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A Clinical Study on the Profile, Severity, and Risk Factors of Bronchiolitis in Children Aged 1–24 Months Admitted to the Department of Pediatrics, Jhalawar Medical College

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HIGHLIGHTS

- Bronchiolitis is a leading pediatric concern
- Infants aged 1–24 months most affected
- Study evaluates profile, severity, and risks
- Hospital-based research provides clinical understanding
- Findings support improved pediatric care strategies

Key Words:
Bronchiolitis
Infants
Severity
Respiratory infection

ABSTRACT

Background: Bronchiolitis is a prevalent lower respiratory tract infection predominantly affecting infants and young children, particularly those aged under two years. It is commonly associated with viral pathogens, most notably respiratory syncytial virus (RSV), and represents a leading cause of pediatric hospitalization. While medical risk factors are well-documented, the role of non-medical contributors such as feeding practices and environmental exposures is gaining attention. **Objectives:** This study aimed to examine the clinical profile and outcomes of bronchiolitis in children aged 1–24 months and to analyze identifiable risk factors associated with the severity of the disease. **Methods:** A prospective observational study at Jhalawar Medical College included 218 children (1–24 months) with newly diagnosed bronchiolitis. Exclusions were prior wheezing, congenital anomalies, and immunodeficiencies. Data were collected via semi-structured questionnaires. Severity was assessed using the Wood Downes Score, and statistical analysis was done using Epi Info and Open Epi. **Results:** Most cases occurred in children aged 1–12 months (88.5%), with a male predominance (57.8%). Peak incidence was observed during winter months, particularly December and January. Severity was mild in 40.8%, moderate in 39.5%, and severe in 19.7% of cases. Severity correlated significantly with younger age, low birth weight, bottle feeding, lack of exclusive breastfeeding, exposure to passive smoking, indoor allergens, larger family size, joint family structure, lower socioeconomic status, and presence of upper respiratory infections in family members ($p < 0.05$). Severe cases required prolonged oxygen therapy and longer hospital stays. **Conclusion:** Bronchiolitis is most severe in younger infants and is influenced by both medical and modifiable non-medical risk factors. Public health measures targeting these preventable factors could help reduce disease severity and healthcare burden.

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Bronchiolitis is a lower respiratory tract infection that primarily affects infants and young children, making it a significant public health issue worldwide. It is most commonly caused by viral infections, with respiratory syncytial virus (RSV) being the leading pathogen. This condition results in a substantial number of hospitalizations each year, straining healthcare systems and causing distress to affected families. It is one of the major clinical challenges in pediatric healthcare, with a high incidence in children under the age of two. In particular, RSV, influenza, and adenovirus are responsible for the majority of cases. While the mortality rate from bronchiolitis is low (less than 1%), the morbidity is considerable, with a large number of children requiring hospitalization. Each year, approximately 20% of infants in the United States contract bronchiolitis, and 2-3% of them require hospital care. Infants under one year are particularly vulnerable, with nearly double the likelihood of developing the condition compared to older children [1-3].

The pathophysiology of bronchiolitis involves inflammation and obstruction of the small airways, a phenomenon that is especially pronounced in infants due to their immature immune systems and smaller airways. This viral infection leads to symptoms like cough, tachypnea (rapid breathing), wheezing, and respiratory distress. In severe cases, bronchiolitis can result in complications such as respiratory failure and secondary bacterial infections. Despite its prevalence and impact, there remains a lack of sufficient data on the disease's rate in developing or underdeveloped countries. The clinical presentation of bronchiolitis typically starts with an upper respiratory infection followed by increased respiratory effort and wheezing. According to the American Academy of Pediatrics (AAP), bronchiolitis is defined by these clinical symptoms, especially in children younger than two years of age [4,5].

Several medical factors contribute to the severity of bronchiolitis, including prematurity, low birth weight, chronic lung disease, congenital heart disease, and immunodeficiency, whether congenital or acquired. However, non-medical factors also play a critical role in exacerbating the severity of the disease, leading to higher hospitalization rates. These factors include feeding practices, family history of asthma, exposure to passive smoking, environmental allergens like wood-burning stoves and mosquito coils, overcrowding, the number of siblings, and lower socioeconomic status. Studies have shown a clear association between these non-medical factors and the severity of the disease, some of which are preventable. Despite this, current research tends to focus more on disease management rather than on preventive strategies that could be more effective in reducing the incidence and severity of bronchiolitis [6,7].

