ISSN (Print): 2663-9491 ISSN (Online): 2789-6897

Original Article

Study on Children with Bronchiolitis — A Tertiary Care Hospital Experience

DOI: dx.doi.org

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Received: 19 November 2024
Accepted: 28 November 2024
Published: 15 December 2024

Published by:
Gopalganj Medical College,
Gopalganj, Bangladesh

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ABSTRACT

Introduction: *Bronchiolitis, an inflammation of the bronchioles, is typically viral and identified by its clinical and epidemiological traits. Predominantly caused by RSV, it affects infants seasonally, with peaks in winter and spring. It leads to significant hospitalizations in children under two, especially those with risk factors like young age, prematurity, and chronic illnesses.* ***Aim of the study:*** *The study aims to assess the diagnostic methods, radiological findings, and management strategies used in treating bronchiolitis, including the effectiveness of various interventions.* ***Methods & Materials:*** *This observational study at the Department of Pediatric, 250 Bedded General Hospital, Khulna, Bangladesh, analyzed 180 bronchiolitis cases from January 2021 to December 2021. Children under two with clinical bronchiolitis were included, excluding those with congenital heart disease, immunodeficiency, severe malnutrition, or parental refusal.* ***Result:*** *The study of 180 children with bronchiolitis revealed that most patients were between 2 and 6 months old, with a higher prevalence in males (62.78%) and a notable presence in both urban and rural settings. Clinical symptoms commonly included wheezing (95%) and tachypnea (85%). Risk factors such as passive smoking (31.67%) and overcrowding (27.78%) were significant.* ***Conclusion:*** *This study highlights that bronchiolitis predominantly affects infants under six months, with a higher incidence in males and both urban and rural settings. Key clinical symptoms include wheezing and tachypnea. Significant risk factors include passive smoking and overcrowding, aligning with existing literature.*

Keywords: *Bronchiolitis, RSV, Infants*

(The Insight 2024; 7(1): 248-256)

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INTRODUCTION

Bronchiolitis refers to the inflammation of the small airways known as bronchioles and is typically identified by its clinical and epidemiological characteristics. According to the American Academy of Pediatrics, bronchiolitis in infants is defined as a lower respiratory tract infection caused by a virus characterized by wheezing. The European guidelines describe bronchiolitis as a viral illness that occurs seasonally in infants[1]. It exhibits a clear seasonal pattern, leading to outbreaks primarily in the winter and spring[2]. In temperate regions, bronchiolitis is characterized by an increase in number in late October, a peak in January/February, and an ending in April[3]. Bronchiolitis is one of the main reasons for hospital admissions among infants and young children globally, responsible for 15-17% of all hospitalizations in children under the age of 2[4,5]. The infection is primarily caused by RSV, accounting for over 50% of cases[6]. Other viruses responsible for the infection include influenza, parainfluenza, adenovirus, and metapneumovirus[7,8]. The most severe cases predominantly occur in healthy infants. Factors that increase the risk of severe illness include young age, prematurity, chronic lung disease, congenital heart disease, immune deficiency, male gender (1.5 times more likely), and low socioeconomic status[1,9]. The initial symptoms typically include a runny nose, nasal congestion, reduced appetite, and a cough, usually lasting around three days[2]. Epithelial cells start regenerating in 3-4 days, and functional regeneration takes 2 weeks[1]. As the disease advances, symptoms such as rapid breathing (tachypnea), the use of accessory respiratory muscles with intercostal and subcostal retractions, and wheezing may emerge. Over time, grunting, nasal flaring, cyanosis, hypoxia, and respiratory failure can also develop[2]. RSV-induced bronchiolitis can present in various forms, from mild upper respiratory tract infections to severe and potentially life-threatening lower respiratory tract infections that may necessitate hospitalization and mechanical ventilation[10]. By the age of two, the majority of children will have had at least one RSV infection[11]. Although most cases of acute bronchiolitis are mild and can be managed at home, acute respiratory distress syndrome leads to 2-3% of pediatric patients being hospitalized, with 5% of those needing transfer to intensive care units[12,13]. Supportive therapy, rather than interventional therapy, has been recently recommended for patients with acute viral bronchiolitis[4]. Since there are no specific treatments available, preventive measures are crucial for reducing the impact of these infections. Using the monoclonal antibody palivizumab for prophylaxis can help lessen the severity of RSV-related bronchiolitis and decrease hospitalizations due to RSV infection[14,15]. Currently, no prophylaxis options are available for healthy term and preterm infants[4]. Understanding the patient's age and gender and presenting signs and symptoms is crucial for identifying and effectively managing bronchiolitis as a clinical syndrome in everyday practice. In light of this, we aim to assess the diagnostic methods,

radiological findings, and management strategies used in treating bronchiolitis, including the effectiveness of various interventions.

