To study the prevalence of acute bronchiolitis in the NGMCTH Kohalpur

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ABSTRACT

Introduction: Acute bronchiolitis, a common respiratory condition in infants and young children, is a leading cause of hospitalization for respiratory infections. The illness typically starts with upper respiratory symptoms before progressing to wheezing and breathing difficulties. In developing regions, limited healthcare access may lead to delays in diagnosis and treatment. Environmental and socio-demographic factors, including exposure to smoke, air pollution, and nutritional status, can influence the incidence and severity of bronchiolitis. This study aims to assess the prevalence, clinical features, and risk factors of acute bronchiolitis in children under two years old at Nepalgunj medical college teaching hospital.

Methods: This observational study included 93 clinically confirmed cases of acute bronchiolitis based on the National Institute for Health and Care Excellence guidelines. Data were collected on socio-demographic variables, clinical features, nutritional status, and environmental risk factors. Data analysis was done for descriptive statistics, such as mean, Standard deviation, median, range, and percentage. The data were analysed with IBM SPSS Statistics version 26, and the chi-square test was used.

Results: The prevalence of acute bronchiolitis was 23.97%. Most cases occurred in infants aged 1-6 months (57%), and a male predominance of 69.9% was noticed. Common symptoms included cough and nasal congestion (100%), rapid breathing (90.3%), and chest retractions (57%). Fever was present in 43% of cases, while feeding difficulties were noted in 32.3%. Nutritional assessments revealed that 60.21% of infants had normal birth weights. Environmental exposures indicated that 32.25% of families had smoked, and 48.4% of cases were associated with indoor air pollution.

Conclusion: The findings of this study underscore the high prevalence of acute bronchiolitis in young children, particularly in infants under one year of age. The study highlights the importance of early diagnosis and intervention to mitigate the disease's impact on respiratory health.

Keywords: Acute bronchiolitis, respiratory infections, respiratory syncytial virus.

INTRODUCTION

Acute bronchiolitis is a diagnostic term used to describe the clinical picture produced by multiple different viral lower respiratory tract infections in infants and very young children. Bronchiolitis is typically a result of viral infection. Respiratory Syncytial Virus (RSV) is the primary pathogen associated with bronchiolitis and is responsible for two-thirds of all cases. These viral pathogens include rhinovirus, parainfluenza, influenza virus, adenovirus, and coronavirus.[1] Clinical studies conducted in India revealed that RSV was detected in 30-70% of children diagnosed with bronchiolitis.[2-4]

It is estimated that around 34 million new cases of lower respiratory infections due to RSV occur globally in children under the age of 5. Infection occurs when the nasal or conjunctival mucosa is exposed to contaminated secretions or when virus-containing respiratory droplets larger than 5μm in diameter are inhaled within a distance of 2 meters from an infected patient. The incubation

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period for the virus ranges from 4 to 6 days, during which it replicates in the nasal epithelium. This process often results in symptoms like nasal congestion, a runny nose, irritability, and difficulty in feeding the child; about 50% of infected infants also develop fever. The virus, upon reaching the lower respiratory tract, starts to target the ciliated epithelial cells lining the bronchioles and the pneumocytes.[5]

Acute bronchiolitis is generally a self-limiting condition, and its management typically involves supportive measures. However, there is a gap in the available literature concerning the clinical characteristics, risk factors, and needs for intensive care in infants and children from western and mid-western Nepal. Understanding the predisposing factors for acute bronchiolitis and its potential progression to a severe state is crucial for developing targeted and effective management strategies.