Infants and children between the ages of one and 24 months are particularly vulnerable to respiratory infections, including bronchiolitis, due to their developing immune systems and narrower airways. Recognizing the severity of the disease in this age group is vital for timely intervention, which can prevent complications and reduce the strain on healthcare facilities. Identifying risk factors for severe bronchiolitis allows for targeted preventive measures and interventions, potentially improving outcomes for children affected by the disease. By understanding these factors and the viral etiologies involved, clinicians can make more informed decisions, and public health strategies can be improved to better manage bronchiolitis [8,9].

This study aims to enhance the understanding of bronchiolitis in infants and young children by documenting its clinical profile, risk factors, and the impact of the viral causes. Identifying these factors and understanding the viral triggers will help improve clinical management and guide public health approaches to the disease. Ultimately, preventing the non-medical risk factors that exacerbate bronchiolitis can reduce hospitalization rates and shorten the duration of hospital stays. By addressing both the medical and non-medical factors that contribute to bronchiolitis severity, healthcare systems can better manage this common and impactful disease, reducing both the personal and societal burden it imposes. This prospective observational study will comprehensively document the clinical outcomes of bronchiolitis in children aged one to 24 months, filling critical gaps in current knowledge [10,11].

The aim of this study is to examine the clinical profile and outcome of bronchiolitis in children aged 1 to 24 months, as well as to analyze the identifiable risk factors that contribute to the severity of the condition.

MATERIAL AND METHODS

This prospective observational study was conducted at the Department of Paediatrics, in Jhalawar Medical College, Jhalawar for 1 year. Ethical approval has been obtained from the Ethical Approval Committee of Department of Paediatrics, in Jhalawar Medical College, Jhalawar.

Study Population

The study population will consist of children diagnosed with bronchiolitis who are admitted to the Department of Pediatrics during the study period and meet the inclusion and exclusion criteria. Inclusion criteria include newly diagnosed cases of bronchiolitis in children aged 1 to 24 months. Exclusion criteria include children younger than 1 month or older than 24 months, those with a previous episode of wheezing, underlying respiratory or cardiac diseases, preterm birth, immunodeficiency, or signs of sepsis.

Data Analysis

Data collected was entered into an MS Excel spreadsheet and summarized based on the type of variables. Continuous variables were expressed as mean and standard deviation and analyzed

using t-tests for two-group comparisons and one-way ANOVA for more than two groups. Nominal/categorical variables were summarized as frequency and percentage and analyzed using Chi-square or Fisher's exact test, as appropriate. Sensitivity, specificity, positive predictive value, and negative predictive value were calculated with 95% confidence intervals. Statistical analysis was performed using Epi Info version 7.2.1.0 and Open Epi version 3 software, with a p-value of <0.05 considered statistically significant. Ethical approval was obtained from the Institutional Ethical Committee, and informed written consent was obtained from all participants before the study.

RESULTS

In a study involving 218 cases of bronchiolitis, the majority of affected children (193 cases, 88.5%) were under one year of age, with 59.1% in the 1–6 months age group and 29.3% in the 7–12 months group. Only 11.5% of cases occurred in children aged 12–24 months. A higher prevalence was observed among males, accounting for 126 cases (57.8%), compared to 92 cases (42.2%) in females.

Table 1: Seasonal Pattern of Bronchiolitis

Month - Year	No	%
Sep-23	12	5.5
Oct-23	14	6.4
Nov-23	33	15.1
Dec-23	49	22.4
Jan-24	36	16.5
Feb-24	23	10.5
Mar-24	14	6.4
Apr-24	9	4.1
May-24	5	2.2
Jun-24	7	3.2
Jul-24	7	3.2
Aug-24	9	4.1
Total	218	100

Out of 218 total bronchiolitis cases, the highest incidence occurred in December (22.4%) and January (16.5%), followed by November (15.1%) and February (10.5%), indicating a peak in winter months.

