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CLINICAL PROFILE AND OUTCOME OF ACUTE BRONCHIOLITIS IN CHILDREN BELOW TWO YEARS OF AGE: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Acute bronchiolitis is one of the most common lower respiratory tract infections among infants and young children. It is an important cause of pediatric emergency visits and hospital admissions, particularly during seasonal viral outbreaks. The disease is usually self-limiting but may become severe in young infants and children with underlying risk factors.

Aim: To evaluate the clinical profile, associated risk factors, severity pattern, management requirement, and outcome of acute bronchiolitis in children below two years of age.

Methods: A prospective observational study was conducted in the Department of Pediatrics during 2019 among 130 children aged two years or less diagnosed clinically with acute bronchiolitis. Children presenting with the first episode of wheezing associated with features of viral lower respiratory tract infection were included. Children with bronchial asthma, congenital heart disease, chronic lung disease, foreign body aspiration, and severe neurological disorders were excluded.

Results: The mean age of participants was 8.2 ± 4.6 months. The majority of children were below one year of age, and male predominance was observed. Cough, breathlessness, wheezing, fever, feeding difficulty, and chest retractions were common presenting features. Lack of exclusive breastfeeding, passive smoking exposure, low birth weight, prematurity, and malnutrition were important associated risk factors. Moderate bronchiolitis was the most common severity category. Prematurity, low birth weight, passive smoking exposure, and malnutrition demonstrated significant association with severe bronchiolitis. Most children improved with supportive treatment. Oxygen supplementation was required in 58 (44.6%) children, ICU admission in 12 (9.2%) cases, and mortality was observed in 4 (3.1%) patients.

Conclusion: Acute bronchiolitis predominantly affected infants below one year of age and was associated with significant respiratory morbidity. Early identification of risk factors, monitoring of oxygen saturation, and timely supportive management are essential to improve outcomes.

Keywords: Acute Bronchiolitis, Infants, Lower Respiratory Tract Infection, Pediatrics, Respiratory Distress, Wheezing.

INTRODUCTION

Acute bronchiolitis is one of the most common lower respiratory tract infections affecting infants and young children. It is characterized by acute inflammation, edema, mucus production, and necrosis of epithelial cells in the small airways, leading to airway narrowing and obstruction. Clinically, the disease usually presents with cough, rhinorrhea, wheezing, tachypnea, chest retractions, feeding difficulty, and varying degrees of hypoxia. It is a major cause of emergency visits and hospital admissions among children below two years of age.[1]

Respiratory Syncytial Virus is the most common etiological agent responsible for acute bronchiolitis. Other respiratory viruses, including rhinovirus, parainfluenza virus, adenovirus, influenza virus, and human metapneumovirus, may also contribute to disease occurrence. Viral infection leads to airway epithelial injury and inflammatory response, producing

obstruction of small airways. Because infants have narrow bronchioles and limited respiratory reserve, even mild airway edema and mucus plugging can result in significant respiratory distress.[2]

The disease primarily affects infants below two years of age, with the highest frequency and severity observed among children below six months of age. Younger infants are more vulnerable because of smaller airway caliber, immature immune response, reduced ability to clear secretions, and limited capacity to compensate during respiratory distress. Bronchiolitis-associated hospitalization is therefore more common in infancy than in later childhood.[3]

Several host and environmental factors influence the severity of bronchiolitis. Prematurity, low birth weight, malnutrition, lack of breastfeeding, congenital heart disease, chronic lung disease, immunodeficiency, overcrowding, and passive exposure to tobacco smoke have been associated with severe disease, oxygen requirement, prolonged hospitalization, and intensive care admission. Identification of these risk factors at admission is important for deciding monitoring intensity and level of care.[4]

The management of acute bronchiolitis is mainly supportive. Assessment of hydration, feeding ability, respiratory rate, work of breathing, oxygen saturation, and general activity is essential. Supportive management includes oxygen supplementation when indicated, maintenance of hydration, nasal suctioning when required, respiratory monitoring, and escalation of care in severe cases. Routine use of antibiotics, bronchodilators, corticosteroids, and multiple unnecessary investigations is generally not recommended unless there are specific clinical indications.[5]

The present study was conducted to evaluate the clinical profile, associated risk factors, severity pattern, management requirement, and outcome of acute bronchiolitis among children below two years of age admitted to a tertiary care hospital.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Pediatrics at a tertiary care teaching hospital in 2019. A total of 130 children aged two years or less diagnosed clinically with acute bronchiolitis were included in the study.