METHODS

This study was a hospital-based cross-sectional study, conducted at Nepalgunj Medical College teaching hospital, Kohalpur, Nepal, in the Paediatric ward. This study was carried out from 15 Aug 2025 to 14 Feb 2026 (6-month period). All children below two years of age who attended the Paediatric and Emergency Department of Nepalgunj Medical College Teaching Hospital during the study period were included in the study. All infants and children below 2 years who met the case definition for acute bronchiolitis as per the National Institute for Health and Care Excellence guidelines 2021 were included in the study.[6]

Case definition / Operational definition:

Diagnose a case of bronchiolitis if: a baby or child who has a coryzal prodrome lasting 1 to 3 days, followed by:

- Cough
- Either tachypnoea or chest retractions (or both)
- Either wheeze or crackles on chest auscultation (or both)

Infants younger than one month, children with congenital malformations, those without parental consent, and children with chronic conditions such as chronic pulmonary disease or congenital heart disease were excluded from the study. The target sample size was obtained by using the single-population proportion formula, sampling method: $n = z^2pq / d^2$, where n = required sample size, z = standard normal variant at 95% confidence level is 1.96.

p = expected proportion of population based on previous studies. An earlier study had revealed the prevalence of Acute bronchiolitis in NMCTH, Nepal, to be 31.6%.[7] Hence, p has been taken as 0.316.

q = Complement of prevalence, 1– 0.316 = 0.684.

d = Permissible error. We determined the permissible error to be 10%. Given that the study duration is limited to six months, setting the error margin at 10% ensures an achievable sample size, thereby making the study feasible within the available timeframe. Putting values in the above formula, sample size (n) = $(1.96^2 \times 0.316 \times 0.684) / 0.10^2 = 83.03$.

Non-response rate = 10% of 83.03 = 8.303

The final sample (n) was calculated to be 83.03 + 8.303 = 91.33 ~ 91.

Before starting the study, ethical approval was obtained from the Institutional Review Committee (IRC) of Nepalgunj Medical College Teaching Hospital (Ref-17/082-083). All information collected was kept confidential and used solely for research purposes. The parents of the participants were informed about the study, and informed consent was obtained before participation began. Following informed consent, participants undergo a thorough examination, during which a detailed history regarding age, chief complaints, feeding practices, and any neonatal or birth complications is taken. General examinations included measurements of respiratory rate and oxygen saturation, as well as a specific respiratory system examination.

Statistical Analysis

Data were collected using a semi-structured questionnaire, which documented all relevant information in a proforma. Data were entered using Microsoft Excel 21 and analysed using IBM SPSS 26. Descriptive statistical analyses were performed, including calculations of frequency, percentage, mean, median, and standard deviation.

To assess the statistical significance of categorical risk factors, the chi-square test was used. A p-value < 0.05 was considered statistically significant.

RESULTS

The clinical profile of each patient was documented, and the risk factors were categorized into three broad headings:

- socio-demographic variables
- nutritional variables
- environmental variables

During the study period, a total of 388 children under two years of age were admitted to the inpatient department. The prevalence of bronchiolitis was calculated based on the number of clinically confirmed cases of bronchiolitis, which were 93 (23.97%).

Socio-demographic variables: More than half of the children, 53 (57%), of them were in the age group of 1-6 months, followed by 29 (31.2%) in the 7-12 months group, 9 (9.7%) in the 13-18 months age, and 2 cases (2.2%) in the age group of 19-24 months as shown in Table 1 below. The maximum age was 23 months, and the minimum age was two months, with a mean ± standard deviation (SD) of 7.10 months ±4.99, and the median age was 6 months.

Among the analysed cases, 65 (69.9%) of cases were male, and 28 (30.1%) of cases were female.

Table 1: Age distribution of acute bronchiolitis

Age	Frequency (n)	Percentage (%)
1-6 months	53	57.0
7-12 months	29	31.2
13-18 months	9	9.7
19-24 months	2	2.2
Total	93	100.0

Table 2: Gestational age at delivery

Gestational age at delivery	Frequency (n)	Percentage (%)
Preterm (<37weeks)	24	25.8
Term (37-42 weeks)	66	71
Post-term (>42weeks)	3	3.2

Table 3: Environmental Variables

Environmental risk factors	Frequency (n)	Percentage (%)
Family/Sibling History of Respiratory Tract Infection		
Present	42	45.16
Absent	51	54.80
History of smoking in the family		
Present	30	32.25
Absent	63	67.74
Family H/O atopy, asthma		
Present	12	12.9
Absent	81	87.90
Indoor air pollution		
Present	45	48.4
Absent	48	51.6

