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(RESEARCH ARTICLE)

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Epidemiological and clinical profile of pediatric acute bronchiolitis in Herat, Afghanistan: A descriptive study

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Abstract

Background: Acute bronchiolitis is a leading cause of hospitalization in infants and young children worldwide. Despite its clinical significance, there is limited data on its epidemiology in Afghanistan. To describe the demographic, seasonal, and clinical characteristics of children admitted with acute bronchiolitis to Herat Regional Hospital during 1402 (2023/2024).

Methods: This descriptive cross-sectional study included all pediatric patients diagnosed with acute bronchiolitis and admitted to the pediatric internal medicine ward of Herat Regional Hospital. Data from 180 cases were extracted retrospectively using a structured checklist and analyzed using Microsoft Excel.

Results: Among 11,131 pediatric admissions, 180 cases (1.6%) were diagnosed with acute bronchiolitis. The majority were male (67.8%) and under six months old (60%). A significant proportion (56.1%) came from low-income families. All patients presented with cough, wheezing, and increased respiratory rate. Most cases occurred in winter (78.3%), followed by spring (21.7%). Salbutamol nebulization was administered to all patients, while epinephrine was used in 12.8%. The case fatality rate was 1.1%.

Conclusion: Acute bronchiolitis predominantly affects male infants under six months and peaks during colder seasons. These findings emphasize the need for seasonal preparedness, public awareness, and early supportive intervention to reduce complications in high-risk populations.

Keywords: Acute Bronchiolitis; Pediatric Respiratory Infections; Afghanistan; Hospital Admissions; Seasonal Variation

1. Introduction

Acute bronchiolitis is one of the most frequent causes of lower respiratory tract infections (LRTIs) and hospitalization among infants and young children globally. It is primarily a viral infection characterized by inflammation of the small airways, commonly triggered by respiratory syncytial virus (RSV). Nearly all children are infected with RSV by the age of two, and a significant proportion develop symptoms requiring medical attention [1].

Globally, bronchiolitis contributes substantially to pediatric morbidity, particularly in resource-limited settings where early detection and supportive care may be constrained [2]. Epidemiological studies in Mali and Pakistan have consistently shown that infants under one year are most affected, with seasonal peaks during colder months [3,4].

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The clinical manifestations of bronchiolitis include cough, wheezing, nasal flaring, and signs of respiratory distress, with varying severity depending on age, nutritional status, and exposure to risk factors such as tobacco smoke or bottle feeding [5,6].

Several studies also link bronchiolitis in early life with an increased risk of recurrent wheezing and asthma during childhood, especially in patients infected with rhinovirus or with a history of atopy [7]. The disease burden, including hospital stays and mortality, remains significant in many developing countries, underscoring the need for local epidemiological data to inform healthcare strategies [8].

Despite being mostly self-limiting, bronchiolitis can progress to severe respiratory failure in vulnerable infants, necessitating intensive care support [9]. Treatment primarily involves supportive care, including hydration and oxygen therapy, with minimal benefit from bronchodilators or corticosteroids [10,11].

Risk factors such as male gender, lack of breastfeeding, low birth weight, and poor socioeconomic status have been consistently associated with higher incidence and severity [12,13]. Additionally, environmental exposures like indoor air pollution and seasonal viral epidemics significantly influence disease trends [14].

The primary objective of this study was to describe the pattern and frequency of acute bronchiolitis cases among children admitted to Herat Regional Hospital in the year 1402. By doing so, we aim to provide data that can inform preventive strategies and improve clinical management of bronchiolitis in Afghanistan. Specifically, the study sought to identify the age and sex distribution of affected children, seasonal trends, and demographic factors contributing to higher disease incidence. Additionally, the study explored treatment methods used in this setting, with a focus on the effectiveness of common interventions like salbutamol nebulization. Given the limited research in this area within Afghanistan, this descriptive study fills a vital gap in local epidemiological knowledge and has practical implications for pediatric care, especially in low-resource settings.

2. Methods

2.1. Study Design

This was a descriptive, cross-sectional study conducted over one calendar year (1402) in the pediatric internal medicine department of Herat Regional Hospital, a major public healthcare facility in western Afghanistan.

