Original Article

Study of Clinical profile of Bronchiolitis at a Rural based Tertiary Care Hospital

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Abstract:

Acute bronchiolitis is a common self-limiting lower respiratory tract infection primarily affecting infants and young children, with Respiratory Syncytial Virus (RSV) as the leading causative agent. Despite its significant burden on healthcare systems, data on clinical profiles in resource-limited settings are limited. **Objectives:** To study the clinical, radiological, and haematological profiles of bronchiolitis in children aged 2 months to 5 years presenting to a tertiary care hospital in Maharashtra. **Methodology:** A prospective observational study was conducted on children aged 2 months to 5 years diagnosed with bronchiolitis. Data on demographic characteristics, clinical features, radiological findings, and haematological parameters were collected and analysed. **Results:** The study included 100 children, with a mean age of 1 year. The highest incidence (50%) was observed in infants aged 2–6 months. A slight male predominance (55%) was noted. Fever and cough were present in all cases (100%), followed by wheezing (80%), difficulty breathing (70%), nasal congestion (70%), and cyanosis (10%). Radiological findings revealed hyperinflation in 70% of cases, peribronchial thickening in 40%, and patchy infiltrates in 30%. Haematological analysis showed a mean hemoglobin level of 10.5 ± 1.2 g/dL, total leukocyte counts of 11,000 ± 4,000 cells/µL, neutrophil percentage of 35 ± 25%, and lymphocyte percentage of 55 ± 10%. Lymphocytosis was observed in 60% of cases, leucocytosis in 40%, and elevated CRP levels in 30%. **Conclusion:** Bronchiolitis predominantly affects infants under 1 year, with a slight male predominance. Fever, cough, and wheezing are the most common clinical features. Early diagnosis and management are crucial to reducing complications.

Key words: Bronchiolitis, Respiratory Syncytial Virus, Hyperinflation, Paediatric respiratory infections

Introduction:

Acute bronchiolitis is a self-limiting lower airway disease primarily affecting infants and young children, caused by viral infections. Respiratory Syncytial Virus (RSV) accounts for over 80% of lower respiratory tract infections (LRTI) in infants, showing a male predominance and a seasonal pattern, with outbreaks typically occurring in winter and spring. Other causative agents include parainfluenza virus, adenovirus, mycoplasma, rhinovirus, and emerging viruses like human metapneumovirus and human bocavirus.(1) A prospective, population-based study conducted by the Centers for Disease Control and Prevention reported an average RSV hospitalization rate of 5.2 per 1000 children under 24 months over a five-year period from 2000 to 2005.(2)

Clinicians generally identify bronchiolitis by a combination of signs and symptoms in children less than 2 years of age. The illness begins with rhinorrhoea, cough, and mild fever, which may progress to increase respiratory effort, indicated by grunting, nasal flaring, intercostal and subcostal retractions, tachypnea, wheezing, and rales. Infants may also display irritability, poor feeding, and vomiting. While most cases are mild, with recovery occurring within 3–5 days, some children may experience worsening symptoms, particularly those with comorbid conditions such as chronic lung disease, congenital heart disease, or immunocompromised states.(3) The progression of bronchiolitis can vary, starting with transient symptoms such as apnoea and evolving into respiratory distress caused by lower airway obstruction. Pulse oximetry aids in assessing the need for supplemental oxygen.

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Physical examination may reveal hyperresonance on percussion and wheezes or fine crackles on auscultation. Severe cases may present with grunting, marked retractions, cyanosis, and impaired perfusion. Apnoea is more common in premature infants and those under two months of age.[4]

Acute respiratory tract infections (ARIs) account for 30–50% of paediatric outpatient consultations, 20–30% of paediatric hospital admissions, and over one-third of annual child deaths.[5] Although often self-limiting, severe ARIs can lead to complications that burden healthcare systems in resource-limited settings, particularly in developing countries. India, Bangladesh, Nepal, and Indonesia collectively account for 40% of global ARI-related mortality.[6] Despite healthcare policies addressing ARI control, its prevalence remains high, with 4 million cases of pneumonia and nearly 1 million deaths reported annually.[5]

On average, children under 5 years of age experience about five episodes of acute lower respiratory infections (ALRIs) annually, most of which are mild and self-limiting. However, ALRIs contribute to 20–40% of hospital admissions and 30–50% of outpatient visits.[7] These infections are influenced by various sociodemographic, environmental, and sociocultural factors that affect morbidity and mortality.[8] While most population-based studies have focused on the clinical profile, risk factors, and outcomes of ALRIs in adults, data on paediatric populations remain limited.[9]

Methodology:

Study Design: This was a prospective, observational study conducted at a tertiary care hospital in Maharashtra over a defined study period.