Table 4: Association of socio-demographic risk factors with bronchiolitis

Risk factors	Frequency (n)	Percentage (%)	p-value
Gender			
Male	65	69.9	0.6087
Female	28	30.1	
Gestational age			
Preterm (<37weeks)	24	25.8	0.7215
Term (37-42 weeks)	66	71	
Post-term (>42weeks)	3	3.2	
Mode of delivery			
NVD	56	60.2	0.7093
LSCS	37	39.8	
Birthweight			
<1 kg	0	0	0.0309
1 kg - 1.5 kg	4	4.4	
1.5 kg - 2.5 kg	33	35.48	
2.5 kg - 4 Kg	56	60.21	
>4 kg	0	0	

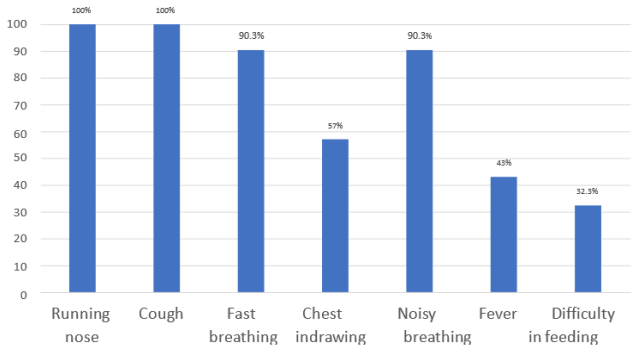
Table 5: Association of nutritional and environmental risk factors with bronchiolitis

Risk factors	Frequency(n)	Percentage(%)	p-value
Type of feeding			
Breastfed	50	53.76	0.1093
Formulated	25	26.88	
Mixed feed	18	19.35	
Family/ Sibling history of Respiratory tract infection			0.4470
Present	42	45.16	
Absent	51	54.80	
History of smoking in the family			
Present	30	32.25	0.2726
Absent	63	67.74	
Family history of atopy/asthma			
Present	12	12.9	0.7698
Absent	81	87.90	
Indoor air pollution			
Present	45	48.4	0.3749
Absent	48	51.6	

In our study, gestational age at delivery was recorded as mentioned in Table 2. Preterm births, occurring before 37 weeks, were 24 (25.8%), whereas the majority of infants, 66 (71%), were delivered at term between 37 and 42 weeks, while only 3 (3.2%) cases were born post-term, after 42 weeks.

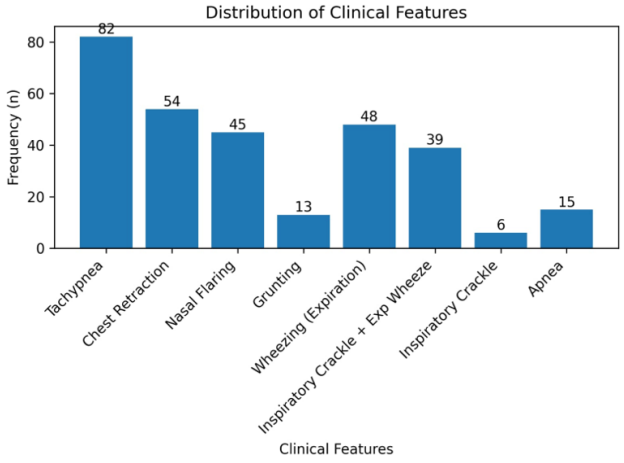
Among deliveries, 56 cases (60.2%) were normal vaginal deliveries (NVD), whereas 37 cases (39.8%) were delivered through lower segment caesarean section (LSCS).

Figure 1: Distribution of symptoms noted in acute bronchiolitis(%)s



The most frequently reported symptoms were a runny nose and cough, present in all 100 (100%) cases, followed by fast breathing and noisy breathing, each observed in 84 cases (90.3%). Chest indrawing was noted in 53 cases (57%), while fever affected 40 cases (43%), and feeding difficulties were seen in 30 cases (32.3%), as shown in Figure 1.