Table 2: Severity of Bronchiolitis

Severity	Children	
	No.	%
Mild	89	40.8
Moderate	86	39.5
Severe	42	19.7
Total	**218**	**100**

Among 218 children with bronchiolitis, 40.8% had mild, 39.5% had moderate, and 19.7% had severe disease.

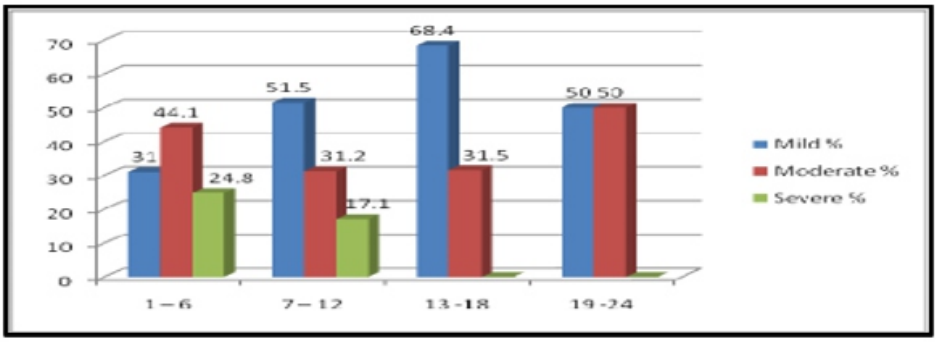

Figure 1: Severity of Bronchiolitis Among Different age Groups

Severity of bronchiolitis was highest in infants aged 1–6 months, with decreasing severity in older age groups-a statistically significant trend (p = 0.02).

In the analysis of bronchiolitis severity by gender among 218 children, males exhibited slightly higher proportions of mild cases (45.2%) compared to females (34.7%), while females had a marginally higher rate of moderate (43.4%) and severe cases (21.7%) than males (36.5% and 18.2%, respectively); however, this difference was not statistically significant (p=0.3). Irritable cry was most prevalent in the 1–6 months age group (70.5%) and declined with increasing age, being absent in the 19–24 months group, with this trend showing statistical significance (p=0.011). Poor feeding followed a similar pattern, being most common in infants aged 1–6 months (73.6%) and progressively decreasing in older children, also with a significant association (p=0.0001).

Aspiration during feeding was observed most frequently in the youngest group (37.2% in 1–6 months) and was nonexistent in those aged 19–24 months, again indicating a statistically significant decline with age (p=0.0001).

The study found a statistically significant association between the severity of bronchiolitis and the presence of symptoms such as irritable cry, poor feeding, and aspiration during feeding. Irritable cry was reported in 79% of severe cases compared to 62.7% of moderate and 35.9% of mild cases (p=0.001). Poor feeding was observed in 81.3% of severe cases, 62.7% of moderate, and 44.9% of mild cases (p=0.001). Similarly, aspiration while feeding was markedly more common in severe bronchiolitis (86%) than in moderate (23.2%) or mild cases (6.7%), with this trend also being statistically significant (p=0.004). These findings highlight that as the severity of bronchiolitis increaseS, these symptoms become more prevalent.

Table 3: Birth Weight VS Severity of Bronchiolitis

Severity	Birth Weight (in Kg)			
	<2.5		>2.5	
	No.	%	No.	%
Mild	21	24.4	68	51.5
Moderate	41	47.6	45	34
Severe	24	27.9	19	14.3
'P'	**0.0003** **Significant**			

Low birth weight children (<2.5 kg) showed significantly higher severity of bronchiolitis compared to those with birth weight >2.5 kg (p = 0.0003).

The severity of bronchiolitis was significantly associated with feeding practices, showing that children who were exclusively breastfed experienced milder forms of the illness, with only 6.5% of severe cases among them compared to higher severity in non-exclusively breastfed children (p=0.001). Conversely, bottle feeding was linked to increased severity, with 25.5% of severe cases occurring among bottle-fed children, and this association was statistically significant (p=0.01). However, no significant relationship was found between the severity of bronchiolitis and a parental history of asthma (p=0.7), indicating that genetic predisposition may not play a major role in disease severity in this study population.