Study Setting: The study was conducted in the paediatric department of rural based tertiary care hospital which serves as a referral center.

Study Population:

Inclusion Criteria:

- Children aged between 2 months and 5 years.
- Diagnosed with bronchiolitis based on clinical symptoms (fever, cough, wheezing, and respiratory distress) and, where available, radiological findings.
- Attending the paediatric outpatient or admitted to the paediatric inpatient department.

Exclusion Criteria:

- Children with pre-existing chronic respiratory diseases (e.g., asthma, cystic fibrosis).
- Children with congenital heart disease or other significant systemic illnesses.
- Children with incomplete medical records or missing data.

Sample Size: 100

Variables:

Demographic Variables	Clinical Features	Radiological Findings	Haematological Parameters
1) Age (categorized into 2–6 months, 7–12 months, and 1–5 years). 2) Gender (male/female).	Fever, cough, wheezing, difficulty breathing, nasal congestion, cyanosis.	Hyperinflation , peribronchial thickening, patchy infiltrates, and normal chest radiographs.	Haemoglobin (HB) level, total leukocyte count (TLC), Neutrophil (%) Lymphocyte (%) Platelet count. Leucocytosis, Lymphocytosis, CRP

Ethical approval was obtained from the institutional ethics committee. Written informed consent was obtained from the parents or guardians of all participating children.

Data Analysis: The collected data was entered into a spreadsheet and analyzed using statistical software.

Results:

Table 1: Age Distribution

Age	Frequency	Percentage (%)
2–6 months	50	50%
7–12 months	30	30%
1–5 years	20	20%

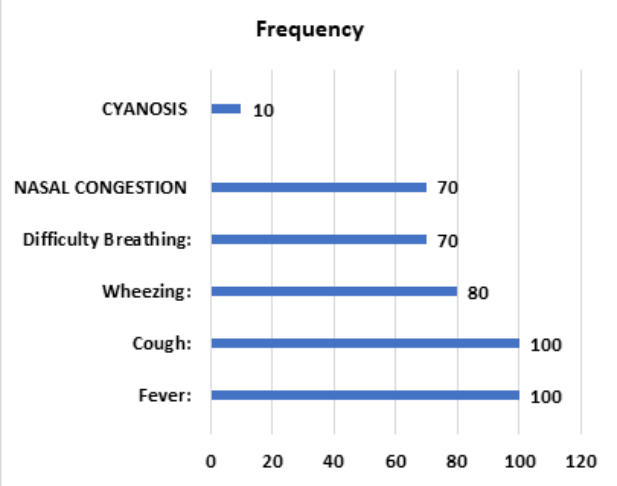
The majority of bronchiolitis cases (50%) occurred in infants aged 2–6 months, followed by 30% in the 7–12 months age group, and 20% in children aged 1–5 years. The mean age was 1 year. This data highlights that bronchiolitis is primarily a disease of younger infants, with the highest incidence observed in the first 6 months of life. This is likely due to the immaturity of the immune and respiratory systems in this age group.

Table 2: Gender Distribution

Gender	Frequency	Percentage (%)
Male	55	55%
Female	45	45%
Total	100	100%

A slight male predominance was observed, with males accounting for 55% of cases and females for 45%. This finding aligns with existing literature suggesting a higher susceptibility to bronchiolitis in males, possibly due to anatomical and hormonal differences.

Graph 1: Clinical Features



The most common clinical features included fever and cough, both present in 100% of cases. Wheezing was observed in 80% of patients, while 70% experienced difficulty breathing and nasal congestion. Cyanosis was reported in 10% of cases, indicating severe hypoxia in a small subset of patients. These findings underscore the importance of recognizing respiratory distress symptoms in bronchiolitis, with wheezing and breathing difficulty being significant indicators of airway obstruction and inflammation.

