

## Demographic, clinical, chest X-ray characteristics, and outcome of children admitted with acute bronchiolitis in the tertiary care hospital South India

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### ABSTRACT

**Aim and Objectives:** The goal of this research was to assess the demographic, clinical, and radiological characteristics of children brought to the hospital with acute bronchiolitis. **Materials and Methods:** This is a prospective study of children aged 1–3 years who were admitted to a tertiary care center with acute bronchiolitis between June and August 2021. The research excludes infants <1 month. Age, sex, comorbidities, tachypnea, respiratory distress, saturations, nebulizations, oxygen therapy, and mortality were all recorded as variables. The data were analyzed using appropriate statistical methods. **Results:** About 60% of the 162 children admitted with bronchiolitis are males, and 68% of the babies had been exposed to passive smoking. Cough (98%) and wheeze (91%) were the most common symptoms and signs, respectively. On chest X-rays, 73% of the children had hyperinflated lung fields and 8% had atelectasis. Out of 29 children with severe hypoxemia and respiratory failure, 25 children responded to high-flow nasal cannula or continuous positive airway pressure, and only four required intubation and invasive ventilation. In our study, there was no mortality. **Conclusion:** The most common reason for hospitalization among infants is acute bronchiolitis. We have significantly reduced the use of antibiotics, systemic steroids, and bronchodilators in our hospital after developing standard treatment protocols for acute bronchiolitis and strictly following them.


**Key words:** Bronchiolitis, Cough, Infant, Hypertonic saline, Wheeze

Acute viral bronchiolitis is the most common cause for infant hospitalization and accounts for about 15–20% of all infant admissions in India. In about 80% of cases, it is caused by the respiratory syncytial virus. Human meta pneumovirus, parainfluenza, influenza, and rhinovirus are among the other causal pathogens. Bronchiolitis caused by *Mycoplasma pneumoniae* is rare, as are subsequent bacterial infections [1,2]. Bronchiolitis causes bronchial edema and reduced expiratory flow. Lower respiratory signs such as tachypnea, wheezing, crackles, retractions, chest indrawing, nasal flaring, apneic episodes (preterm and young infants), and grunt may appear one to 3 days after the upper respiratory infection (fever, cough, and cold). Irritability, poor feeding, and vomiting may also be present in the infant. However, in many patients, the infection is benign, and recovery begins within 3–5 days. Prematurity, low birth weight, passive smoking, young maternal age, family history of bronchial asthma, congenital heart disease, immunocompromised status, and male sex are all risk factors for severe bronchiolitis [3]. This study was done to identify the consistent symptoms, signs,

and chest X-ray findings of acute bronchiolitis and to know the effectiveness of current treatment guidelines in management of acute bronchiolitis.

### MATERIALS AND METHODS

This is a prospective study of children aged 1 month to 3 years who were admitted to the pediatric department of Maharajah's Institute of Medical Sciences in Vizianagaram (Andhra Pradesh, India) with acute bronchiolitis, diagnosis was mainly based on clinical features after ruling out other lower respiratory tract infections like pneumonia [4,5]. After taking approval from the Institutional Ethics Committee, the research was conducted from June to August 2021 (3 months), corresponding to the disease's seasonality. Infants under the age of 1 month were not included in the study. These children epidemiological, clinical, and chest X-ray findings were recorded in a pre-designed format after the parents gave their consent. All children are initially treated with humidified oxygen and hypertonic saline nebulizations, with continuous vitals monitoring [4-7]. If they are not responding to initial treatment, they were given a trial of salbutamol and steroid

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nebulization. Only children with high cell counts, C-reactive protein, and having opacities on their chest X-rays were given antibiotics. The study sample was determined by the number of children admitted to the hospital with clinical diagnosis of acute bronchiolitis throughout the study period, as well as the number of parents who consented. Among 188 children with acute bronchiolitis between 1 month and 3 years of age, 162 gave their consent to participate in the study. For statistical analysis, IBM SPSS version 21.0 and Microsoft Excel 2010 were applied. The mean and standard deviations of quantitative variables were stated. The Chi-square test and independent-sample t-test were used to compare differences in proportions and mean values, and the appropriate p-values were calculated.  $p < 0.05$  were considered statistically significant.

## RESULTS

A total of 97 (60%) of the 162 children admitted with acute bronchiolitis are male, and 123 (76%) are under the age of 24 months. Passive smoking is a risk factor in 68% of cases, 21% are preterm, and 11% have other comorbidities such as congenital heart disease, reactive airway disease, and congenital malformations. Preterm infants and children with co-morbidities experienced severe bronchiolitis in 92% of cases. Table 1 shows the demographic characteristics. Table 2 shows classification of bronchiolitis based on severity and standard treatment guidelines given by Indian Academy of Pediatrics (IAP) [4,5].

Hyperinflated lung fields are the most common chest X-ray finding, with atelectasis being found in 8% of patients. Table 3 shows children's chest X-ray patterns.

Cough (98%) and wheeze (91%) are common clinical findings in children with bronchiolitis. Bronchiolitis caused severe illness in 20% of the children admitted. Only four of the 29 children admitted with bronchiolitis required intubation and invasive ventilatory support, while the rest 25 were treated with non-invasive ventilation (CPAP/HFNC). By following the guidelines given by IAP, antibiotic use decreased from 40% in the previous

season in 2020 to 18% in 2021 [3,5]. Systemic corticosteroids and oseltamivir were given to just four children on mechanical ventilation. Due to feeding and breathing difficulties, some infants were given enteral feeding. Bronchiolitis did not cause death in any of the children. Tables 4 and 5 indicate the clinical and therapeutic profiles of children admitted with bronchiolitis, respectively.