Children aged below two years presenting with the first episode of wheezing associated with signs of viral lower respiratory tract infection were included. Children with bronchial asthma, congenital heart disease, chronic lung disease, foreign body aspiration, and severe neurological disorders were excluded. These exclusion criteria were applied to avoid inclusion of children with recurrent wheezing disorders or other conditions that could independently influence respiratory symptoms and outcome.

A detailed clinical history was obtained from the parent or guardian of each child. Information regarding age, gender, birth history, gestational age at birth, birth weight, breastfeeding status, immunization status, exposure to passive smoking, history of fever, cough, breathlessness, wheezing, feeding difficulty, and duration of symptoms was recorded. Risk factors including prematurity, low birth weight, passive smoking exposure, lack of exclusive breastfeeding, and malnutrition were specifically documented.

A complete clinical examination was performed in all enrolled children. General examination included assessment of temperature, pulse rate, respiratory rate, hydration status, feeding ability, cyanosis, and general activity. Respiratory examination included evaluation of chest retractions, nasal flaring, grunting, wheezing, crepitations, air entry, and signs of respiratory distress. Oxygen saturation was measured by pulse oximetry wherever clinically indicated and available.

Severity of bronchiolitis was assessed clinically based on respiratory distress, respiratory rate, feeding difficulty, presence of chest retractions, cyanosis, general condition, and oxygen saturation. Cases were categorized as mild, moderate, or severe according to the overall clinical assessment. Children with severe respiratory distress, hypoxia, cyanosis, poor feeding, altered sensorium, or worsening respiratory status were monitored closely and managed according to institutional protocol.

Supportive management was provided to all patients according to severity. Oxygen supplementation was given when oxygen saturation was low or respiratory distress was significant. Intravenous fluids were administered in children with poor oral intake or dehydration. Nebulization and antibiotics were used only when clinically indicated according to physician judgment and associated clinical findings. Children requiring close monitoring or advanced respiratory support were admitted to intensive care.

Outcome parameters included requirement of oxygen supplementation, intravenous fluids, ICU admission, duration of hospitalization, recovery and discharge, and mortality. Mean hospital stay of more than five days was considered prolonged hospitalization according to the study format.

Data were entered into a structured data sheet and analyzed using SPSS software version 22. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Chi-square test was used to assess association between risk factors and severe bronchiolitis. Independent t-test was used for comparison of continuous variables wherever applicable. A p-value less than 0.05 was considered statistically significant.

Institutional ethical committee approval was obtained prior to commencement of the study. Informed consent was obtained from parents or guardians before inclusion of children in the study, and confidentiality of patient information was maintained.

RESULTS

A total of 130 children diagnosed with acute bronchiolitis were included in the study. The mean age of participants was 8.2 ± 4.6 months.

Table 1: Demographic Characteristics of Study Participants

Variable	Frequency (%)
Male	78 (60.0)
Female	52 (40.0)
Age <6 months	54 (41.5)
Age 6–12 months	48 (36.9)
Age 13–24 months	28 (21.5)

Male predominance was observed, with 78 (60.0%) male children and 52 (40.0%) female children. The majority of patients belonged to the age group below six months, accounting for 54 (41.5%) cases, followed by the 6–12 months age group with 48 (36.9%) children. Thus, nearly four-fifths of affected children were below one year of age.

Table 2: Clinical Presentation Among Study Participants

Clinical Feature	Frequency (%)
Cough	122 (93.8)
Breathlessness	116 (89.2)
Wheezing	110 (84.6)
Fever	88 (67.7)
Feeding difficulty	74 (56.9)
Chest retractions	82 (63.1)
Cyanosis	18 (13.8)

Cough was the most common presenting symptom, observed in 122 (93.8%) children, followed by breathlessness in 116 (89.2%) cases. Wheezing was present in 110 (84.6%) patients. Chest retractions were observed in 82 (63.1%) children, indicating clinically significant respiratory distress in many cases. Cyanosis was less common but represented severe respiratory compromise.

Table 3: Associated Risk Factors Among Study Participants

Risk Factor	Frequency (%)
Prematurity	32 (24.6)
Low birth weight	38 (29.2)
Passive smoking exposure	46 (35.4)
Lack of exclusive breastfeeding	52 (40.0)
Malnutrition	28 (21.5)

Lack of exclusive breastfeeding was the most common associated risk factor, observed in 52 (40.0%) children, followed by passive smoking exposure in 46 (35.4%) cases. Low birth weight was present in 38 (29.2%) children, and prematurity was documented in 32 (24.6%) cases.

