

RESPIRATORY SYNCYTIAL VIRUS BRONCHIOLITIS: ARE ANTIBIOTICS NEEDED?

L.L. DRACEA¹ C.S. POPA²

Abstract: *Bronchiolitis is one of the most frequent respiratory infection in infants and young children that has a self-limited favorable outcome if no risk factors present. We conducted a retrospective study over a 4 months period on patients under 2 years of age, regarding antibiotic prescription in patients with diagnosis of RSV bronchiolitis. Data from clinical files were analyzed in correlation with presence of risk factors for adverse outcomes. Two thirds of study population underwent antibiotic treatment, even there were no justified medical criteria for prescription. Patients with a longer hospitalization, and with associated risk factors have fulfilled criteria for antibiotic prescription. Even there is no sustained reason of using antibiotics in uncomplicated bronchiolitis, uncertainty of diagnosis may determine pediatrician to start empirically antibiotic treatment. Review of clinical status and risk factors correlated with laboratory data, should sustain adherence to guidelines in order to discourage use of antibiotics in hospital settings.*

Keywords: *antibiotics, bronchiolitis, risk factors*

1. Introduction

Bronchiolitis is the major cause of hospitalization among infants and young children. Respiratory syncytial virus (RSV) is the most common etiology, responsible for up to 90% of bronchiolitis cases during RSV season (from November to March). It usually affects babies between three and six months of age. Respiratory syncytial virus may infect almost all children by the age of two years, and up to 50% of those will have had clinical symptoms of bronchiolitis [4].

The diagnosis of bronchiolitis is based on clinical and epidemiological findings [1].

Laboratory tests are unnecessary and usually used to exclude other diagnosis (bacterial pneumonia, sepsis, associated comorbidities). Bacterial and viral screening is important in helping confirm the etiology and also determine infection control for those patients that need hospitalization.

Etiological tests are not required, but recent studies showed that rapid laboratory diagnosis of respiratory syncytial infection will decrease the use of antibiotics and use of laboratory tests, being associated with shorter hospitalization [2]. Respiratory syncytial

¹ Faculty of Medicine, Transilvania University of Braşov

² Children's Clinical Hospital in Brasov

virus can be identified in the nasopharyngeal secretions using an immunofluorescence assay, culture or molecular biology techniques.

Treatment is usually symptomatic, including supplemental oxygen, fever control and intravenous fluids, if necessary.

According to national and international guidelines, clinicians are advised not to administer antibiotics to children with a diagnosis of bronchiolitis, unless a proven concomitant bacterial infection or a strong suspicion of one [1] [3].

Despite recommendations and viral etiology, antibiotics are often prescribed. Clinicians are tempted to use antibiotics in some cases, because of empirical diagnosis or certain associated risk factors.

2. Objectives

The aim of the study was to investigate the determinants of antibiotic prescription in respiratory syncytial virus bronchiolitis among hospitalized children.

3. Material and Methods

We conducted a retrospective study on patients hospitalized for respiratory syncytial virus bronchiolitis in the Clinical Emergency Children's Hospital of Braşov, over a 4 months period (September-December 2017).

Data was obtained from patients' clinical files. The analysis of medical records was based on:

- demographic data,
- clinical findings,
- laboratory tests,
- chest X-ray and
- drug prescription,
- risk factors for adverse outcomes

Patients with the following criteria were included:

- age under 2 years,
- diagnosis of lower respiratory tract infections (LRTI) at admission,
- diagnosis of respiratory syncytial virus bronchiolitis upon hospital discharge.

Any patients with a diagnosis of concomitant bacterial infection were excluded from the study.

Etiological diagnosis was performed using in vitro rapid diagnostic test for respiratory syncytial virus detection in nasopharyngeal secretions. According to the hospital protocol, at the time of the study, all infants and young children admitted for lower respiratory tract infections should have undergone nasopharyngeal swab upon admission in order to detect bacterial colonisation.

The study population was divided in two groups: A - with, and B - without antibiotic prescription and clinical files were analysed as mentioned before.

Evaluated risk factors for severe outcomes were:

- age under 3 months,
- history of prematurity,
- chronic or underlying cardiac and pulmonary diseases,
- transient immunodeficiency,
- malnutrition.

Statistical analysis was done using the Fisher test, considering a relevant p value <0.05.

4. Results and Discussions

Over the 4 months study period, 101 patients were diagnosed with RSV bronchiolitis upon hospital discharge. 37 patients were excluded because of

concomitant bacterial infections during hospitalization. Bacterial otitis media with effusion was the most commonly associated diagnosis (19 patients), followed by bacterial diarrhea (12 patients), urinary tract infection (3 patients), sepsis (2 patients) and tuberculosis contact (1 patient).

