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Original article

Parainfluenza virus as a cause of acute respiratory infection in hospitalized children[☆]



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ABSTRACT

Background: Human parainfluenza viruses account for a significant proportion of lower respiratory tract infections in children.

Objective: To assess the prevalence of Human parainfluenza viruses as a cause of acute respiratory infection and to compare clinical data for this infection against those of the human respiratory syncytial virus.

Methods: A prospective study in children younger than five years with acute respiratory infection was conducted. Detection of respiratory viruses in nasopharyngeal aspirate samples was performed using the indirect immunofluorescence reaction. Length of hospital stay, age, clinical history and physical exam, clinical diagnoses, and evolution (admission to Intensive Care Unit or general ward, discharge or death) were assessed. Past personal (premature birth and cardiopathy) as well as family (smoking and atopy) medical factors were also assessed.

Results: A total of 585 patients were included with a median age of 7.9 months and median hospital stay of six days. No difference between the HRSV+ and HPIV+ groups was found in terms of age, gender or length of hospital stay. The HRSV+ group had more fever and cough. Need for admission to the Intensive Care Unit was similar for both groups but more deaths were recorded in the HPIV+ group. The occurrence of parainfluenza peaked during the autumn in the first two years of the study.

Conclusion: Parainfluenza was responsible for significant morbidity, proving to be the second-most prevalent viral agent in this population after respiratory syncytial virus. No difference in clinical presentation was found between the two groups, but mortality was higher in the HPIV+ group.

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Introduction

Acute respiratory tract infections (ARTIs) in childhood are a major cause of morbidity and mortality, with pneumonia being the leading cause of death among children between one and five years old.^{1,2} Viruses are the predominant etiology of ARTIs in this pediatric group.^{3–5}

The human parainfluenza viruses (HPIVs) account for a significant proportion of lower respiratory tract infections in children, where their rates of detection vary with pathology (respiratory infection of the upper or lower tract) and with the investigation setting (outpatient units or hospital wards).⁶

With the attention of parents and medical professionals firmly focused on annual outbreaks of respiratory syncytial virus (HRSV) and influenza, HPIV infections can be overlooked.⁷ However, HPIVs are the second most common cause of lower and upper respiratory tract infections in children younger than five years after HRSV.^{8–11}

This prospective study was conducted to determine the prevalence of HPIVs in children hospitalized for ARTI, assess the clinical characteristics of HPIV+ and HRSV+ patients, and to compare the two groups identifying any specific features of infections caused by HPIVs. Seasonality was also examined in the present study.

Methods

This prospective study included all children with ARTI younger than five years with prodromes of upper respiratory tract infections (URTIs) on clinical history, admitted to the hospital general wards or Intensive Care Unit (ICU) of the Department of Pediatrics of Santa Casa de São Paulo Hospital (São Paulo city), between February 2005 and May 2007. After 2007, surveillance continued but using other methodology for diagnosing viral infections. Immunosuppressed patients like HIV-infected, and those with neoplasia or transplantations were excluded.

The Central Hospital at Santa Casa de São Paulo is a reference university hospital for the central and northern region of the city providing high complexity care, including emergency care. Approximately 60,000 patients receive medical attention annually at urgency and emergency units. Out of 9500 admissions during the study period, around one-third was due to respiratory infections. Data on clinical characteristics and demographics were collected at patient admission. The study was approved by the Research Ethics Committee of the Hospital under the number 064/09. Prior to inclusion in the study, parents or legal guardians of the patients signed a free and informed consent form. ARTI was defined as the presence of two or more signs of inferior respiratory tract involvement: respiratory dysfunction, characterized by fatigue, tachypnea, wheezing, crackling, and/or fever (axillar temperature of 37.8 °C) on physical exam. The prodromes of URTIs were characterized by the presence of coryza, sneezing, and/or nasal obstruction. Disease history was considered in the last five days. Bronchiolitis was characterized by first episodes of wheezing in infants with URTI prodromes; children with previous episodes of pulmonary wheezing were diagnosed as

recurrent wheezing, while acute crisis was characterized as acute wheezing. Cases with crackles on pulmonary auscultation and lung consolidation on chest radiography exams were considered alveolar pneumonia, whereas cases with diffuse infiltration and with crackling on pulmonary auscultation were diagnosed as non-alveolar pneumonia.

All patients included in the study had samples of nasopharyngeal secretion collected within the first 24 h of admission. Samples were then stored on ice and sent to the Adolfo Lutz institute for Indirect Immunofluorescence (IIF), performed using a panel of five monoclonal antibodies specific for HRSV, Influenza A and B, HPIV 1, 2 and 3, and Adenovirus, for the detection of seven viruses (Kit Light Diagnostic TM, Chemicon International Inc, Temecula, USA).

Variables analyzed included age, gender, admission date, clinical characteristics (cough, fever, shortness of breath, and apnea), data on physical exam (wheezing, dyspnea, cyanosis, inspiratory nasal wing collapse), clinical diagnoses, personal (cardiopathy, premature birth, and gastroesophageic reflux) and family (smoking and atopy) medical histories, patient hospital ward (general or ICU), and outcome (discharge or death).

Patients were categorized into two groups (HPIV+ or HRSV+ on IIF) and subsequently compared. Medians of quantitative variables were compared using the Mann–Whitney test. Qualitative variables were analyzed by comparing proportions in each group using the Chi-square or Fisher's exact tests as applicable. The level of significance was set at 0.05. All statistical tests were performed using the Sigma Stat program version 3.5.

Results

A total of 585 patients were included in the study. HPIVs were detected in 45 patients, corresponding to 19.9% of all positive cases, and 7.7% of children overall. The HRSV was the most frequently detected viral agent (26.5%). IIF was positive for influenza in 3.42% of patients and adenovirus in 1%. The clinical data of the HPIV-positive patients was compared against data from HRSV-positive subjects (see Table 1). A total of 44.4% of HPIV positive patients were female versus 43.9% in the HRSV-positive group. Median age was similar among HPIV+ and HRSV groups, 6.8 and 7.1 months, respectively. Length of hospital stay (median six days) was also similar in the two groups. Comparing signs and symptoms of acute lower respiratory tract infection between HPIV+ and HRSV+ groups revealed greater proportion of cough (96.1% vs 82.2%, $p < 0.05$) and fever (72.3% vs 48.9%, $p < 0.05$) in the HRSV group. No statistically significant difference was found for the other signs and symptoms examined, including shortness of breath, wheezing, dyspnea, and cyanosis. The most frequent diagnoses in the HPIV+ group were acute wheezing (28.9%), non-alveolar pneumonia associated to acute wheezing (26.7%), and bronchiolitis (22.2%). In the HRSV+ group diagnoses were bronchiolitis (35.5%), non-alveolar pneumonia associated with acute wheezing (27.1%), and acute wheezing (14.5%). Both groups were similar with regard to past personal medical history of premature birth, congenital cardiopathy, and gastroesophageic reflux disease, as well as for family history of atopy and smoking (Table 1). Of the patients in the

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