METHODS & MATERIALS

This observation study was conducted at the Department of Pediatric, 250 Bedded General Hospital, Khulna, Bangladesh. A total of 180 cases with bronchiolitis were studied from January 2021 to December 2021. All the children enrolled in this study were admitted with a clinical diagnosis of bronchiolitis, as determined by the attending pediatrician. This diagnosis was based on symptoms upon examination. Admission was considered necessary due to a decline in respiratory status, reduced oral intake, or the need for oxygen or parenteral therapy. Only those who were discharged with a confirmed diagnosis of bronchiolitis were included in the analysis. The inclusion criteria were developed on the basis of National guidelines for the management of bronchiolitis [13].

Inclusion criteria

- Children aged two years or younger.
- Symptoms include a history of cough or runny nose, coupled with signs like tachypnea, hypoxia, subcostal or intercostal retractions, nasal flaring, grunting, and the presence of wheezing or crackles upon examination.

Exclusion Criteria

- Children had a history of congenital heart disease, immunodeficiency, grade III or IV protein-energy malnutrition, or if their parents refused consent.
- Children presenting with a pulse rate over 200/min, a respiratory rate exceeding 80/min, oxygen saturation below 94% despite oxygen therapy, profound lethargy, altered consciousness, or convulsions.

Data on clinical parameters and demographic factors were collected with a predetermined structured data collection instrument. After the parents gave their proper written consent, the questionnaire was filled out through a face-to-face interview. Clinical examination was done meticulously in all cases. Appropriate laboratory investigations, such as Complete blood count and chest radiograph, were also obtained.

The data was collected in Microsoft Excel. After being collected, they were edited through checking and rechecking. Data analysis was done by computer-aided statistical software Statistical Package for Social Sciences (SPSS) version 26.0 for Windows. Data was presented in tables and graphs.

RESULT

The study involved 180 children diagnosed with bronchiolitis. The majority of the patients (60%) were aged between 2 to 6 months. Children aged 7 to 12 months constituted 20% of the study population. The study observed a higher prevalence of bronchiolitis in males, who comprised 62.78% of the cases, compared to females, who made up 37.22%. More than 63% of the

families belonged to the middle class, while 25% were from the lower class. A slightly higher proportion of the children came from urban areas (47.22%) compared to rural areas (42.78%). Additionally, 10% of the children were from urban slums (**Table I**).

Table – I: Demographic Features of Patients (*n*=180)

Variables	Frequency	Percentage
Age (months)		
2-6	108	60.00
7-12	36	20.00
13-18	21	11.67
19-24	15	8.33
Sex		
Males	113	62.78
Females	67	37.22
Monthly Family Income		
Lower-class	45	25.00
Middle-class	114	63.33
Upper-class	21	11.67
Residence		
Rural	77	42.78
Urban	85	47.22
Urban slum	18	10.00

All patients exhibited cough and cold, while fever was observed in 85%, dyspnea in 65%, noisy breathing in 50%, and lethargy in 35% of the cases. Wheezing was the most common clinical sign (95%), followed by tachypnea (85%), crepitations (75%), retractions (35%), and cyanosis (6.11%). Key risk factors included passive smoking (31.67%), overcrowding (27.78%), low birth weight (23.89%), preterm birth (11.67%), and malnutrition (7.22%) (**Table II**).