Table 3: Radiological Finding

Radiological Features	Frequency	Percentage (%)
Hyperinflation:	70	70%.
Peribronchial thickening	40	40%
Patchy infiltrates	30	30
Normal	10	10

Radiological examination revealed hyperinflation in 70% of cases, peribronchial thickening in 40%, and patchy infiltrates in 30%, while 10% of patients had normal chest X-rays. Hyperinflation, as the most common finding, points to significant air trapping and small airway obstruction, while peribronchial thickening and infiltrates suggest inflammation and associated edema in the airways.

Table 4: Haematological Feature (1)

Haematological Feature	Mean
HB	10.5 ± 1.2
TLC	11,000 ± 4000
Neutrophil	35 ±25
Lymphocytes	55±10
Platelet	300,000 ± 100,000

Table 5: Haematological Feature (2)

Haematological Feature	Frequency	Percentage (%)
Leucocytosis	40	40%
Lymphocytosis	60	60%
Increased CRP	30	30%

The hematological analysis showed a mean hemoglobin level of 10.5 ± 1.2 g/dL, total leukocyte count (TLC) of 11,000 ± 4,000 cells/µL, neutrophil percentage of 35 ± 25%, lymphocyte percentage of 55 ± 10%, and platelet count of 300,000 ± 100,000/µL. Among the patients, 40% had leucocytosis, 60% had lymphocytes, and 30% showed elevated CRP levels. These findings reflect the viral etiology of bronchiolitis, characterized by lymphocytosis and mild inflammation. Elevated CRP levels in a subset of patients could indicate bacterial superinfection or more severe inflammatory responses.

Discussion:

In our study, the majority of cases of bronchiolitis were seen in infants aged 2–6 months, comprising 50% of the cohort, followed by 30% in the 7–12 months age group and 20% in children aged 1–5 years. The mean age of the patients was 1 year, highlighting that bronchiolitis predominantly affects younger children. In comparison, Jinela Desouza's study reported a wider age distribution, with 41.37% of cases in children aged 0–1 years, 19.28% in the 1–2 years group, and fewer cases distributed across older age groups up to 6 years.(10) This broader age range indicates that while bronchiolitis is most common in younger children, older age groups may also be affected, albeit to a lesser extent.

In terms of gender, our study demonstrated a slight male predominance, with 55% of cases being male and 45% female, consistent with many studies on bronchiolitis. Similarly, Jinela Desouza's study showed a comparable distribution, with 55.02% male patients and 44.98% female patients.[10] This consistency across studies underscores the slight male predisposition to bronchiolitis, likely due to anatomical and physiological differences.

Our results showed a higher concentration of cases in the younger age groups, with 50% of patients falling within 2–6 months, 30% in 7–12 months, and 20% in the 1–5 years category, emphasizing that 80% of cases occurred below 1 year of age. In comparison, Jinela DeSouza's results provided a more detailed breakdown of age groups, reporting 41.37% of cases in the 0–1 year age group, followed by 19.28% in 1–2 years, 12.85% in 2–3 years, 8.43% in 3–4 years, 5.62% in 4–5 years, and 12.45% in 5–6 years. Both datasets highlight that the majority of cases occur in early childhood, particularly under 1 year of age, although our results suggest a higher proportion in infancy (2–6 months) compared to the broader 0–1 year category in Jinela DeSouza's data.[10]

In our study, hyperinflation was observed in 70% of cases, making it the most common radiological finding. In comparison, Suhas et al. mentioned hyperinflation in their study but did not quantify its prevalence, suggesting a difference in reporting focus or methodology.[11] Peribronchial thickening was identified in 40% of our cases, whereas Suhas et al. did not report this feature, instead highlighting fibrosis as the most frequent abnormality in 42% of their cases.[11] Additionally, patchy infiltrates were noted in 30% of our cases, a finding not discussed by Suhas et al., which could indicate differences in patient characteristics or disease presentation.

Normal radiological findings were observed in 10% of our cases, compared to 16% in Suhas et al study, suggesting a higher disease burden or more advanced imaging detection in our cohort. These differences in radiological findings between the two studies may be attributed to variations in patient demographics, disease etiology, or the stages of disease progression at the time of evaluation. The higher prevalence of hyperinflation and additional findings like peribronchial thickening and patchy infiltrates in our study may reflect a broader or more advanced disease spectrum in our patient population.

