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ORIGINAL ARTICLE

Etiology of acute bronchiolitis and the relationship with meteorological conditions in hospitalized infants in China



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KEYWORDS

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Background/Purpose: To investigate the prevalence of common viruses and *Mycoplasma pneumoniae* (MP) in hospitalized infants with acute bronchiolitis and study the relationship between bronchiolitis and meteorological conditions.

Methods: A 2-year prospective study was conducted on infants with a first episode of bronchiolitis admitted to Respiratory Department of Suzhou Children's Hospital. Demographic and clinical characteristics and meteorological conditions were obtained and analyzed.

Results: Pathogens were identified in 59.6% of 998 cases analyzed. The most frequent pathogen identified was respiratory syncytial virus (28.7%), followed by human bocavirus (11.6%), MP (9.0%), human parainfluenza virus-3 (7.8%), human metapneumovirus (6.6%), influenza A (3.5%), adenovirus (1.0%), and human parainfluenza virus-1 (0.3%). The clinical scores in children with MP or human metapneumovirus single infections, based on the assessment of severity of acute bronchiolitis, were significantly lower than in children with respiratory syncytial virus single infections. Respiratory syncytial virus had the strongest inverse correlation with mean temperature, followed by influenza A and human metapneumovirus. In addition, MP and human parainfluenza virus-3 showed positive correlations with mean temperature.

Conclusion: Although respiratory syncytial virus was the most frequent pathogen in patients in whom bronchiolitis was diagnosed, other pathogens, including newly identified viruses and MP,

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also play important roles in infants with bronchiolitis. Different respiratory pathogens have different traits in response to certain meteorological conditions.

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Introduction

Bronchiolitis is a disorder that most commonly occurs in infants younger than 2 years via viral infection of the lower respiratory tract. It is characterized by acute inflammation, edema, and necrosis of epithelial cells that line the small airways, increased mucus production, and bronchospasm.¹ It is the leading cause of hospitalization of infants younger than 2 years, and more than 80% of children hospitalized are younger than 6 months. Importantly, disease severity is directly related to the size and maturity of the infant.

Several pathogens can cause similar signs and symptoms, including viruses and atypical bacteria. The most common etiology is infection with respiratory syncytial virus (RSV), with the highest incidence of RSV infection occurring between December and March.² Ninety percent of children are infected with RSV in the first 2 years of life,³ and up to 40% of them will develop a lower respiratory tract infection.^{4,5} Other viruses identified as causing bronchiolitis are human metapneumovirus (hMPV), human bocavirus (HBoV), influenza (IV), adenovirus (ADV), and human parainfluenza viruses (HPIVs). To date, there have been a limited number of studies on *Mycoplasma pneumoniae* (MP) infections in infants with bronchiolitis. This atypical bacterium may be an important infectious agent that induces the severe illness of acute bronchiolitis.⁶

Several studies have been performed to investigate the possible relationship between meteorological factors and respiratory pathogens, and the use of a single-center study to explore the relationship between bronchiolitis and meteorological conditions is rational given the number of patients seen at this institution each year.

Our study explored the viral and atypical bacterium etiology of hospitalized infants with bronchiolitis. We also aimed to describe the relationship between respiratory pathogens and meteorological conditions. A greater understanding of the etiology of bronchiolitis and the role of meteorological conditions is important for clinicians to master their knowledge base of different pathogens, make correct diagnoses, and avoid overprescribing antibiotic agents.

Materials and methods

Study design

This prospective cross-sectional study of children with bronchiolitis was conducted between January 2009 and December 2010 at the Children's Hospital affiliated to Suzhou University in Suzhou, China. The study was approved by the medical ethics committee of the hospital. Informed consent was obtained from parents or legal guardians. All patients were evaluated by an attending physician.

Patient population

From 2009 to 2010, 3134 children were consecutively hospitalized due to acute respiratory infection at the Respiratory Department of Suzhou Children's Hospital. Of these patients, 89 patients [bronchitis (15), bronchiolitis (33), and pneumonia (41)] were excluded because their parents refused to participate in the study. Nineteen children who presented with a history of chronic lung disease, underlying immunodeficiency states, or preexisting cardiac, renal, neurologic, or hepatic dysfunction, or bronchopulmonary malformation were excluded from the study. A total of 998 children admitted to Children's Hospital were identified with a diagnosis of acute bronchiolitis by an attending physician were enrolled in the study. Acute bronchiolitis was defined as the first episode of cough, rhinorrhea, wheezing, or rales, with chest radiographic findings of over-aeration and peribronchial infiltration with or without atelectasis in children younger than 2 years. Children with recurrent wheezing in whom bronchiolitis had been previously diagnosed and treated by a physician were excluded from the study.

Clinical data

During the hospital stay, the trained attending physician administered a study questionnaire and collected the clinical information. The severity of disease was assessed by clinical score using seven criteria (Table 1).

Specimens

We prospectively collected nasopharyngeal aspiration (NPA) fluids from all patients within 24 hours of admission

Table 1 Seven-component bronchiolitis clinical score system for assessing the severity of acute bronchiolitis.

Score	0	1	2
Heart rate (beats/min)	<120	120–160	>160
Wheezing	None	Audible wheezing with auscultation	Audible wheezing without auscultation
Respiratory rate breaths/min	20–40	40–60	>60
Dyspnea	Nil	Yes, without cyanosis	Yes, with cyanosis
Respiratory support	Nil	Oxygen tent	Respirator
Feeding difficulties	Absent	Mild	Serious
Duration of hospital stay (days)	<6	6–10	>10

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