Figure No. 2: Distribution of clinical signs and examination findings in acute bronchiolitis



Regarding clinical signs, tachypnoea was recorded in 82 cases (88.17%), and chest retractions were noted in 54 cases (58%). Nasal flaring was observed in 45 cases (48.4%), grunting in 13 cases (14%), and wheezing during expiration in 48 cases (51.6%). Both inspiratory crackles and expiratory wheezing were present in 39 cases (41.9%), while inspiratory crackles alone were seen in 6 cases (6.5%). Additionally, apnoea was documented in 15 cases (16.12%), as shown in Fig. 2

In the present study, 42 children (45.16%) had a family or sibling history of respiratory tract infections. Additionally, 30 cases (32.25%) involved family members who had a history of smoking. Family history of atopy or asthma was present in 12 cases (12.9%). 45 children (48.4%) with bronchiolitis were found to have exposure to indoor air pollution.

In our study, the majority of bronchiolitis cases, 56 (60.21%), occurred in infants with normal birth weights of 2.5 to 4.0 kg. Additionally, 33 cases (35.48%) were in infants weighing 1.5 to 2.5 kg, while only 4 cases (4.4%) were in the 1.0 to 1.5 kg range. Notably, no cases were observed in infants weighing less than 1.0 kg or more than 4.0 kg.

In the statistical analysis of risk factors for acute bronchiolitis, chi-square tests were performed to assess their significance. The results indicated that birth weight ($p = 0.0309$) was significantly associated with bronchiolitis. Other factors, such as gender, gestational age, mode of delivery, type of feeding, family history of Respiratory tract infection, history of smoking in the family, family history of atopy/asthma, and indoor air pollution, were not found to be statistically significant.

DISCUSSION

This study was carried out to assess the prevalence, clinical features, and risk factors of acute bronchiolitis in children attending Nepalgunj Medical College.

Prevalence

The prevalence was 23.97% in the present study. This finding goes in accordance with studies conducted in India by Srinivasa et al. and Kumar et al., reporting 17% and 21% respectively.[8,9] Similarly, a study conducted by Rijal et al. showed a prevalence of 31.6%.[7] The higher end of disease prevalence is often found in countries with elevated levels of disease transmission, often resulting from densely populated living conditions, high levels of environmental pollution, or limited access to preventive healthcare services.[10]

Socio-demographic variables

It was noted that 57% of cases belonged to ages 1-6 months, and 31.2% belonged to ages 7-12 months. The inference can be made that most cases (88.2%) belonged to an infantile age group of less than one year of age.

This finding was consistent with other studies by Sanghavi et al. Uyan et al. and Kulhalli et al., in which infants younger than 1 year with acute bronchiolitis accounted for 85-96.46%.[11-13] Factors contributing to susceptibility in this age group include narrower airways, a shorter bronchial tree, and underdeveloped lungs.

Our study showed male predominance, with 69.9% of cases being male and 30.1% female. Similarly, a study by Malla et al., in Nepal reported 63% of bronchiolitis cases in males and 37% in females.[14] For instance, research by Sanghavi et al. Angurana et al., and Kulhalli et al., in India, Uyan et al, in Turkey, Kadim et al, in Iraq, and Arif et al, and Iqbal et al, in Pakistan, all reported higher male rates of 61.1%, 65.9%, 58.8%, 58%, 60.8%, 68.87%, and 57%, respectively.[10-13,15-17] This could likely be explained by cultural influences, where there is often a stronger inclination to seek medical care for boys rather than girls.[9]

The majority, 71%, were born at term between 37- 42 weeks. These findings are consistent with Koehoorn et al., who noted that 89% of infants in their study were delivered at term.[18] Additionally, Sanghavi et al. and Kulhalli et al., observed significantly higher frequency in term-born babies, 81.5% and 90.6%, respectively.[11,13] Interestingly, term-born infants appear more susceptible, potentially due to increased exposure to environmental triggers, such as viral pathogens. While preterm infants are often at risk due to underdeveloped lungs and immune systems, term infants may face a different set of vulnerabilities, including heightened exposure to common respiratory infections.

