

Viral Etiology in Children Aged <2 Years with Clinical Suspicion of Bronchiolitis

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ABSTRACT

Background: Acute bronchiolitis is the commonest cause of lower respiratory tract infection in children under 2 years of age. There are no prospective studies in south India, which depict the viral epidemiology of bronchiolitis. Therefore, we undertook this prospective study of all the children <2 years who were admitted with suspected lower respiratory tract infection.

Aim and objective: To determine the exact viral etiology in children aged <2 years with clinical suspicion of bronchiolitis.

Design: Prospective observational study.

Setting: A single-center study was conducted in Narayana Health City, Bengaluru. Fifty children aged <2 years with a clinical suspicion of bronchiolitis were included in the study and their nasopharyngeal swab were sent for multiplex PCR viral panel. The data were analyzed and results were reported.

Results: Forty-six out of 50 children who were clinically suspected to have viral bronchiolitis showed positive result on nasopharyngeal swab PCR study. Among them 33 had single viral infection while 13 had multiple viral infections. Respiratory syncytial virus (RSV) was the most common virus involved followed by rhinovirus and parainfluenza virus. The clinical signs and symptoms had a good correlation with the laboratory diagnosis of viral bronchiolitis.

Conclusion: There is an extremely good correlation between clinical features of acute viral bronchiolitis with their laboratory diagnosis. Good clinical history and physical examination can avoid undue use of antibiotics in children <2 years.

Keywords: Bronchiolitis, PCR, Virus.

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INTRODUCTION

Bronchiolitis is a very common lower respiratory viral infection in young children. It is the acute inflammation of the bronchioles. Clinically, bronchiolitis is a constellation of symptoms and signs which includes cold, cough, fast breathing, crepitations, and wheeze occurring in children <2 years of age. This condition is most commonly caused by viruses. Bronchiolitis has substantial economic and social implications in children.

In young children, most of the bronchiolitis occurs during the seasonal epidemics of respiratory viral infections, usually caused by a respiratory syncytial virus (RSV), parainfluenza virus, influenza virus, adenovirus, and metapneumovirus.

The occurrence and severity of LRTI are dependent on a multitude of factors, such as the community, host immune status, virulence of the pathogen involved, and anatomical location. Hence, it is important to consider these factors during treating children with this disease.

Management of this condition is predominantly supportive. Several studies have evaluated the role of various medications. However, very few studies have proven to be beneficial. Although it is a very common practice to use antibiotics in case of any clinically suspected lower respiratory tract infection, one should do a detailed examination of such children and determine the etiology before prescribing antibiotics and further preventing risks of antibiotic resistance.

MATERIALS AND METHODS

This is a single-center prospective observational study conducted in Narayana Health City, Bengaluru. All children between 1 month and

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24 months of age with fever, coryza, rhinitis, cough, and breathing difficulty of acute onset who visited the outpatient department (OPD), emergency department, or those admitted in our hospital were selected. A probable clinical diagnosis of bronchiolitis was made and the reports were analyzed. Patient's legal representatives were given the option of undergoing the nasopharyngeal aspirate for analysis and those willing for the test were recruited into the study. The severity of bronchiolitis was scaled based on modified Woods clinical asthma score (M-WCAS) and the number of days of hospitalization.

From patients recruited into the study, clinical profile and vitals were noted (heart rate, respiratory rate, temperature, SpO₂), clinical examination findings were noted (air entry, presence of crepitations and rhonchi, work of breathing), and chest X-ray findings documented. The nasopharyngeal aspirate was collected with suction attached to an NG tube or nasal wash with the suction bulb or endotracheal tube aspirate for an intubated child. The

sample was sent within 30 minutes to the microbiology laboratory and processed using multiplex PCR for the viral panel.

Multiplex PCR technique was used for the isolation of viruses. The viral panel included RSV, human metapneumovirus, parainfluenza, adenovirus, influenza, rhinovirus, coronavirus, enterovirus, and bocavirus. The results of these tests were correlated with the clinical diagnosis of these children.

RESULTS

Out of the total 50 children selected for our study, 12 (24%) were <6 months old, 36 (72%) were <1 year old, and 14 (28%) were between 1 year and 2 years old.

