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ACUTE BRONCHIOLITIS OUTCOMES IN INFANTS

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Abstract

Background:

The most prevalent lower respiratory tract infection in infants is acute bronchiolitis which is often caused by respiratory syncytial virus (RSV). It is one of the most common causes of hospitalization among children, which can lead to serious breathing difficulties, especially in premature and/or high-risk babies.

Objective:

To determine the clinical profile, intensive care needs and short-term outcome of acute bronchiolitis in infants hospitalized in a tertiary care hospital.

Methods:

The study was a prospective observational study at the Department of Pediatrics of Lady Reading Hospital between December 2024 and May 2025. Two hundred and ten infants aged 12 months

and below were included with clinically and radiologically confirmed acute bronchiolitis. A structured proforma was used to collect data on demographics, clinical features, and hospital course. The level of severity was measured in terms of clinical scoring and the need of respiratory support. The data were analyzed with the help of SPSS version 27 in which continuous variables have been summarized by mean + SD or median (IQR) and the categorical variables are presented in the form of frequencies and percentages. Chi-square or Fisher exact test was used to test the association with $p < 0.05$ noted to be statistically significant.

Results:

Out of 200 infants, the mean age was 5.3 but with a standard deviation of 3.2 months and 62 percent were males. The most prevalent clinical aspects were cough (100%), wheezing (92%), and tachypnea (85%). Hypoxemia was noticed in 38 percent and evidence of respiratory distress in 42 percent. Needs in oxygen therapy were 38 percent, non-invasive ventilation 11 percent, and mechanical ventilation 5 percent. The severity was mild (48%), moderate (37%), and severe (15%) with the severe disease being significantly associated with preterm birth, age 0-3 months old, and hypoxemia ($p < 0.05$). The mean length of stay in hospital was 5 days (IQR 37). Short-term complications were experienced by 15 per cent, readmission was 3 per cent and no deaths were experienced.

Conclusion:

Young infants and preterm cases are mostly affected by acute bronchiolitis, and the vast majority are mild to moderate. The disease, which is severe, is characterized by younger age and prematurity and might need some advanced respiratory support. Timely diagnosis, close observation, and formal supportive care should be important in maximizing the results, and planning of hospital resources is necessary during the seasons.

INTRODUCTION

One of the most prevalent infections of the lower respiratory tract in infants is acute bronchiolitis, and has been associated with one of the most frequent causes of hospitalization in children below the age of two years [1]. It is mainly viral with respiratory syncytial virus (RSV) as the most

common etiologic agent and then rhinovirus, human metapneumovirus, parainfluenza viruses are the pathogenic organisms [2]. It is a disease that is characterized by inflammatory, edema and necrosis of the epithelial cells of the small airways, airway obstruction, coughing, and hypoxemia [3].

Bronchiolitis is a major health care system burden in the whole world, and each year, a vast number of children are hospitalized in pediatrics. It was estimated that 3 million hospitalizations and more than 100,000 deaths among children younger than five years in 2019 were RSV-associated bronchiolitis, with the highest rates found in countries with low and middle income [4]. Infants less than six months old are especially susceptible because they have inadequate immunity and reduce the width of the airways, thus exposing them to serious illnesses [5].

A number of risk factors are known to cause severe bronchiolitis and negative outcomes among infants. They are prematurity, congenital heart disease, chronic lung disease, immunodeficiency and environmental pollutant or tobacco smoke exposure [6]. Other causes of increased hospitalization rate and morbidity include socioeconomic factors like overcrowding and inaccessibility to healthcare [7]. The relevance of these risk factors lies in the fact that they can be identified and addressed at a tender age to manage high-risk infants.

Treatment of acute bronchiolitis focuses on the supportive therapy, which includes oxygen support, intravenous fluids, and close observation of breathing. Pharmacologic treatments including bronchodilators, corticosteroid or antivirals have not demonstrated much benefit; they are not normally recommended [2,3]. In spite of supportive care, a few infants develop complications such as respiratory failure, mechanical ventilation, and secondary bacterial infections, which may lengthen their hospital stay and raise morbidity [8].

