



## OPTIMIZATION OF EARLY DIAGNOSIS AND PREVENTION CLINICAL COURSE OF MODERATE PNEUMONIA IN CHILDREN

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### ABSTRACT

*Pneumonia is an important respiratory infection that affects millions of children worldwide, causing illness and death. Among lower tract infections, pneumonia is one of the most serious respiratory problems in childhood. Pneumonia is the single largest contributor of childhood mortality worldwide, killing an estimated 1 million children under 5 years of age annually.*

Pneumonia is an infection of the lower respiratory tract that involves airways and parenchyma with consolidation of the alveolar spaces. Infectious agents that commonly cause community-acquired pneumonia vary by age. Streptococcus pneumoniae is the most common bacterial cause of pneumonia (particularly lobar pneumonia) and occurs in children of any age outside the neonatal period. Other common causes include respiratory syncytial virus (RSV) in infants, other respiratory viruses (parainfluenza viruses, influenza viruses, human metapneumovirus, adenoviruses) in children younger than 5 years old, and Mycoplasma pneumoniae in children older than age 5 years. M. pneumoniae and Chlamydia pneumoniae are principal causes of atypical pneumonia. Age is a determinant in the clinical manifestations of pneumonia. Causes of pneumonia in immunocompromised persons include gram-negative enteric bacteria, mycobacteria (M. avium complex), fungi (aspergillosis), viruses (CMV), and Pneumocystis jirovecii (formerly carinii). Additional agents occasionally cause pneumonia. Severe acute respiratory syndrome (SARS) is due to SARS-associated coronavirus (SARS-CoV) or SARS-CoV-2, the cause of the coronavirus infectious disease (COVID-19) pandemic. SARS-CoV-2 is an emerging pathogen but appears to cause less mortality in children than in adults; in addition to respiratory disease, it is also associated with a postinfectious multisystem inflammatory syndrome similar but not the same as Kawasaki disease

Neonates may have fever or hypoxia only, with subtle or absent physical examination findings. With a young infant, apnea may be the first sign of pneumonia. Fever, chills, tachypnea, cough, malaise, pleuritic chest pain, retractions, and apprehension because of difficulty breathing or shortness of breath are common in older infants and children. Other common features include abdominal pain and diarrhea, headache, sore throat, as well as loss of taste or smell sensations. Severe involvement includes worsening dyspnea, hypoxia, and

greater than 50% lung infiltrates on imaging. Viral pneumonias are generally associated more often with cough, wheezing, or stridor; fever is less prominent than with bacterial pneumonia. Mucosal congestion and upper airway inflammation suggest a viral infection. Bacterial pneumonias are typically associated with higher fever, chills, cough, dyspnea, and auscultatory findings of lung consolidation. Atypical pneumonia in young infants is characterized by tachypnea, cough, and crackles on auscultation. Dullness to percussion may be due to lobar or segmental infiltrates or pleural fluid. Auscultation may be normal in early or very focal pneumonia, but the presence of localized crackles, rhonchi, and wheezes may help one detect and locate pneumonia. Distant breath sounds may indicate a large, poorly ventilated area of consolidation or pleural fluid.

The white blood cell (WBC) count with viral pneumonias is often normal or mildly elevated, with a predominance of lymphocytes, whereas with bacterial pneumonias, the WBC count can be elevated ( $>15,000\text{--}20,000/\text{mm}^3$ ) and with a predominance of neutrophils. Mild eosinophilia is characteristic of infant *C. trachomatis* pneumonia. Blood cultures should be performed on moderately to severely ill, hospitalized children to attempt to diagnose a bacterial cause of pneumonia. Polymerase chain reaction (PCR) or rapid viral antigen detection. *M. pneumoniae* can be confirmed by Mycoplasma PCR. CMV pneumonitis can be diagnosed with PCR from broncho-alveolar lavage fluid. The diagnosis of *M. tuberculosis* is established by the tuberculin skin test, serum interferon- $\gamma$  release assay, or analysis of sputum or gastric aspirates by culture, antigen detection, or PCR. The need to establish an etiologic diagnosis of pneumonia is greater in immunocompromised patients, patients with recurrent pneumonia, or those with pneumonia unresponsive to empirical therapy. For these patients, bronchoscopy with bronchoalveolar lavage and brush mucosal biopsy, needle aspiration of the lung, and open lung biopsy are methods of obtaining material for microbiologic diagnosis. Frontal and lateral radiographs are required to localize disease and adequately visualize retrocardiac infiltrates; they are recommended for diagnosis among hospitalized children but are not necessary to confirm the diagnosis in well-appearing outpatients. Computer tomography (CT) is used to evaluate serious disease, lung abscesses, bronchiectasis, and effusion characteristics.

Therapy for pneumonia includes supportive and specific treatment and depends on the degree of illness, complications, and knowledge of the infectious agent likely causing the pneumonia. Most cases of pneumonia in healthy children can be managed on an outpatient basis. However, children with hypoxemia, inability to maintain adequate hydration, or moderate to severe respiratory distress should be hospitalized. Hospitalization should be considered in infants under 6 months with suspected bacterial pneumonia, those in whom there is a concern for a pathogen with increased virulence (e.g., methicillin-resistant *S. aureus* [MRSA]), or when concern exists about a family's ability to care for the child and to assess symptom progression. Because viruses cause many community-acquired pneumonias in young children, not all children require empiric antibiotic treatment for pneumonia. Presumed pneumococcal pneumonia can be treated with high-dose ampicillin therapy. Ceftriaxone and/or vancomycin can be used if the isolate shows high-level resistance and the patient is severely ill. For infants 2–18 weeks old with afebrile pneumonia most likely caused by *C. trachomatis*, a macrolide is the recommended treatment. Severe or critical COVID-19 is treated with oxygen, dexamethasone, remdesivir, mechanical ventilation, and ECMO

Prevention of pneumonia in children includes several measures:

- Provide recommended vaccines for children, including Haemophilus influenzae vaccination against type b (Hib), pneumococcal, pertussis (whooping cough) and influenza.
- Encourage regular hand washing, covering the mouth and nose while coughing or sneezing and not having close contact with sick people.
- Encourage only breastfeeding in the first six months of a child's life, because breast milk contains important antibodies that help protect against infections and provides nutrients.
- Avoid exposure to environmental risk factors, including tobacco smoke in this regard, keeping children away from smoke, because it increases the risk of respiratory tract infections. Preventing improper child feeding, malnutrition and eliminate overeating and provide adequate nutrition for children because malnourished children are more susceptible to infections. Pneumonia remains a major health problem for children worldwide.

Acute pneumonia among children can be significantly reduced by early diagnosis, effective treatment, rehabilitation, ambulatory control, promotion of vaccination and reduction of environmental risk factors. It is necessary to detect early signs of pneumonia and seek medical help immediately. Continued research and collaborative efforts among health professionals and researchers are needed, prioritizing preventive measures and early disease detection and effective treatment.

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