2.2. Study Population

The study population included all pediatric patients diagnosed with acute bronchiolitis who were admitted to the hospital during the study period. The inclusion criterion was a clinical diagnosis of acute bronchiolitis based on signs and symptoms such as cough, wheezing, tachypnea, and respiratory distress, as recorded by the attending physicians. Patients without complete medical records or unclear diagnoses were excluded.

2.3. Sampling Method and Size

A convenience sampling technique was used. All 180 cases of acute bronchiolitis documented in the hospital registry out of 11,131 total pediatric admissions during the year were included in the analysis.

2.4. Data Collection

Data were collected retrospectively from emergency room and ward registers, as well as individual patient case files. A structured data collection form was used to extract relevant variables, including patient age, sex, season of admission, presenting symptoms, economic status, and treatment regimen.

2.5. Data Analysis

The data were entered into SPSS v.26 and analyzed using descriptive statistics. Frequencies and percentages were calculated for categorical variables. Results were presented in tabular format with charts and graphs where appropriate.

3. Results

Out of 11,131 pediatric admissions to Herat Regional Hospital in the year 1402, a total of 180 children (1.6%) were diagnosed with acute bronchiolitis. The following tables present the demographic characteristics, seasonal distribution, and clinical profiles of these patients.

Table 1 Demographic Characteristics of Pediatric Bronchiolitis Cases (n = 180)

Variable	Frequency	Percentage (%)
Sex		
Male	122	67.8
Female	58	32.2
Age Group		
1–6 months	108	60.0
7–12 months	27	15.0
13–24 months	21	11.7
>24 months	24	13.3
Socioeconomic Status		
Low-income	101	56.1
Middle-income	57	31.7
High-income	22	12.2

Most bronchiolitis cases occurred in male infants (67.8%), with the highest frequency in children aged 1 to 6 months (60%). A notable proportion (56.1%) of patients came from low-income households, suggesting a strong correlation between socioeconomic vulnerability and disease occurrence. Children older than two years made up only a small fraction of cases (13.3%) (Table 1).

Table 2 Seasonal Distribution of Bronchiolitis Admissions

Season	Number of Cases	Percentage (%)
Spring	39	21.7
Winter	141	78.3

The seasonal pattern was strikingly clear: 78.3% of all bronchiolitis cases occurred in winter, followed by 21.7% in spring. No cases were recorded during the summer or autumn months, highlighting the strong seasonal dependence of this respiratory condition, consistent with patterns of viral circulation in colder climates (Table 2).

Table 3 Clinical Presentation and Management Features

Clinical Feature / Treatment	Frequency	Percentage (%)
Fever	115	63.9
Cyanosis	15	8.3
Severe bronchiolitis	50	27.8
Mortality	2	1.1
Salbutamol nebulization	180	100.0
Epinephrine nebulization	23	12.8

All patients with bronchiolitis presented with the classic triad of symptoms—cough, wheezing, and rapid breathing. Fever was observed in nearly two-thirds of cases, while cyanosis appeared in a smaller fraction (8.3%). Around 28% of the cases were classified as severe. Salbutamol nebulization was administered universally, whereas epinephrine was used in approximately 13% of patients. The case fatality rate was low, with only two recorded deaths (1.1%) (Table 3).

Table 4 Association of Patient Characteristics with Severe Bronchiolitis

Predictor	Category (ref.)	Severe n / non-severe n	χ^2 (df)	*P*	Crude OR (95 % CI)
Sex	Female	12 / 46	1.65 (1)	0.20	—
	Male	38 / 84			1.73 (0.83–3.64)
Age group	> 24 mo	3 / 21	11.57 (3)	0.009	—
	13–24 mo	3 / 18			1.17 (0.21–6.51)
	7–12 mo	4 / 23			1.22 (0.24–6.09)
	1–6 mo	40 / 68			4.12 (1.15–14.68)
Socio-economic status	High	3 / 19	5.86 (2)	0.053	—
	Middle	12 / 45			1.69 (0.43–6.67)
	Low	35 / 66			3.36 (0.93–12.14)
Season	Spring	5 / 34	4.64 (1)	0.031	—
	Winter	45 / 96			3.19 (1.17–8.69)
Fever	No	12 / 53	3.70 (1)	0.054	—
	Yes	38 / 77			2.18 (1.04–4.56)
Cyanosis	No	40 / 125	10.31 (1)	0.001	—
	Yes	10 / 5			6.25 (2.02–19.37)