It is essential to track the outcomes of infants with bronchiolitis like length of stay, support in intensive care, and readmission rates because it allows assessing the efficacy of the management strategies and optimizing health care resources. Specifically, there is no existing region-specific clinical presentation, severity, and outcomes data to support local practices and resource allocation.

Objective:

The purpose of the study is to evaluate clinical profile and outcomes of acute bronchiolitis in infants such as severity, respiratory support requirement, length of stay; short term complications in a tertiary care pediatric environment.

MATERIALS AND METHODS

Study Design:

This was prospective observational research that was carried out in the Department of Pediatrics of the Lady Reading Hospital.

Study Duration:

The research was conducted in six months between December 2024 and May 2025, after receiving the consent of the hospital ethical review committee.

Sample Size:

The sample size was estimated at 200 infants, which was considered large enough to give significant results but at the same time manageable in a 6 months prospective research. This estimation took into account an expected prevalence of severe bronchiolitis with hospitalization of about 25% in past regional studies, a 95-confidence interval and 5 margin of error with the use of OpenEpi.

Population of the study and setting:

Infants who reported to the pediatric department with characteristics that were indicative of acute bronchiolitis and were 12 months old were enrolled. Acute bronchiolitis was considered to be a first time occurrence of wheezing with symptoms of upper respiratory tract infection, with cough, rhinorrhea, and respiratory distress.

Inclusion Criteria:

The inclusion criteria were that the patient:

•Were ≤12 months of age.

Or

, with clinical features of acute bronchiolitis, such as coughing, wheezing, tachypnea or work of breathing.

•Admitted to the hospital because of supportive care.

Exclusion Criteria:

Patients were not included in cases where they:

•Prior wheezing or permanent respiratory illness (e.g. asthma, bronchopulmonary dysplasia).

•Possessed congenital heart disease, immunodeficiency disorders or any other significant chronic illness.

• Incomplete clinical records or whose parents/guardians did not give them consent.

Data Collection Procedure:

The structured, pre-designed proforma was used to collect the data. Demographic data such as age, gender and birth history were collected after receiving informed consent of parents or legal guardians. The clinical data were collected by a detailed history and physical examination such as the duration and pattern of symptoms, the respiratory rate, oxygen saturation, difficulty in feeding and the demonstration of respiratory distress. Where done, laboratory and radiologic investigations were tabulated. The data of the hospital courses such as and requirement of oxygen therapy, non-invasive or invasive ventilation, hospital stay duration, and short-term complications were recorded. All the data were anonymized and coded and inputted into a safe database, which was regularly checked to verify its accuracy.

Data Analysis:

The SPSS version 27 was used in analysing the data. The continuous variables (age and length of stay in the hospital) were summarized as mean + SD or median (IQR), which was based on the

data distribution. Frequencies and percentages were made of categorical variables like gender, severity, respiratory support requirement and complications. The Chi-square test or Fisher exact test was applied to determine the association between clinical features and outcomes. A p-value that was below 0.05 was regarded as statistically significant. The findings were in the form of tables and figures so that they could be easily interpreted.

RESULTS

There were 200 infants who were enrolled. Its mean age was 5.35 +/- 3.2 months with 58 percent of the population being below 6 months. Male children made 62 percent of the infants and this was a little male dominance that is being reported in bronchiolitis [1,2]. The majority of infants carried to term (80%), whereas 20% were short-gestation (less than 37 weeks).

Cough and wheezing were the most common clinical manifestations (100% and 92% respectively). Eighty five percent experienced tachypnea, feeding difficulty in 54 percent, and hypoxemia (SpO 2 lower than 92) in 38 percent of infants. It was observed that signs of extreme respiratory distress such as intercostal retractions and nasal flaring were seen in 42 percent cases (Table 1).