In our study, normal vaginal delivery (NVD), accounted for 60.2%, while 39.8% were delivered via lower segment caesarean section (LSCS). This trend aligns with findings from a study conducted by Angurana et al., and Kulhalli et al., where it was noted that NVD took place in 75.7% and 90.6%, respectively.[13,15]

Clinical profile

The most common symptoms noted were a runny nose and cough in 100% of cases, followed by fast breathing in 90.3% and noisy breathing in 90.3% of cases. Chest indrawing was found in 57% of cases, and fever in 43% of cases.

These findings were comparable with other studies, like Angurana et al, who observed that the most frequent symptoms included fast breathing (98.8%), cough (98.3%), and fever (74%). Signs observed on examination were tachypnoea (98.8%), wheezing (49.7%), and crepitus (23.1%).[15] Sanghavi et al, observed that 92.6% of patients showed signs of respiratory distress, including rapid breathing and chest retractions.[11]

Nutritional risk factors

In our study, (60.21%) occurred in infants with normal birthweights (2.5- 4.0 kg), with 35.48% in the 1.5- 2.5 kg. These findings contrast with much of the existing literature, which emphasizes the increased risk of bronchiolitis in low birthweight infants. Studies like Koehoorn et al., report that low birth weight infants (<2500 grams) are at higher risk for hospitalization, yet 82% of cases in their study were in the normal birth weight range.[18] Similarly, research by McLaughlin et al., and Kulhalli et al. highlights that, while low birthweight is a key factor in severe cases, bronchiolitis is still prevalent in normal-weight infants.[13,19] During the study period, a greater number of babies with normal birth weight were admitted to the hospital; therefore, our study showed a higher risk of bronchiolitis among normal birth weight babies.

Environmental risk factors

Family/sibling history of respiratory tract infection was noted in 45.16% of cases. Iqbal et al. and Malla et al. found similar results of 38% and 35.5%, respectively.[14,16] This reinforces the view that genetic and environmental factors play a significant role in the transmission and susceptibility to respiratory illnesses like bronchiolitis.

In our study, 32.25% of cases involved family

members who smoked. This aligns closely with findings from Carbonell-Estrany et al., who reported a nearly identical prevalence of 32.5% in their study on respiratory syncytial virus bronchiolitis.[20]

Similarly, Kott et al., reported a higher percentage of 43% of family members who smoked, and Malla et al. found an even more striking figure, with 83.5% of cases linked to smoking in the household.[14,21]

In our study, a family history of atopy or asthma was noted in 12.9% of cases. This is consistent with other research, such as Sanghavi et al., who reported a similar rate of 9.3%, and Iqbal et al., who found that 14% of bronchiolitis cases were seen in family history of asthma or atopy.[11,16] This suggests that while atopy and asthma in the family are relevant risk factors, their impact may vary depending on regional and environmental contexts.

In our study, 48.4% were associated with exposure to air pollution, particularly indoor pollution. This is consistent with findings by Malla et al., who reported a higher prevalence of 68.5% of cases linked to indoor air pollution.[14] A study by Rumchev et al., found that children exposed to indoor pollutants were 2.5 times more likely to develop respiratory issues.[22]

CONCLUSIONS

The findings of this study underscore the high prevalence of acute bronchiolitis in young children, particularly in infants less than one year old. The study highlights the importance of early diagnosis and intervention to mitigate the disease's impact on respiratory health. Furthermore, the identification of modifiable risk factors, such as exposure to tobacco smoke and air pollution, suggests that public health initiatives focused on reducing these exposures could significantly decrease the incidence of acute bronchiolitis. This research contributes valuable insights into the clinical and socio-demographic characteristics of bronchiolitis in a specific region of Nepal, establishing a foundation for future studies and interventions.

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Data availability statement: The data are available from the corresponding author upon reasonable request.

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