Table – II: Clinical Characteristics and Related Factors (*n*=180)

Variables	Frequency	Percentage
Symptoms		
Cough	180	100.00
Cold	180	100.00
Fever	153	85.00
Dyspnea	117	65.00
Lethargy	63	35.00
Noisy Breathing	90	50.00
Signs		
Wheeze	171	95.00
Tachypnea	153	85.00
Crepitations	135	75.00
Retractions	63	35.00
Cyanosis	11	6.11
Risk Factors		
Passive smoking	57	31.67
Overcrowding	50	27.78
Low birthweight	43	23.89
Preterm	21	11.67
Malnourished	13	7.22

The seasonal distribution of bronchiolitis cases showed that the highest incidence occurred in December, accounting for 21.11% of the cases, followed by January (19.44%) and February (18.33%). March also had a notable number of cases, representing 11.11% of the total (**Table III**).

Table – III: Seasonal Distribution of Bronchiolitis

Months	Frequency	Percentage
January	35	19.44
February	33	18.33
March	20	11.11
April	8	4.44
May	3	1.67
June	6	3.33
July	2	1.11
August	6	3.33
September	4	2.22
October	9	5.00
November	16	8.89
December	38	21.11

Hyperinflation was the most common radiological finding in 60% of the cases, followed by increased translucency in 41.11%. Other findings included streaky densities (12.78%), consolidation (10%), collapse (2.78%), and patchy opacities (5%), with 17.22% of patients showing normal radiological results (**Table IV**).

Table – IV: Radiological Findings in Studied Cases (*n*=180)

Findings	Frequency	Percentage
Hyperinflation	108	60.00
Increased translucency	74	41.11
Streaky densities	23	12.78
Consolidation	18	10.00
Collapse	5	2.78
Patchy opacities	9	5.00
Normal	31	17.22

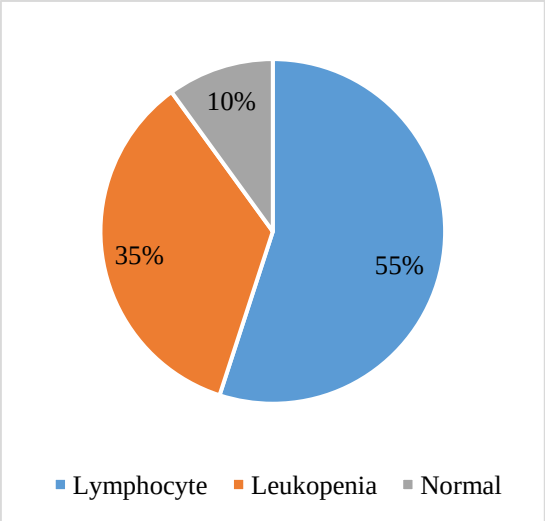

Figure – 1: CBC Findings in Studied Cases (*n*=180)

Figure 1 shows that among all, 55% had elevated lymphocyte levels, 35% of the children experienced leukopenia and only 10% had normal CBC results. The study examined management strategies for bronchiolitis in children, with oxygen administration being the most common (85.56%), followed by hypertonic saline nebulization (83.33%). Maintenance IV

fluids were used in 43.89% of cases, beta 2 agonist nebulization in 25%, and IV antibiotics in 15.56% (**Table V**).

Table – V: Type of Management Strategies of the Disease

Management	Frequency	Percentages
Oxygen administration	154	85.56
Hypertonic saline nebulization	150	83.33
Maintenance IV fluids	79	43.89
Beta 2 agonist nebulization	45	25.00
IV antibiotics	28	15.56