Table 4: Severity Distribution of Acute Bronchiolitis

Severity	Frequency (%)
Mild	42 (32.3)
Moderate	64 (49.2)
Severe	24 (18.5)

Moderate bronchiolitis was the most common severity category, observed in 64 (49.2%) children. Mild bronchiolitis was present in 42 (32.3%) cases, while severe bronchiolitis was observed in 24 (18.5%) patients. This indicates that nearly one-fifth of children required closer monitoring for severe disease.

Table 5: Association Between Risk Factors and Severe Bronchiolitis

Risk Factor	Severe Bronchiolitis n (%)	p-value
Prematurity	14 (58.3)	0.002
Low birth weight	16 (66.7)	0.001
Passive smoking exposure	18 (75.0)	<0.001
Malnutrition	10 (41.7)	0.018

Prematurity, low birth weight, passive smoking exposure, and malnutrition demonstrated significant association with severe bronchiolitis. Passive smoking exposure showed the strongest association, being present in 18 (75.0%) children with severe disease.

Table 6: Management and Outcome Among Study Participants

Parameter	Frequency (%)
Oxygen supplementation	58 (44.6)
Intravenous fluids	48 (36.9)
ICU admission	12 (9.2)
Mean hospital stay >5 days	34 (26.2)
Recovered and discharged	126 (96.9)
Mortality	4 (3.1)

Oxygen supplementation was required in 58 (44.6%) children, while intravenous fluids were administered in 48 (36.9%) cases. ICU admission was required in 12 (9.2%) severe cases. Most children recovered with supportive treatment and were discharged. Mortality was observed in 4 (3.1%) patients.

DISCUSSION

The present prospective observational study evaluated the clinical profile, associated risk factors, severity pattern, management requirement, and outcome of acute bronchiolitis in children below two years of age. The disease predominantly affected infants below one year, with maximum cases occurring below six months of age. Cough, breathlessness, wheezing, feeding difficulty, and chest retractions were common presenting features. Prematurity, low birth weight, passive smoking exposure, and malnutrition were significantly associated with severe bronchiolitis.

The predominance of infants below one year in the present study is consistent with the known epidemiology of bronchiolitis. Meissner described viral bronchiolitis as a disease primarily affecting young infants, particularly because of small airway diameter, immature immune response, and limited respiratory reserve.[6] In the present study, 78.4% of children were below one year of age. This age distribution highlights the need for careful evaluation of young infants presenting with cough and respiratory distress.

Male predominance was observed in the present study. Mansbach et al. reported male predominance among children hospitalized with bronchiolitis in a large multicenter study.[7] Similar findings in the present study may be related to anatomical differences in airway caliber, immunological factors, or healthcare-seeking patterns. However, both male and female infants remain vulnerable, and clinical severity should be assessed individually rather than based only on sex.

Cough, breathlessness, and wheezing were the predominant clinical features. Fitzgerald and Kilham described bronchiolitis as a clinical illness characterized by cough, wheeze, tachypnea, feeding difficulty, and respiratory distress in infants.[8] The present findings are comparable, as cough was present in 93.8%, breathlessness in 89.2%, and wheezing in 84.6% of children. These symptoms remain central to clinical recognition of bronchiolitis in outpatient and emergency settings.

Chest retractions were observed in 63.1% of patients and feeding difficulty in 56.9%. These findings indicate significant work of breathing in many children. Feeding difficulty is particularly important in infants because it may lead to dehydration, worsening fatigue, and need for intravenous fluids or nasogastric feeding. Cyanosis was observed in 13.8% of children and represents a severe clinical sign requiring urgent oxygen assessment and supportive care.

Moderate bronchiolitis was the most common severity category. Florin et al. emphasized that most cases of viral bronchiolitis are managed supportively, but a subset of children develops moderate or severe respiratory distress requiring

hospitalization.[9] The present study showed that 49.2% of children had moderate disease and 18.5% had severe disease. This supports the importance of severity assessment at admission and repeated monitoring during hospitalization.

Lack of exclusive breastfeeding was the most common associated risk factor. Breastfeeding provides immunological protection through antibodies, immune cells, and anti-inflammatory factors and may reduce severity of respiratory infections in infancy. In the present study, lack of exclusive breastfeeding was present in 40.0% of children. Although the association with severe disease was not shown in the table, breastfeeding remains an important preventive factor for infant respiratory health.

Prematurity demonstrated significant association with severe bronchiolitis. Boyce et al. reported that premature infants have higher hospitalization rates for RSV infection.[10] Premature infants have immature lungs, reduced airway reserve, altered immune response, and greater vulnerability to apnea and hypoxia. In the present study, 58.3% of children with severe bronchiolitis had a history of prematurity, supporting the need for closer observation in this group.