## DISCUSSION

In children under the age of two, acute bronchiolitis is the leading cause of morbidity and hospitalization. Bronchiolitis is most common between the ages of 2 and 6 months, according to prior

**Table 2: Classification based on severity of bronchiolitis and standard treatment guidelines [5]**

	MILD	MODERATE	SEVERE
Feeding ability	Normal ability to feed	Appear short of breath during feeding	May be reluctant or unable to feed
Respiratory distress	Little or no respiratory distress	Moderate distress with some chest wall retractions and nasal flaring	Severe distress with marked chest wall retractions, nasal flaring and grunting Can have frequent and prolonged apnea
Saturation	Saturation > 92%	Saturation < 92%, correctable with O <sub>2</sub>	Saturation < 92% may or may not correctable with O <sub>2</sub>
Treatment	Home treatment	Admit, Humidified O <sub>2</sub> , Hypertonic saline/adrenaline nebs, Monitor	Admit in ICU, O <sub>2</sub> /HFNC/CPAP, HS/Adr neb, ABG and Chest X-ray, invasive ventilation sos

**Table 3: Chest X-ray profile in children with bronchiolitis**

Chest X-Ray	Number of cases	%	p-value
Hyperinflated lungs	118	73	<0.01
Prehilar/peribronchial infiltrates	58	36	
Atelactasis	13	8	
Normal	21	13	

**Table 4: Clinical profile of the children admitted with bronchiolitis**

Symptoms and Signs	Number of children	%	p-value
Fever	40	25	
Cold	140	86	
Cough	159	98	<0.01
Respiratory distress	142	88	
Vomiting/Feeding difficulty	131	81	
Decreased activity	30	19	
Tachypnea	136	84	
Chest indrawing/retractions	110	68	<0.01
Wheezing and or crepitations	147	91	<0.01
Cyanosis	4	2.5	
Disproportionate tachycardia	13	8	
SpO <sub>2</sub> < 92%	29	18	

**Table 1: Demographic profile of bronchiolitis children**

Demographic Features	Total (n)	Percentage	p-value
Age			
<1 year	63	39	<0.01
1-2 years	60	37	
2-3 years	39	24	
Sex			
Male	97	60	<0.01
Female	64	40	
Gestational age			
Preterm	34	21	<0.01
Term	124	79	
Smoking exposure			
Yes	110	68	<0.01
No	52	32	
Heart disease/Other co morbidities	18	11	

**Table 5: Management profile of Bronchiolitis children in this study**

Treatment Profile	N	%
Oxygen Therapy		
Face mask/nasal prongs/NRBM	105	65
HFNC/CPAP	24	15
Mechanical ventilation	4	2.5
Nebulizations		
Hypertonic saline	162	100
Bronchodilator	70	43
Steriod	45	28
Antibiotics	29	18
Mean duration of hospital stay	5.5±0.75	
Mortality	0	0

studies, which reflects our findings. There is a male preponderance in our analysis, which is similar to many other studies such as Ahmad *et al.* [8,9]. A retrospective research by Ahmad *et al.* [8,9] found that the peak incidence was in children under the age of 6 months, with males being more common. Similar to Syed *et al.* and Ramagopal *et al.* [10], cough was the most prevalent symptom and wheeze was the most common sign in our study. According to Ahmed *et al.* [8,9], respiratory distress with chest retractions was the most common manifestation in the databases. Iqbal *et al.* [11] found that 91% of the 107 children in their study developed respiratory distress at the time of presentation. Durani *et al.* [12] found that a combination of cough, wheeze, and retractions in infants and young children predicted acute viral bronchiolitis.

Hyperinflated lung fields were the most common X-ray result in our sample, and 13 children had atelectasis, with the right upper lobe (60%) being the most affected, followed by the middle lobe. Many research, such as Rius Peris *et al.* [13], have shown Chest X-rays to be a low-reliable indicator.

In the study by Al-Muhsen *et al.* [9], all patients were given supplemental oxygen, and 38.6% of the children required mechanical ventilation. Despite the viral etiology, the majority of these children (97.1%) were given inhaled bronchodilators and antibiotics (98.5%). Corticosteroids were also given to half of them. In our study, the use of non-invasive ventilator techniques reduced the need for invasive ventilation and mortality, which is similar to Ganu *et al.* [14] study. In our study, we minimized the administration of antibiotics, steroids, and bronchodilators by following protocol, compared to the previous studies. There was no difference in morbidity or mortality between children who got corticosteroids and those who did not. In our study, the recovery rate was 100%, compared to 97% in Hemalatha *et al.* study [15]. Many studies like Silva *et al.* [16] recommended bronchodilator therapy as a therapeutic test and should be discontinued if there is no improvement. The limitations of the study are organism that causes acute bronchiolitis was not identified, and there was no comparative group to evaluate the efficacy of inhaled bronchodilators and steroids in treating acute bronchiolitis.

## CONCLUSION

Acute viral bronchiolitis is one of the most prevalent reasons for infant hospitalization. The most common symptom of acute

bronchiolitis is cough, which is often accompanied by wheezing and chest retractions. The treatment of choice for treating acute bronchiolitis is humidified oxygen. Alternatives include hypertonic saline and adrenaline nebulization. Antibiotics should not be used in children with suspected acute bronchiolitis, because secondary bacterial infections are uncommon. Children who are not responding can be considered a trial of inhaled bronchodilators and steroids. We have greatly reduced the use of antibiotics, systemic steroids, and bronchodilators in our hospital after formulating standard treatment protocols for acute bronchiolitis and strictly following them.

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