DISCUSSION

Viral bronchiolitis is a frequent reason for hospital admission in young children. RSV-positive cases tend to be more severe, occurring in younger children, requiring more frequent oxygen therapy, and leading to longer hospital stays. Although RSV is known to be the primary cause of bronchiolitis in infants, the global impact of RSV infections is still underestimated. Severe bronchiolitis predominantly affects children under 6 months of age[16–18]. In our study, we aimed to describe the demographical data, clinical characteristics, seasonal trends, radiological and CBC findings, and treatment of children admitted with bronchiolitis in a tertiary care hospital, Bangladesh. In this study, 180 children with a clinical diagnosis of bronchiolitis were assessed. The majority, 108 children (60%), were aged 2-6 months, which aligns with findings from other research, such as the study by Syed et al., where 80% of infants were within the 30–90-day age range. The prevalence of males in their study was attributed to the inclusion of infants under 90 days old[19]. ***Hoseiny et. al.*** and ***Makam et. al.*** showed similar results where they conclude that Bronchiolitis typically affects children younger than two years with a peak incidence between two and six months of age[20,21]. The male: female ratio in our study was similar to Sommer et al and Iqbal et al where they got the male: female ratio of 1.42:1 and 1.3:1 respectively[22,23]. In terms of family income, a significant majority of the patients (63.33%) came from middle-class families. Regarding residence, the majority of the patients lived in urban areas (47.22%), followed by those from rural areas (42.78%). A smaller proportion of the children resided in urban slums (10%). This distribution highlights that bronchiolitis is prevalent in both urban and rural settings, with a slight predominance in urban areas. Halder et al also showed similar findings[6]. All the children had cough and cold, and fever for 85%, dyspnea for 65% of children, similar to studies done by Gokce et al in which all the children in their study had cough and fever for 88% children[24]. In Soleimani et al study, 89% babies had cough, with fever for 72% and dyspnea for 71% of children[25]. In Gokce et al and Soleimani et al study wheezing was present in 58% and 79% of children which was similar to our study where most of the children presented with wheeze (95%)[24,25]. ***Iqbal et. al.*** exhibited 91% children with respiratory

distress at the time of presentation[23]. Tachypnea was present in 85% and chest retractions in 35% of children in our study which is similar to Ganavi et al's result[26]. Severe signs like cyanosis are less common in the present study with 6.11% children. Crepititions were seen in 135 (75%) patients. According to our observation, passive smoking was reported in 31.67% of the cases, highlighting its significant role in the development of bronchiolitis. Overcrowding was also a notable risk factor, affecting 27.78% of the children. 11.67% of the children were born preterm. Malnutrition was identified in 7.22% of the patients. The results of our study are almost similar to other research[27]. These findings underscore the impact of environmental and developmental factors on the incidence and severity of bronchiolitis, suggesting that addressing these risk factors could be crucial in managing and preventing the condition. The infection was present year-round, with increased incidence during the winter months. This pattern is consistent with findings from other studies[28]. The most common radiological findings in the study subjects were increased translucency and hyperinflation which is consistent with the findings of other study[6]. ***Soleimani et. al.*** found in 2014 that hyperinflation in radiologic studies, was the most prevalent finding[25]. Lymphocytosis in 55% of patients, Leukopenia in 35% cases and others had normal results in CBC (Figure 1). ***Soleimani et. al***. reported Lymphocytosis in 67 patients (67%) and all others had normal results in CBC [25]. The correct diagnosis of bronchiolitis can be made by considering the most common epidemiological factors such as age, gender, clinical findings laboratory and radiologic signs, and therefore ensuring proper diagnosis and appropriate treatment. Management of bronchiolitis is usually symptomatic as recommended by most of the guidelines; however, most of our patients received supplemental oxygen and 3% saline nebulization. No therapies have received support across all guidelines except for the use of supplemental oxygen. Chest physiotherapy does not speed up recovery. Antibiotics, though still widely used, are of no benefit in bronchiolitis[29]. Some of our patients received different treatment modalities like bronchodilators. Bronchodilators are less likely to be recommended in more recent guidelines, and the theory that they may be of greater benefit in infants more likely to develop asthma has been refuted[30,31].

Limitations of the study

The study has several limitations that should be considered. The study relied on clinical diagnosis and did not include viral identification, which could provide a more accurate understanding of the etiology of bronchiolitis in the studied population. The study's retrospective nature may introduce bias in data collection, and the lack of long-term follow-up prevents assessment of outcomes beyond the initial hospital stay.

Conclusion & Recommendations

In conclusion, this study provides valuable insights into the demographic, clinical, and seasonal patterns of

bronchiolitis in young children at a tertiary care hospital in Bangladesh. Our findings confirm that bronchiolitis predominantly affects infants under six months, with a higher incidence in males and a notable prevalence in both urban and rural settings. The clinical presentation aligns with existing literature, highlighting wheezing and tachypnea as common symptoms. Risk factors such as passive smoking and overcrowding were significant.

Funding

This research was funded by the authors themselves.

Conflict of Interest

The authors declare no conflict of interest.

Ethical Approval

The study was approved by the Institutional Ethics Committee

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