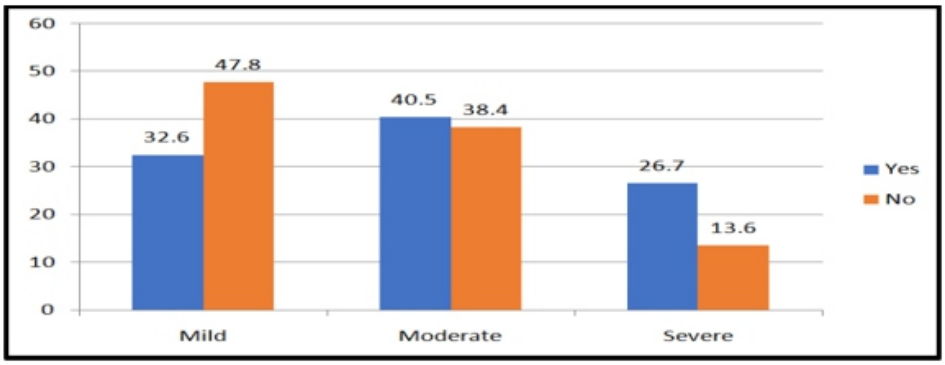

Figure 2: Passive Smoking VS Severity

Children exposed to passive smoking had significantly higher severity of bronchiolitis compared to those not exposed (p = 0.02).

Table 4: Indoor Allergens VS Severity of Bronchiolitis

Severity	Indoor Allergens			
	Yes		No	
	No.	%	No.	%
Mild	20	26.6	69	48.2
Moderate	37	49.3	49	34.2
Severe	18	24	25	17.4
'P'	0.001 Significant			

Exposure to indoor allergens was significantly associated with increased severity of bronchiolitis, with more severe cases seen in exposed children (p = 0.001).

Table 5: Age at Risk for Bronchiolitis when Exposure to URI in Family Members

Age (in Months)	URI in Family Members			
	Yes		No	
	No.	%	No.	%
1-6	86	66.6	43	33.3
7-12	38	59.3	26	40.6
13-18	7	36.8	12	63.1
19-24	2	33.3	4	66.6
'P'	0.02 Significant			

Younger children, particularly those aged 1–6 months, showed a stronger association between bronchiolitis and URI exposure in family members, with the association decreasing as age increased (p = 0.02).

Table 6: Type of family VS Severity of Bronchiolitis

Type of family	Mild		Moderate		Severe	
	No.	%	No.	%	No.	%
Joint	32	30.7	45	43.2	27	25.9
Nuclear	57	50	41	35.9	16	14
'P'	0.02 Significant					

Children from joint families had significantly more severe bronchiolitis compared to those from nuclear families (p = 0.02). The severity of bronchiolitis was found to increase with the number of children in a family, with a statistically significant association (p=0.01). Children from larger families (more than two children) showed a higher incidence of severe bronchiolitis, with 28.9% of cases in this group being classified as severe. Additionally, the severity of bronchiolitis was more pronounced in lower socioeconomic status (SES) families, as determined by the Modified Kuppuswamy scale. Families in SES classes IV and V had a higher proportion of severe cases, with 31.6% of severe cases found in Class V and 24.4% in Class IV. This association was also statistically significant (p=0.01), indicating that both birth order and socioeconomic status play a significant role in the severity of bronchiolitis.

Table 7: Oxygen Requirement VS Severity of Bronchiolitis

Oxygen Requirement	Mild		Moderate		Severe	
	No.	%	No.	%	No.	%
<72HRS	82	73.2	30	26.7	0	0
>72HRS	7	6.6	56	52.8	43	40.5
'P'	0.001 Significant					

Severe bronchiolitis cases required prolonged oxygen support (>72 hours), with a statistically significant relationship between severity and oxygen requirement (p = 0.001).

Table 8: Duration of Hospital Stay VS Severity of Bronchiolitis

Duration of Hospital Stay	Mild		Moderate		Severe	
	No.	%	No.	%	No.	%
<7days	86	42.7	83	41.2	32	15.9
>7days	3	17.6	3	17.6	11	64.7
'P'	0.001 Significant					

Severe bronchiolitis cases required a significantly longer hospital stay (>7 days) compared to mild and moderate cases (p = 0.001).