Severe bronchiolitis was more frequent among male infants (OR = 1.73) and, notably, in those aged < 6 months, who had quadruple the odds of severe disease compared with children > 24 months (OR = 4.12, P = 0.009). Winter admissions also showed a three-fold elevation in severity risk (OR = 3.19). Low socio-economic status approached significance (OR = 3.36, P = 0.053). Clinical markers of hypoxaemia were strong severity signals: cyanosis multiplied the odds six-fold (OR = 6.25, P = 0.001), while documented fever nearly doubled the risk (OR = 2.18, P = 0.054).

4. Discussion

This study highlights the epidemiological and clinical profile of pediatric acute bronchiolitis in Herat, Afghanistan, offering valuable insights in a region where local data are limited. The prevalence of bronchiolitis among pediatric admissions was 1.6%, aligning with reported rates in similar resource-limited settings [15].

Consistent with global findings, the majority of patients were male (67.8%), and infants under 6 months were most affected (60%) [6,8]. The age distribution reflects the vulnerability of this group due to narrower airways and immature immune responses [16].

Socioeconomic disparities were prominent, with over half of the patients coming from low-income families. Studies have consistently shown that lower socioeconomic status correlates with increased exposure to indoor pollutants, crowding, and limited healthcare access, heightening bronchiolitis risk and severity [17,18].

The seasonal distribution, with 78.3% of cases during winter, matches the known viral seasonality of respiratory syncytial virus (RSV) and other pathogens responsible for bronchiolitis [9,19]. This pattern is well documented in both developed and developing countries, supporting the need for targeted preventive efforts during high-incidence months.

Fever (63.9%) and respiratory distress were common clinical features, aligning with established diagnostic criteria [20,21]. Cyanosis was less common (8.3%) but was associated with severe cases, in line with predictors of hypoxemia and the need for hospitalization [22].

Approximately 28% of cases were classified as severe, a rate similar to other observational studies [23]. Severity was often associated with younger age, low birth weight, and feeding difficulties [21,24].

Regarding treatment, all patients received salbutamol nebulization, though current guidelines question the routine use of bronchodilators. Studies suggest that bronchodilators provide minimal clinical benefit and should be used selectively [25,26]. Epinephrine was used in 12.8% of cases, which may be considered in select severe cases, but its effectiveness remains inconclusive.

The mortality rate was low (1.1%), aligning with global estimates of <1–2% in hospitalized bronchiolitis patients without major comorbidities [27,28].

This study underscores the need for improved preventive strategies, including parental education, exclusive breastfeeding promotion, smoke-free environments, and appropriate use of clinical guidelines. The findings are consistent with international patterns but provide much-needed local data to inform public health interventions in Afghanistan.

5. Conclusion

This study provides the first comprehensive insight into the epidemiological and clinical characteristics of pediatric acute bronchiolitis in Herat, Afghanistan. The findings underscore that the disease predominantly affects male infants under six months of age, particularly during the winter season. Socioeconomic vulnerability emerged as a significant factor, with over half of the affected children coming from low-income households. While clinical presentations were consistent with global patterns—cough, wheezing, and respiratory distress—fever and severe cases were also common, highlighting the importance of early recognition and timely intervention. Despite the universal administration of salbutamol nebulization, the therapeutic efficacy of bronchodilators remains questionable, suggesting the need for adherence to evidence-based guidelines. The low mortality rate (1.1%) is encouraging but calls for sustained preventive efforts including parental education, promotion of breastfeeding, reduction of household air pollution, and targeted public health interventions during high-incidence months. Overall, this study fills a critical gap in local pediatric respiratory health data and offers actionable insights for clinicians, hospital administrators, and health policymakers aiming to improve the management and prevention of bronchiolitis in Afghanistan's resource-constrained settings.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare that they have no conflicts of interest.

Statement of ethical approval

Ethical approval for this study was obtained from the Ethics Review Board at Herat Regional Hospital. Written consent was obtained from all patients or their guardians prior to participation.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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