In our study, the majority of cases of bronchiolitis were observed in the 2–6 months age group (50%), followed by 30% in the 7–12 months group and 20% in the 1–5 years group, with the mean age being approximately 1 year. This closely aligns with Mahajan et al., where 60% of cases were also in the 2–6 months group, followed by 20% in the 7–12 months group and 12% in the 13–18 months group.[12] This reinforces that bronchiolitis predominantly affects younger infants. Regarding gender distribution, our study showed a nearly balanced ratio with 55% males and 45% females. In contrast, Mahajan et al. reported a slightly higher male preponderance, with 62% males and 37% females.

Clinically, all patients in our study presented with cough (100%), fever (100%), and difficulty in breathing (70%). Additionally, nasal congestion was reported in 70% of cases, a symptom not highlighted in Mahajan et al. Mahajan et al., however, reported universal symptoms of cough (100%) and cold (100%), with fever present in 85% of patients and dyspnoea in 65%. Wheezing, a hallmark feature of bronchiolitis, was reported in 80% of cases in our study compared to 95% in Mahajan et al. Cyanosis was less frequent in both studies, observed in 10% of cases in our study and 6% in Mahajan et al.[12] Tachypnea and retractions, while not explicitly detailed in our study, were present in 85% and 35% of cases, respectively, in Mahajan et al. [12]

Radiological findings showed hyperinflation in 70% of cases in our study, slightly higher than the 65% reported by Mahajan et al. Our study also noted additional findings such as peribronchial thickening in 40% and patchy infiltrates in 30%, which were not emphasized in Mahajan et al.[12] Conversely, Mahajan et al. described para-cardiac opacities in 19% and consolidation in 16% of cases. The proportion of normal chest X-rays was comparable, with 10% in our study and 5% in Mahajan et al.[12]

Haematological profiles were similar between the two studies. The mean haemoglobin levels were 10.5 g/dL in our study and 10.58 g/dL in Mahajan et al., while TLC was 11,000/mm³ and 11,590/mm³, respectively. Lymphocytosis was slightly more prevalent in our study (60%) compared to 55% in Mahajan et al., and leucocytosis was observed in 40% of our cases and 35% in Mahajan et al. Platelet counts were notably higher in Mahajan et al. (580,000/µL) than in our study (300,000/µL). Elevated CRP levels were more frequently reported in our study (30%) compared to 9.8% in Mahajan et al. [12]

In our study, bronchiolitis was most commonly observed in the 2–6 months age group (50%), followed by 30% in the 7–12 months group and 20% in the 1–5 years group, with a mean age of 1 year. This age distribution highlights the vulnerability of younger children to bronchiolitis. In comparison, Ganavi Ramagopal et al. did not explicitly report age distribution but focused on differentiating the clinical features between RSV-positive and non-RSV cases.[13]

In terms of gender, our study showed a slight male predominance, with 55% males and 45% females. Ganavi Ramagopal et al. also did not provide specific gender-based analysis but focused on symptom and sign prevalence between the two groups of bronchiolitis cases.[13] Clinically, our study found that fever and cough were present in all cases (100%), and wheezing was observed in 80% of cases. Difficulty in breathing was reported in 70% of patients, and nasal congestion was observed in 70% of cases. Cyanosis, though less common, was noted in 10% of patients. In contrast, Ganavi Ramagopal et al. reported fever in 30% of RSV-positive cases and 50% of non-RSV cases ($p = 0.068$), with wheezing significantly more common in RSV-positive patients (89.7%) compared to non-RSV cases (41.5%, $p < 0.001$)13. Cyanosis was a rare finding in Ganavi Ramagopal et al., observed in 2.5% of RSV-positive cases and absent in non-RSV cases.[13]

Conclusion:

This study provides a comprehensive clinical profile of bronchiolitis in children aged 2 months to 5 years in a tertiary care hospital in Maharashtra. The findings highlight that bronchiolitis predominantly affects infants under 1 year, with a slight male predominance. Fever, cough, and wheezing are universal clinical features, while hyperinflation is the most common radiological finding. Hematological analysis indicates a viral etiology with lymphocytosis as the predominant finding, though a subset of patients showed elevated CRP, suggesting bacterial coinfection or severe inflammation. These results emphasize the importance of early diagnosis and management to prevent complications.

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