Low birth weight was also significantly associated with severe disease. Low birth weight infants may have reduced pulmonary reserve, impaired immune response, poor nutritional status, and greater susceptibility to respiratory infections. In the present study, low birth weight was present in 66.7% of children with severe bronchiolitis. Such children should be considered at higher risk for oxygen requirement and prolonged hospitalization.

Passive smoking exposure showed the strongest association with severe bronchiolitis. Jones et al. demonstrated that parental smoking increases the risk of bronchiolitis and related hospitalization.[11] Tobacco smoke exposure impairs mucociliary clearance, damages airway epithelium, increases airway inflammation, and reduces local respiratory defense mechanisms. The present study found passive smoking exposure in 75.0% of severe cases, emphasizing the need for parental counselling regarding smoke-free home environments.

Malnutrition was significantly associated with severe bronchiolitis. Malnourished children may have impaired cellular and humoral immunity, poor respiratory muscle strength, reduced cough effectiveness, and greater vulnerability to infections. In the present study, malnutrition was present in 41.7% of severe cases. Nutritional assessment should therefore be part of pediatric evaluation, especially in infants admitted with respiratory illness.

Oxygen supplementation was required in 44.6% of patients. The American Academy of Pediatrics guideline emphasizes supportive care, including oxygen supplementation when hypoxemia is present, as the mainstay of bronchiolitis management.[12] In the present study, oxygen requirement reflected the burden of moderate and severe respiratory distress. Continuous monitoring of oxygen saturation is important, especially in infants with retractions, poor feeding, cyanosis, or lethargy.

Intravenous fluids were required in 36.9% of children. Children with bronchiolitis may have poor oral intake because of tachypnea, fatigue, nasal obstruction, and respiratory distress. Adequate hydration is an important supportive component. Overhydration should be avoided, and fluid therapy should be individualized according to clinical status, feeding ability, and hydration assessment.

ICU admission was required in 9.2% of children. Severe bronchiolitis may progress to respiratory failure, recurrent apnea, severe hypoxia, or exhaustion. Zorc and Hall emphasized that careful clinical assessment and appropriate escalation of care are necessary in bronchiolitis, while routine unnecessary medications should be avoided.[13] In the present study, ICU admission was required only in a minority of children, but this subgroup represented the highest-risk group.

Most children recovered and were discharged, indicating that supportive management was effective in the majority of cases. Ralston et al. recommended that treatment should focus on supportive care rather than routine bronchodilators, corticosteroids, or antibiotics in uncomplicated bronchiolitis.[14] The present study supports this approach, as the majority of children improved with oxygen, hydration, monitoring, and supportive measures.

Mortality was observed in 4 (3.1%) patients and was mainly associated with severe respiratory distress and delayed presentation. Although mortality from bronchiolitis is generally low in otherwise healthy infants, risk increases in young infants, premature babies, malnourished children, and those presenting late with hypoxia. Nair et al. estimated a substantial global burden of RSV-associated severe disease and mortality in young children, particularly in low- and middle-income settings.[15] This reinforces the importance of early recognition and timely hospital care.

The present study has practical implications for pediatric practice. Children below six months, premature infants, low birth weight infants, malnourished children, and those exposed to passive smoke should be considered at increased risk for severe bronchiolitis. Parental education should include early identification of warning signs such as fast breathing, chest indrawing, poor feeding, lethargy, cyanosis, and reduced urine output. Families should also be counselled regarding breastfeeding, avoidance of tobacco smoke exposure, hygiene, and timely medical care during respiratory infections.

The present study has certain limitations. Viral testing was not performed, so the etiological agents could not be identified. The study was hospital-based and therefore may represent more severe cases compared with community bronchiolitis. Long-term follow-up was not performed, and recurrent wheezing after bronchiolitis was not assessed. The study did not include detailed socioeconomic status, overcrowding, vaccination status analysis, or objective clinical severity scoring. Future studies with viral diagnostics, standardized severity scores, and follow-up for recurrent wheezing may provide stronger evidence.

CONCLUSION

Acute bronchiolitis predominantly affected infants below one year of age, especially those below six months. Male predominance was observed. Cough, breathlessness, wheezing, chest retractions, and feeding difficulty were common clinical features. Moderate bronchiolitis was the most frequent severity category. Prematurity, low birth weight, passive smoking exposure, and malnutrition were significantly associated with severe bronchiolitis. Most children recovered with supportive management, although oxygen supplementation, intravenous fluids, and ICU care were required in selected cases. Early recognition of high-risk infants, monitoring of oxygen saturation, adequate hydration, avoidance of unnecessary medications, and timely supportive care are essential for improving clinical outcomes.

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