Finally, 64 patients met the inclusion criteria for our study.

Demographic analysis of the study population (n=64) revealed:

- median age of 6.5 months,
- no significant environmental differences (47% rural, 53% urban),
- male predominance (sex ratio 2:1 male: female),
- Caucasian race.

The mean hospitalization length was 6.68 days.

All patients with inclusion criteria in the study, did not meet the mentioned guidelines criteria for antibiotic prescription in RSV bronchiolitis. Despite this, 42 patients (65.6%), defined as group

A in our study, were identified as receiving antibiotic prescription.

The mean duration of antibiotic treatment was 5.52 days.

The antibiotics most commonly prescribed were intravenous penicillin (n=30; 46.8%), followed by cephalosporins (n=12; 18.7%) that were used for patients with risk factors for severe outcomes (Figure 1).

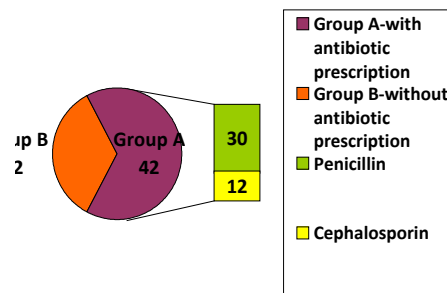


Fig. 1. Distribution of antibiotic prescription among groups of study population

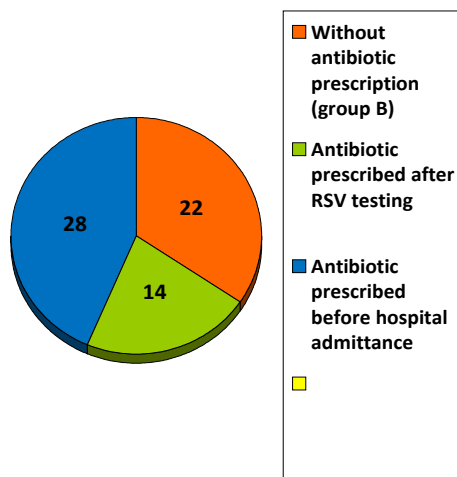


Fig. 2. Distribution of modality of antibiotic prescription among patients in study population

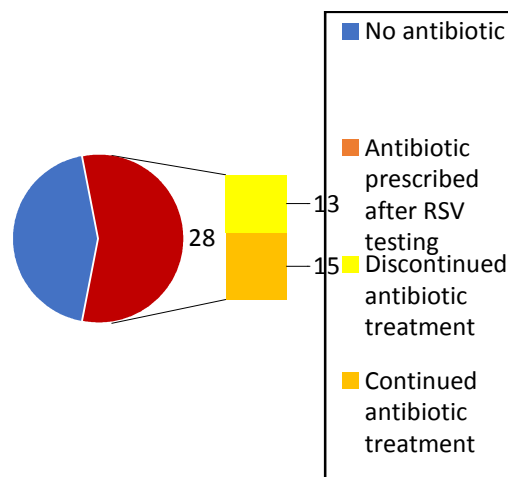


Fig. 3. Distribution of antibiotic prescription after positive RSV testing

23 patients (35.9%) out of 64 patients of the study population associated risk factors for severe outcome (Table. 1). Most of them received antibiotic treatment as it followed:

- 5 patients with history of prematurity below 32 weeks of gestation
- 3 patients with associated cardiac malformation
- 11 patients under 3 months of age at diagnosis

Only 4 patients with RSV bronchiolitis, under 3 months of age, did not receive antibiotic treatment.

Statistical analysis showed that any associated risk factor was correlated with antibiotic prescription ($p= 0.029$), and also with a longer hospitalization period. In group A, 19 patients had risk factors, compared to only 4 patients in group B. (Table 1) The medical decision for antibiotic use could have been justified for the patients with risk factors in group A, because of clinician's fear of bacterial complications.

Even the study population has been defined as being with RSV bronchiolitis, it was interesting to observe that 21 patients (32.8%) had already been prescribed oral antibiotic in the community before hospital admission. Among these patients, in 7 cases, antibiotic prescription has been discontinued upon admission.