DISCUSSION

Bronchiolitis is a common respiratory illness primarily caused by viral infections, affecting infants and young children. It is one of the leading causes of hospitalization in this age group and significantly impacts their health. Understanding the clinical profile and risk factors associated with the severity of bronchiolitis is essential for improving disease management and patient outcomes. This study aimed to investigate the clinical profile, outcomes, and hospital stay duration of bronchiolitis in children aged 1-24 months, as well as identify risk factors associated with the severity of the condition [12,13].

The study found that bronchiolitis predominantly affected infants, with 88.5% of cases occurring in the 1-12 months age group. The remaining 11.5% were in the 13-24 months age group. This age distribution is consistent with other studies that have shown a higher incidence in infants under 12 months. This age group is more vulnerable to respiratory viral infections due to their immature immune systems and smaller airways. These findings emphasize the need for targeted preventive measures, early recognition, and appropriate management for this vulnerable population [14].

In terms of gender distribution, the study found that bronchiolitis was more common in males (57.8%) than females (42.2%). Other studies also report a male predominance, with male-to-female ratios ranging from 1.5:1 to 2.25:1. While the exact reasons for this gender difference remain unclear, it may be related to factors such as airway size, immune response, and environmental exposure. Understanding this gender disparity can help guide preventive strategies and inform clinicians when managing bronchiolitis in male infants and young children [15].

The study also identified seasonal trends in bronchiolitis cases, with the highest number of admissions occurring during the winter months, particularly in December and January. This aligns with previous research showing bronchiolitis cases peak in the colder months, likely due to the seasonality of respiratory viruses like respiratory syncytial virus (RSV), which are the primary

causes of bronchiolitis. The cooler temperatures, lower humidity, and increased indoor crowding during winter months facilitate the transmission of these viruses, contributing to the seasonal surge in cases [16].

Regarding the severity of bronchiolitis, the study categorized cases into three levels: mild (40.8%), moderate (39.5%), and severe (19.7%). The findings highlight that a significant portion of cases was moderate or severe, underlining the substantial burden of severe bronchiolitis. Severity classification is essential for better understanding the clinical spectrum of the disease and helps in patient risk stratification, which can guide appropriate management strategies [17].

The study also explored various factors associated with the severity of bronchiolitis. A significant inverse relationship was found between age and severity, with younger infants tending to experience more severe disease. Other factors associated with greater severity included irritability, poor feeding, aspiration during feeding, low birth weight, bottle-feeding, exposure to passive smoking, and indoor allergens. Children from joint families, higher birth orders, and lower socioeconomic classes were also found to have more severe bronchiolitis. These findings align with other studies that have identified similar risk factors for severe bronchiolitis, such as low birth weight, preterm birth, non-breastfeeding, and exposure to environmental factors like smoke [18,19].

The study also revealed that severe cases of bronchiolitis required prolonged oxygen therapy, reflecting a higher degree of respiratory compromise. Additionally, the severity of the disease was directly linked to the length of hospital stay, with severe cases requiring a longer hospital stay compared to milder cases. This relationship underscores the increased resource utilization and intensive care requirements for patients with severe bronchiolitis. The findings suggest that early identification of high-risk patients and the implementation of targeted preventive measures can help reduce the severity of the disease and improve patient outcomes [20].

Bronchiolitis primarily affects infants under 12 months, with a higher incidence in males. Seasonal peaks are observed during the winter months, and the severity of the disease is influenced by various factors, including age, birth weight, feeding practices, exposure to environmental pollutants, and socioeconomic status. Understanding these factors is critical for improving disease management, resource allocation, and patient care. By identifying at-risk populations and recognizing the signs of severe bronchiolitis early, healthcare providers can enhance treatment outcomes and reduce the burden of this common pediatric illness [21,22].

CONCLUSION

This study examines the clinical profile and outcomes of bronchiolitis in children aged 1–24 months. Most cases (88.5%) were in infants under 12 months, with a male predominance (57.8%) and peak admissions during winter, especially December and January. Moderate and severe cases made up 39.5% and 19.7%, respectively, highlighting disease burden. Younger age, low birth weight, feeding practices, and socioeconomic status were key factors influencing severity. Severe cases were linked to longer hospital stays and extended oxygen therapy, underscoring the need for targeted interventions to manage high-risk groups and reduce complications.

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