which have identified persistent cough as the hallmark of *M. pneumoniae* infection, often lasting beyond the acute phase of illness (8, 12). While traditionally described as a dry cough, productive cough can also be seen, especially when there is secondary bacterial infection or increased mucus production due to airway inflammation (7).

Fever was another common symptom, with the majority of children experiencing moderate to high-grade fever. This aligns

with previous research indicating that fever is typically present in children with *M. pneumoniae* pneumonia and may persist for several days despite the gradual onset of other symptoms (13). The persistence and intensity of fever can sometimes lead to misdiagnosis or delayed recognition, particularly in younger children. Wheezing was frequently observed in our patient cohort, highlighting a well-documented, though sometimes underappreciated, aspect of *M. pneumoniae* infection in children. Wheezing and other signs of lower airway involvement are often reported, especially in younger patients or those with pre-existing reactive airway disease. It is suggested that *M. pneumoniae* can trigger or exacerbate airway hyperresponsiveness through direct epithelial damage and immune-mediated mechanisms (14, 15). This wheezing may sometimes mimic or overlap with asthma, making clinical differentiation challenging. In contrast, extrapulmonary symptoms were rarely recorded in our population. While *M. pneumoniae* is known to cause a wide range of extrapulmonary complications—including dermatological, neurological, and cardiac manifestations—these tend to occur less frequently in children and may be more common in severe or prolonged cases (12, 16). The low incidence of such symptoms in our study may reflect the generally mild-to-moderate nature of illness in this cohort or the timing of presentation. Overall, the symptom profile observed supports previous findings that *M. pneumoniae* pneumonia often presents with persistent cough, fever, and wheezing, while extrapulmonary manifestations are less common in pediatric populations. Recognizing this typical pattern is essential for early diagnosis and timely initiation of appropriate antibiotic therapy, particularly in cases not responding to standard treatment for typical bacterial pneumonia.

In our study, age-appropriate tachypnea was observed in the vast majority of children with *M. pneumoniae* pneumonia (93.8%), confirming its role as a sensitive early indicator of lower respiratory tract involvement in pediatric pneumonia. Tachypnea is widely recognized as a cardinal sign of pneumonia in children and is included in the World Health Organization (WHO) criteria for diagnosing community-acquired pneumonia (CAP) in resource-limited settings (5). Although *M. pneumoniae* often causes atypical or milder forms of pneumonia compared to typical bacterial pathogens, our findings suggest that respiratory rate abnormalities remain a prominent clinical feature even in atypical cases, particularly in younger age groups (14).

Pulmonary rales were also present in a large proportion of children. Rales typically reflect alveolar or small airway involvement and are common in *M. pneumoniae* infections due to the organism's ability to adhere to and damage the respiratory epithelium, leading to interstitial inflammation and mucus accumulation (8). These auscultatory findings may help distinguish *M. pneumoniae* pneumonia from purely viral infections, where wheezing may dominate in the absence of focal crackles. Notably, chest indrawing, a clinical marker of more severe pneumonia, was relatively rare (4.2%), and pleural effusion was observed in only a single case. This is consistent with the typically mild to moderate disease course seen in *M. pneumoniae* infections in children, which usually lack signs of severe respiratory distress or complications (9). Chest indrawing is more frequently associated with typical bacterial pathogens like *Streptococcus pneumoniae* or *Haemophilus*

*influenzae*, which often cause lobar consolidation and alveolar filling (17). In contrast, *M. pneumoniae* tends to cause more diffuse interstitial or peribronchial infiltrates with less pleural involvement, although complications such as pleural effusion can occur, particularly in severe or delayed cases (16).

The low incidence of pleural effusion (1 child) in this cohort further supports the notion that while *M. pneumoniae* is a significant cause of pediatric CAP, it is generally not associated with extensive pleural disease. When present, pleural effusions in *M. pneumoniae* are usually small and transient and may be immune-mediated rather than due to direct bacterial invasion (12). These clinical findings emphasize that although *M. pneumoniae* pneumonia may not always present with dramatic physical signs, tachypnea and pulmonary rales are reliable markers, while features of severe disease such as chest indrawing or pleural effusion are uncommon. Clinicians should maintain a high index of suspicion for atypical pneumonia in children with persistent cough, abnormal auscultation, and tachypnea, even in the absence of overt respiratory distress.

