Research Letter

Clinical manifestations and outcomes of respiratory syncytial virus infection in children less than two years in Colombia

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ABSTRACT

This retrospective study describes the epidemiology and identifies risk factors associated with severe complications in lower respiratory tract infection (LRTI) due to respiratory syncytial virus (RSV) in a population of infants hospitalized in a tertiary care hospital in a tropical region of Colombia. A severe complication in RSV LRTI was defined as the presence of SpO2 ≤ 90% in the emergency room and/or pneumonia and/or atelectasis and/or sepsis and/or respiratory failure during hospitalization.

RSV was detected in 193 (46.3%) of 417 patients with LRTI. The average hospital stay lasted for 5.9 days. Severe hypoxemia (SpO2≤ 90% in the emergency department) was resent in 57.5% of the patients. After controlling for potential confounders, comorbidities bronchopulmonary dysplasia, congenital heart disease, length of hospital stay, and alveolar infiltrates in X-ray were independent predictors of severe complications in RSV LRTI.

Keywords: *Complications, Outcome, Predictors*.

The epidemiology and severity of lower respiratory tract (LRTI) due to respiratory syncytial virus (RSV) in tropical regions may differ from that in other climates [1]. This study aims to describe the epidemiology and identify risk factors associated with severe complications in RSV LRTI in a population of infants hospitalized in a tertiary care hospital in a tropical region of Colombia [2-4].

This review of medical records included all infants under two years of age in tertiary centers, in Rionegro, Colombia included to RSV LRTI (ICD-10 code: J21.0) according to the National clinical guideline of bronchiolitis (first wheezing episode younger than 24 months of age) [5] from January, 2015 to December, 2016. Inclusion criteria were defined as children younger than two years of age admitted to the pediatric ward with a diagnosis of RSV confirmed using direct immunofluorescence (Light Diagnostics TM Respiratory Panel 1 DFA, Merck-Millipore Laboratory, Darmstadt, Germany). Patients without lower respiratory compromise, with positive bacterial cultures on admission, confirmed whooping cough (culture or PCR), referred from another hospital center were excluded. The study protocol was reviewed and approved by the Institutional Review Board.

We collected the following variables: age, sex, weight, height, signs and symptoms on admission (including fever, chest in drawing, chest auscultation, oxygen saturation, respiratory rate), history of prematurity, bronchopulmonary dysplasia, comorbidities (congenital heart disease of CHD, neurological disease, bronchopulmonary dysplasia) or BPD), results of chest *X*-rays and other medical test, drugs and other treatments, adverse drug reactions , and complications (pneumonia (5), atelectasis, sepsis, respiratory failure/ICU).

A composite outcome was used to define severe complications associated with RSV (SCRSV). This composite outcome was defined as the presence of oxygen saturation (SpO_2) $\leq$ 90% in the emergency room and/or pneumonia and/or atelectasis and/or sepsis and/or respiratory failure during hospitalization.

A sample size of 123 patients was estimated to find an OR of at least 1.5 between the presence of complicated RSV and the history of comorbidities with a 95% confidence level, 90% accuracy, and a minimum comorbidity frequency in patients without complicated RSV of 1% [3].

To identify factors independently associated with SCRSV, we used ordered logistic regression models to adjust for potential confounding variables. All statistical tests were two-tailed, and the significance level used was $P< 0.05$. The data were analyzed with Statistical Package Stata 15.0 (Stata Corporation, College Station, TX).

RSV was detected in 193 (46.3%) of 417 patients with LRTI and 16% patients were younger than 6 months of age. Only 1 patient (with a history of congenital heart disease) had received palivizumab. The majority (92%) required oxygen, and more than half had chest retractions in the emergency department. A third of all patients had a radiological abnormality (***Table* I**). On analyzing the data about seasonal distribution of RSV infections, there was two peaks of cases, the first between April and August, and the second between November to January; corresponding to the two rainy season in this region.

The median (IQR) hospital stay was 5.88 days [6]. Severe hypoxemia (SO2≤ 90% in the emergency department) was resent in 57.5% of the patients. Twenty three patients (11.9%) had pneumonia, and 9 (4.7%) patients experienced sepsis, 5 (2.6%) had atelectasis and 3 (1.5%) had respiratory failure. No patient had pneumothorax or died.

In bivariate analysis the following variables presented a significant association with ScRSV: age (OR 1.06 CI 95% 1.08-1.13), O2 supportive (OR 22.6 CI 95% 2.91-176.12), chest in drawing (OR 2.43 CI 95% 1.35-4.37), crackles in lung auscultation (OR 8.78 CI 95% 2.51-30.70), and alveolar infiltrates in *X*-ray (OR 8.78 CI 95% 2.51-30.70), length of hospital stay (OR 1.19 CI 95% 1.06-1.33), comorbidities (BPD,CHD, neurological) (OR 0.59 CI 95% 0.59-1.77). After controlling for these potential confounders, comorbidities (BPD, CHD, neurological) , length of hospital stay, and alveolar infiltrates in *X*-ray were independent predictors of SCRSV in our patients (***Table* II**).

In our study, the clinical characteristics and seasonal distribution was similar to previous reports from tropical regions [1,7,9]. Risk factors, including prematurity and underlying chronic illness were observed in frequencies similar to those observed in others populations [8-12]. The reported complications were similar to those in previous studies ranging between 6.5% to 23% [3,9-11].

Since this study was based on medical records review, we cannot included others variables such as passive smoking, maternal breastfeeding, environmental pollution. The study was conducted in a tertiary referral hospital and therefore the patients included represent the high severity, limiting the generalization of results to other contexts. However, the similarity of our population in term of clinical characteristics, risk factors and seasonality of RSV with previous reports suggest strength and consistency in our results.

RSV is an important cause of morbidity in children with bronchiolitis in tropical areas during the rainy season. Identifying groups at high-risk for severe complications, such patients with underlying chronic illnesses are essential to plan future interventions to reduce the burden of disease in these regions.

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Table I Characteristics of Children with Respiratory Syncytial Virus Pneumonia (N=193)

Variable. *n* (%)	***n* (%)**
Age (months), median (IQR)	5.66 (6)
Male, *n* (%)	113 (58.55)
Premature birth	28 (14.51)
Comorbidities (CHD or neurological)	11 (5.71)
BPD	7 (3.6)
Atopy	21 (10.88)
SpO2.median(ds)	88 (0.93)
O2 support, n(%)	178 (92.33)
Clinical and laboratory parameters	
Fever	53 (27.46)
Chest indrawing	102 (52.85)
Tachypnea	30 (15.54)
Rhonchi	78 (40.41)
Crepitation	36 (18.65)
Leucocytosis (> 15.000/mm^3)	31 (16.76)
Increased CRP (> 4 mg/lit.)	59 (44.81)
Chest X-ray	
Normal	22 (12.36)
peribronchial thickening	63 (35.39)
Hyperinflation	33 (18.54)
Atelectasis	5 (2.81)
Bilateral interstitial infiltrates	33 (18.54)
Alveolar infiltrates	22 (12.36)

CRP-C- reactive protein

Table II Independent Predictors of Severe Complications Associated with RSV

Variable	*OR*		*p value*
Age (months)	0.91 (0.76- 1.08)		0.340
Comorbidities (CHD. neurological)	21.45 (1.80-254)		0.015
Length of hospital stay	1.57 (1.26-1.94)		0.000
O2 supportive	0.72 (0.38-13.77)		0.832
Chest indrawing	1.07 (0.26-4.43)		0.918
alveolar infiltrates	12.93 (8.93-18.76)		0.000