Thirty (60%) were males while 20 (40%) were female children. The most common symptom was cough (100%) followed by fever (97.8%), coryza, and tachypnea (95.6%). The most common examination finding was auscultatory crepitations in 91% of the children followed by chest retractions (84.7%). Wheeze was noted in 30 (65.2%) children. Among the radiological findings, bilateral pulmonary hazy opacities were the most common finding amounting to 47% followed by hyperinflation (15%) and collapse (7%). Chest X-ray was normal in 15.2% of the children. Twenty-three (50%) of the children were preterm at birth while 25 (54.3%) had a history of NICU stay. The mean WCAS score was 3.5 ± 1.8 . Out of the total 50 children included in the study, 46 (92%) children showed a positive result for viral PCR studies. Among these positive cases, RSV was the most common (41.3%) followed by rhinovirus (26%) and parainfluenza virus (20%). Other viruses isolated were influenza virus, metapneumovirus, bocavirus, coronavirus, and enterovirus. Thirty-three (71.8%) out of 46 positive cases were infected with a single virus, while 13 (28.2%) were infected with multiple viruses. Thirty-five (76%) out of 46 positive children required oxygen support for a mean duration of 3.3 days. The mean duration of oxygen requirement in children with single virus infection was 2.42 ± 2.11 days as compared to 2.85 ± 2.73 days in children with multiple virus infections. Sixteen (34.7%) children required non-invasive respiratory support in the form of HFNC for a mean duration of 2.5 days. Only five children required mechanical ventilatory support who were successfully extubated and weaned-off oxygen support. The mean duration of hospitalization in children with single virus infection was 7.21 ± 1.52 days as compared to 5.85 ± 3.31 days in children with multiple virus infection. Eight children received one dose of intravenous antimicrobial within the first hour of presentation. But on receiving the PCR report, these antimicrobials were discontinued. There were no mortalities observed in the study population. No significant

differences were observed in the clinical condition and number of days admitted in the hospital among the children with single and multiple viral infection (Tables 1 and 2).

DISCUSSION

Various studies have been conducted in the West to determine the viral etiology in bronchiolitis,¹⁻⁴ but not many have been conducted in India.^{5,6} The most common etiology of bronchiolitis observed in our study was RSV followed by rhinovirus and parainfluenza virus which was similar to the study done by Mansbach et al.⁷ and Mishra et al.⁸ However, literature from the past revealed that rhinovirus was mainly present in the upper airway as a commensal organism and maybe a contaminant while taking a nasopharyngeal swab.

Acute viral bronchiolitis is mainly a clinical diagnosis⁹ with the common complaints being cough, fever, coryza, and tachypnea which was consistent with our study. Even though the etiology of this disease may vary, the children present with similar respiratory complaints. Chest retraction and crepitations were the common examination findings observed in our study which is consistent with the studies done in the past.⁸

Multiplex PCR studies have high sensitivity and specificity in determining the viral etiology in such cases. They can determine multiple viruses from the nasopharyngeal swab of a suspected child. Various studies done worldwide have confirmed coinfection by multiple viruses in children with bronchiolitis.¹⁰ In our study, 92% of the children who were clinically suspected to have viral bronchiolitis showed positive PCR studies. Among the positive children, 71.8% were infected with a single virus while 28.2% of children had co-infection with multiple viruses.

Studies were done in the past which concluded that coinfection of RSV-adenovirus and RSV-influenza virus was life-threatening.¹⁰ But as per our study, there was no significant difference in the severity of the disease among mono-infection and coinfection of these viruses. Similar results were observed in study done by Li et al.¹¹

If diagnosed promptly, treatment is mainly supportive. In Western countries, medications like ribavirin has been used in cases of severe viral lower respiratory tract infection. However, we did not use any specific medication while managing our cases.

There was an extremely strong correlation between the clinico-radiological diagnosis with microbiological diagnosis. No antibiotic therapy is mandated in the treatment of viral bronchiolitis. Undue exposure of antibiotics in children <2 years holds a future complication of antibiotic resistance.¹² Rational use of antibiotics also makes the treatment more economical for the patient.

Table 1: Age-wise distribution of viral etiology

	1–6 months n (coinfection)	7–12 months n (coinfection)	13–18 months n (coinfection)	19–24 months n (coinfection)
RSV	6 (3)	10 (3)	3 (2)	0
Rhinovirus	4 (3)	7 (3)	1 (1)	1 (1)
Parainfluenza	2 (1)	4 (2)	2	2 (1)
Influenza virus	1	6	0	2
Metapneumovirus	1	0	1	0
Influenza virus	1	6	0	2
Bocavirus	0	3 (3)	1	0
Coronavirus	0	1 (1)	0	0
Enterovirus	2 (2)	1 (1)	1 (1)	0

Table 2: Single virus infection vs multiple virus infection

	<i>Single virus infection</i>	<i>Multiple virus infection</i>
<i>No. of cases</i>	33	13
Oxygen support duration	2.42 ± 2.11 days	2.85 ± 2.73 days
Duration of hospitalization	7.21 ± 1.52 days	5.85 ± 3.31 days
WCAS score	3.6 ± 1.9	3.2 ± 1.6

LIMITATION

The major limitation of the study is the small sample size which may not completely resemble the true etiological spectrum. Despite this small sample size, the results achieved are similar to studies done in western countries. This study was conducted in a well-established tertiary center where PCR investigation was readily available. This might not hold true for all centers in India.

CONCLUSION

Acute viral bronchiolitis is a clinical diagnosis in children <2 years of age. Viral PCR studies have high specificity in determining the viral etiology. Accurate diagnosis aids to limit the unwarranted use of antibiotics in these children.

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