In our study, leukocytosis in peripheral blood and elevated serum C-reactive protein (CRP) levels were commonly observed among children diagnosed with *M. pneumoniae* pneumonia. These findings support previous reports indicating that although *M. pneumoniae* is often associated with milder or atypical pneumonia, systemic inflammatory markers such as leukocyte count and CRP can still be elevated, particularly in moderate to severe cases (7, 14). However, it is important to note that these markers are nonspecific and may overlap with findings in typical bacterial or viral pneumonia, which can complicate early clinical differentiation. Leukocytosis in *M. pneumoniae* infection is typically less pronounced than in pneumonias caused by typical bacteria such as *Streptococcus pneumoniae*, but elevated white blood cell counts can still be observed, particularly in younger children or those with secondary bacterial infection (8). Similarly, CRP levels tend to be moderately elevated in *M. pneumoniae* infections, though generally lower than in typical bacterial pneumonias. In fact, some studies suggest that CRP levels in *M. pneumoniae* pneumonia may serve as a marker of disease severity rather than diagnostic specificity (18).

Radiological evaluation in our cohort showed that alveolar infiltrates were the most common pattern observed, while lobar or segmental infiltrates were relatively uncommon, found in only 15 cases (7.7%). This aligns with the typical radiographic presentation of *M. pneumoniae* pneumonia, which often shows patchy, bilateral, or interstitial infiltrates rather than classic lobar consolidation (9, 12). In younger children, however, alveolar infiltrates may predominate due to age-related differences in immune response and lung architecture. The relatively low proportion of lobar or segmental infiltrates in our study further supports the idea that *M. pneumoniae* is more likely to cause diffuse or peribronchial infiltrates, rather than focal consolidation. This is important in the differential diagnosis of pediatric pneumonia, as lobar consolidation is more suggestive of bacterial etiology, while patchy or diffuse infiltrates raise the possibility of atypical pathogens, including *M. pneumoniae* and certain viruses (19). Overall, the combination of elevated inflammatory markers and non-lobar radiologic findings in *M. pneumoniae* pneumonia highlights the need for clinicians

to maintain a broad differential diagnosis when managing pediatric pneumonia, particularly in cases where initial treatment for typical bacteria does not lead to improvement.

Our study found that children aged ≥5 years had a statistically significant higher rate of lobar pneumonia-like lesions compared to those under 5 years old (p = 0.005, *Fisher* exact test). This age-dependent difference in radiographic presentation is consistent with existing literature, which suggests that older children are more likely to present with localized lobar or segmental infiltrates, while younger children typically exhibit diffuse, interstitial, or peribronchial infiltrates (9, 14). Several factors may contribute to this discrepancy. In older children, the immune system is more mature and capable of mounting a stronger, localized inflammatory response, which can result in the radiological appearance of lobar consolidation even with atypical pathogens such as *M. pneumoniae (13)*. In contrast, younger children often present with more nonspecific radiologic findings, likely due to differences in immune response and lung structure, including smaller airways and a more diffuse pattern of infection (20). Moreover, *M. pneumoniae* is known for its variable radiographic manifestations, which can range from perihilar and interstitial infiltrates to lobar consolidation. However, several studies have noted that lobar infiltrates are more frequently observed in school-aged children and adolescents, who represent the classic demographic for *M. pneumoniae* infection (7, 8). This supports our finding that radiological features in older children may mimic those of typical bacterial pneumonia, potentially complicating clinical differentiation without confirmatory testing. Importantly, the presence of lobar pneumonia-like lesions in older children with *M. pneumoniae* infection may lead to misdiagnosis and unnecessary use of β-lactam antibiotics, which are ineffective against this pathogen. Recognizing the possibility of *M. pneumoniae* in older children with lobar pneumonia is essential for guiding appropriate empirical therapy, particularly the use of macrolides. In summary, our finding highlights a significant age-related variation in radiologic presentation, with lobar pneumonia-like lesions more commonly seen in children aged ≥5 years. This underscores the importance of considering patient age when interpreting chest radiographs and forming a differential diagnosis for community-acquired pneumonia in children.

## CONCLUSION

Pneumonia caused by *M. pneumoniae* in children at Hai Phong International Obstetrics and Paediatrics Hospital in 2024 predominantly affected those under 3 years old and presented mainly with respiratory symptoms such as productive cough, fever, wheezing, and age-appropriate tachypnea. Extrapulmonary manifestations were uncommon, and severe signs like chest indrawing or pleural effusion were rare. These findings highlight the importance of early recognition and appropriate management of *M. pneumoniae* pneumonia based on common clinical and epidemiological patterns in the pediatric population.

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