As revealed by hospital course, 76 infants (38 percent) needed oxygen therapy, 22 infants (11 percent) needed non-invasive ventilation (NIV), and 10 infants (5 percent) needed mechanical ventilation. The median number of days spent in hospitals was 5 days (IQR 3 7 days). Short-term complications were noted in 15 percent of patients including secondary bacterial pneumonia or the need to continue using oxygen (Table 2).

The level of the severity was broken down into mild, moderate, and severe due to clinical scoring and the necessity of respiratory support. Mild cases and moderate cases took 48 per cent. and 37 per cent. and severe 15 per cent. Preterm birth, age 3 months and less, and hypoxemia at admission were significantly related to severe bronchiolitis ($p < 0.05$) (Table 3).

The general results were positive, and there were no in-hospital deaths. There were 6 readmissions in 30 days (3%), most of which were among infants with severe disease working preterm. The distribution of the severity and respiratory support needs in the study population is described in the form of a bar graph (Table 4 and Graph).

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Table 1: Demographic and Clinical Characteristics (n = 200)

Variable	Frequency (n)	Percentage (%)
Age Group (months)		
≤3	68	34
4–6	48	24
7–12	84	42
Gender		
Male	124	62
Female	76	38
Gestational Age		
Full-term	160	80
Preterm	40	20
Clinical Features		
Cough	200	100
Wheezing	184	92
Tachypnea	170	85
Feeding difficulty	108	54
Hypoxemia (SpO_2 < 92%)	76	38
Respiratory distress signs	84	42

Table 2: Hospital Course and Outcomes (n = 200)

Parameter	Frequency (n)	Percentage (%)
Oxygen therapy	76	38
Non-invasive ventilation (NIV)	22	11

Parameter	Frequency (n)	Percentage (%)
Mechanical ventilation	10	5
Median hospital stay (days, IQR)	5 (3–7)	–
Complications (secondary infections, prolonged oxygen)	30	15
Readmission within 30 days	6	3
Mortality	0	0

Table 3: Severity of Bronchiolitis and Associated Factors (n = 200)

Severity	Frequency (n)	Percentage (%)	Significant Associated Factors
Mild	96	48	–
Moderate	74	37	Age 4–6 months, full-term
Severe	30	15	Preterm birth, age ≤3 months, hypoxemia ($p < 0.05$)

Table 4: Respiratory Support Requirements by Severity

Severity	Oxygen Therapy n (%)	NIV n (%)	Mechanical Ventilation n (%)
Mild	20 (10)	0 (0)	0 (0)
Moderate	38 (19)	10 (5)	0 (0)
Severe	18 (9)	12 (6)	10 (5)