In group A ($n=42$), 28 patients (43.7% of the study population), admitted with a diagnosis of lower respiratory tract infection, had empiric antibiotic treatment prescribed upon admission. Positive RSV testing resulted in discontinuation of antibiotic therapy in only 13 of these patients. (20.3%) (Fig. 2). For the rest of

the patients in group A ($n=14$, 21.8% of the study population), antibiotic has still been prescribed during hospitalization. Chest x-ray is usually not indicated in Bronchiolitis, interpretation can be misleading and should be discouraged in the absence of risk factors of severe outcome or clinical manifestations of deterioration. Even so, chest x-ray has been performed in 60 patients (93.7%) of the study population. All patients with chest x-ray changes interpreted as opacities ($n=5$, 7.8%) underwent antibiotic treatment, although there has no correlation been found with positive inflammatory markers in any of cases. For the 4 patients that haven't underwent chest x-ray, antibiotic was not prescribed.

We also tried to analyze the associated complications that could have justified the antibiotic prescription. A concomitant diagnosis of acute otitis media without effusion was the most frequent complication, found in 10 patients (15.6%). All of them underwent antibiotic prescription, based on a medical decision that could have been justified, even though no correlation with positive inflammatory markers being observed (Table.1). Acute otitis media being the most common complication, that has to be checked for antibiotic treatment should be reserved for the cases with effusion or bacterial etiology sustained by inflammatory markers.

In order to detect risk of bacterial colonization, nasal cultures have been performed in 32 patients and, 13 (20.3%) have had positive results:

- 7 patients with *Streptococcus pneumoniae*,
- 4 patients with *Staphylococcus aureus* (1 methicillin – resistant

staphylococcus aureus)

- 2 patients with *Haemophilus influenzae*.

Only 3 patients with positive nasal cultures haven't been prescribed an antibiotic.

Knowing the prevalence and distribution of nasal colonization in the community is important, especially for children with risk factors for severe outcomes. Recommendations stress that positive nasal cultures are not markers of bacterial infection unless patient is symptomatic, and patients should not be treated, accordingly.

In the study population, 10 patients out of 13 that have had positive nasal cultures underwent antibiotic treatment in the absence of signs of bacterial infection. Risk

factors for severe disease were associated in 6 cases. None of the patients with positive nasal cultures developed lobar pneumonia during hospitalization.

Severe respiratory distress, defined as oxygen saturation lower than 90% in room air, was found in 18 patients (28.1%) and had no significant statistical impact on antibiotic prescription, although it has been more frequent in group A.

Hospital stay was longer for patients with antibiotic treatment, (7.5 days in group A, compared with 5.5 days in group B), with significant statistical value ($p=0.001$), possibly because of increased incidence of risk factors for adverse outcome and severe respiratory distress.

Table 1

Evaluation of determinants of antibiotic prescription in study population

Category	Group A N=42 (65.6%)	Group B N=22 (34.4%)	Analyses
Opacities on chest X-ray	5	0	P=0.120
Severe respiratory distress	13	5	P=0.498
Risk factors	19	4	P=0.029
Nasal colonization	10	3	P=0.268
AOM (without effusion)	10	0	P=0.005
Prior antibiotic treatment	14	7	P=0.566

5. Conclusions

Although a diagnosis of bronchiolitis having been made with the proof of RSV etiology, the majority of patients in our study underwent antibiotic treatment.

Our analysis has started from the premise that when diagnosis may be misleading, etiological tests could help the clinician to choose the proper treatment. The study demonstrated that viral etiology proven by positive RSV testing has had little impact on antibiotic prescription.

Looking for motivation for the high rate of antibiotic prescription, we identified risk factors for severe outcomes, and as well, associated diagnosis of acute otitis media.

For patients with associated risk factors for severe outcomes, antibiotic use could have been justified for fear of bacterial complications, although guidelines still advise for a no antibiotic policy.

Chest x-ray, not recommended but routinely performed, proved to be misleading and unnecessary.

Misinterpretation of alveolar opacities resulted in antibiotic prescription, even there have been no laboratory tests to support this.

Associated acute otitis media without effusion resulted in a higher rate of antibiotic prescription, although there has been no correlation with positive inflammatory markers.

Regarding nasal colonization that has been observed as predominant in the group with antibiotic treatment, there was no statistical correlation. *Streptococcus pneumoniae* was the most isolated pathogen. Antibiotic prescription could have been justified for patients with positive nasal cultures and associated risk factors for severe disease.

Severe respiratory distress prior antibiotic treatment, although more prevalent in group A, had no statistical impact in correlation with the medical decision for antibiotic treatment.

Antibiotic treatment was identified in patients that had longer hospitalization, possibly due to association with risk factors.

Although guidelines advise for a no antibiotic prescription policy in bronchiolitis, fear of bacterial infection in children with risk factors for severe outcomes, may compel the paediatrician to start prophylactic treatment, even if there is insufficient evidence to justify this.

Review of clinical status and risk factors

correlated with laboratory data, should sustain adherence to guidelines in order to discourage overuse of antibiotics in hospital settings.

Acknowledgements

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