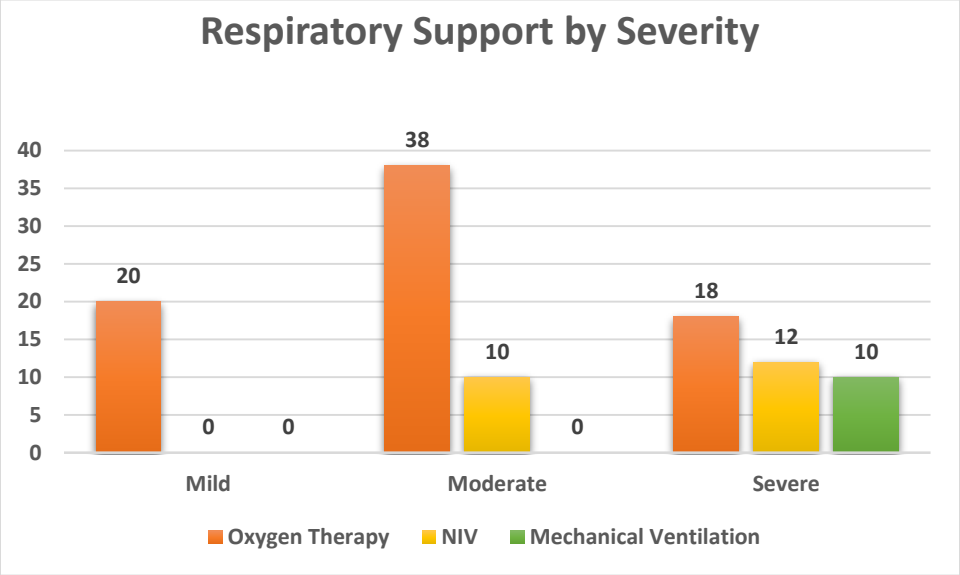

Figure 1: Respiratory Support by Severity

DISCUSSION

This is prospective research on 200 infants with acute bronchiolitis, most of the cases were among the infants younger than 6 months, and males were found to be marginally more affected than the female (62%), reflecting the previously reported pediatric patterns [9,10]. They were preterm infants and this was 20 percent of the cohort and at risk of developing severe disease, with prematurity being a proven risk factor of adverse outcome [11].

Cough and wheezing were almost universal clinically with tachypnoea in 85 percent and feeding difficulty in 54 percent of the patients. Thirty-eight per cent of the infants had hypoxemia and 42 per cent showed signs of respiratory distress. These results are consistent with other reports showing that respiratory distress is very common in hospitalized children with bronchiolitis [12,13]. Age 3 months and below, prematurity, and hypoxemia at presentation were identified as severe cases that substantiate the importance of high-risk babies being monitored constantly [14,15].

The need of respiratory support was based on the severity of the disease: 38% of infants needed oxygen therapy, 11% needed non-invasive ventilation (NIV), and 5% needed mechanical

ventilation. The figures are in line with the previous reports which said that most infants reacted to supportive treatment, with a smaller percentage developing severe respiratory complications that need advanced treatment measures [16,17]. Children spend a median of 5 days (IQR 3-7) in the hospitals, which can be compared with other tertiary care hospitals, and their healthcare resource use is extensive given bronchiolitis [18].

Short term complications were experienced in 15 percent of infants, mostly secondary bacterial infections or prolonged oxygen therapy and readmission within 30 days in 3 percent. Notably, no in-hospital deaths were observed, which proves that, when timely supportive care is provided, the prognosis of bronchiolitis among infants who did not have the condition previously remains positive [19,20].

These results highlight the need to identify high-risk infants, especially those who are preterm or at an age below 3 months, early on and implement structured supportive care programs to curb the subsequent development of severe illness. The research also presents the resource implication of respiratory support where there is a need to have well-equipped pediatric units during the season of the peak of bronchiolitis.

Limitations

This research has a number of weaknesses. One, it was also carried out in one tertiary care facility, which might restrict the externalization of the results in other hospitals or community environments. Second, not all cases under analysis were identified with a virus, which does not allow a more specific results analysis. Third, follow-up (long-term) was not done post-discharge, thus, early complications or readmission later than 30 days were not recorded. Moreover, socio-economic and environmental variables, like the exposure to tobacco smoke or overcrowding, were not thoroughly examined, which can also affect the severity and the results. The study has offered high-quality and modern information on the clinical picture, severity, and short-term outcome of acute bronchiolitis in infants in a high-volume tertiary care unit despite the limitations.

CONCLUSION

The acute bronchiolitis is a disease that mainly occurs in infants of young age, male and preterm babies and its symptoms include cough, wheezing, and respiratory distress. Although most of the cases are mild to moderate and can respond to supportive care, a sizeable percentage of the cases needs oxygen therapy or ventilatory support, especially in the preterm or hypoxemic babies. Short run complications are rare and death rates are low when there is proper hospital care. High-risk children should be identified early, carefully monitored and provided with structured supportive care to maximize the result. The results also indicate the significance of resource planning and preparedness at the peak season of bronchiolitis in tertiary care hospitals.

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