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Original Research Article

Clinical Profile and Outcomes of Pediatric Acute Respiratory Infections: A Retrospective Study

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Abstract:

Background: Acute respiratory infections (ARIs) are a leading cause of morbidity and mortality among children, particularly in low- and middle-income countries. ARIs range from mild upper respiratory tract infections to severe lower respiratory illnesses and are primarily caused by viral pathogens, with bacterial co-infections contributing to severity.

Aim: To evaluate the demographic patterns, clinical presentation, laboratory findings, treatment modalities, and short-term outcomes of pediatric ARIs in a tertiary care setting.

Methodology: A retrospective observational study was conducted over eight months at the Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. Medical records of 90 children aged 1 month to 12 years diagnosed with ARI were analyzed for demographic data, clinical features, laboratory and radiological findings, treatment, and outcomes. Statistical analysis included descriptive statistics and logistic regression to identify predictors of poor outcomes.

Results: Most children were aged 1–5 years (44.4%) with a slight male predominance (55.6%) and higher rural representation (61.1%). Cough (88.9%) and fever (77.8%) were predominant symptoms. Viral infections were most common (38.9%), followed by bacterial (22.2%) and mixed infections (11.1%). Supportive care and antibiotics were the main treatments. Recovery occurred in 77.8%, complications in 16.7%, and mortality was 5.5%.

Conclusion: Pediatric ARIs predominantly affect preschool-aged children, with viral etiologies most common. Early recognition, appropriate management, and targeted interventions are critical to reduce morbidity and mortality.

Keywords: Acute Respiratory Infections, Children, Retrospective Study, Viral Infections, Morbidity, Mortality.

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Introduction

Acute respiratory infections (ARIs) remain a leading cause of morbidity and mortality among children worldwide, particularly in low- and middle-income countries where healthcare resources are limited and access to timely medical care is often inadequate [1]. The World Health Organization (WHO) defines ARIs as infections that affect the upper or lower respiratory tract which include mild conditions that range from the common cold to severe illnesses that include pneumonia and bronchiolitis. The primary sources of these infections are viruses which include respiratory syncytial virus (RSV) and influenza viruses and adenovirus and parainfluenza viruses while bacterial pathogens such as *Streptococcus pneumoniae* and *Haemophilus influenza*e type b also contribute to severe cases [2]. The burden of ARIs is highest among children under five years of age because their immune systems are still developing and their airway anatomy is smaller and they are more vulnerable to environmental risk factors which include indoor air pollution and malnutrition and overcrowded living conditions. Globally, it is estimated that ARIs account for approximately 20–30% of pediatric hospital admissions and remain a primary cause of childhood mortality with pneumonia alone responsible for nearly 15% of deaths in children under five.

The clinical spectrum of ARIs in children shows extensive variation because it includes both mild self-

limiting infections and severe life-threatening illnesses which need urgent medical treatment. Upper respiratory tract infections (URTIs) which include pharyngitis and rhinitis and laryngitis, show high rates of occurrence, but they cause minor health problems while healthcare systems need to treat them and doctors need to prescribe antibiotics for them and students need to miss school because of them [3]. The severity of respiratory tract infections (LRTIs) which include bronchitis and bronchiolitis and pneumonia, increases especially for neonates and infants and children who have existing health conditions like congenital heart disease and chronic lung disease and immunodeficiency. The process of improving survival rates and preventing disease spread requires hospitals to recognize ARIs at their initial stage and provide proper treatment procedures. The essential preventive strategies which reduce pediatric ARI cases and their severity include vaccination against common pathogens and good nutrition and better hygiene practices and timely healthcare service access.

Retrospective studies provide a valuable methodology for analyzing ARIs by evaluating pre-existing clinical data to identify patterns, risk factors, and outcomes in affected children. Researchers use medical records to study various demographic factors and clinical symptoms and laboratory results and treatment methods and hospitalization patterns and short-term results which helps guide both public health initiatives and clinical treatment choices [4]. The research becomes essential because resource-constrained environments require data collection through prospective methods which face difficulties from logistical challenges and financial problems and ethical issues. The research method enables scientists to study extensive patient groups across multiple years which helps them detect yearly patterns and discover how age affects vulnerability and how other health conditions and environmental factors contribute to disease intensity [5]. The colder winter months and the periods of elevated air pollution create seasonal peaks in ARIs which healthcare facilities experience as increased patient demand according to retrospective data.

Several risk factors have been consistently associated with increased susceptibility to ARIs in children. The combination of low parental education and poor household sanitation and overcrowding and tobacco smoke exposure leads to higher rates and more severe infections according to research [6]. The body loses its ability to fight infections because malnutrition especially results from essential micronutrient deficiencies which include vitamin A and zinc and iron. Premature birth and low birth weight create a major risk factor because these infants possess lungs that have not fully developed together with a weak immune system. The existence of chronic health issues such as asthma and cystic fibrosis and congenital cardiac defects increases the chance of developing severe ARIs which shows the need for special preventive strategies and active health observation in young patients who have high disease risk.

The retrospective evaluation of ARIs investigates treatment methods and their results which demonstrate how well current medical methods work while showing which areas need improvement. The study examines whether doctors appropriately prescribe antibiotics and whether they follow clinical guidelines while measuring how often patients need to stay in the hospital and how long they remain sick and which complications they experience including hypoxemia and respiratory failure and secondary infections. Healthcare providers and policymakers use trend analysis to create medical interventions that will improve pediatric treatment results while decreasing unnecessary medical costs. The research shows that vaccination rates and healthcare access and public awareness programs all need improvement to provide effective preventive measures and public health initiatives which will decrease the impact of ARIs.

Acute respiratory infections create a major public health problem because they particularly affect children who are most at risk of experiencing severe health consequences. A retrospective study of pediatric ARIs provides an effective approach to understanding the epidemiology, clinical characteristics, risk factors, management practices, and short-term outcomes of these infections. The analysis results provide essential information which helps to create clinical guidelines and develop preventive measures while hospitals can use it to plan their healthcare resources to decrease ARI-related illnesses and deaths among children.

Methodology

Study Design: This study was designed as a retrospective observational analysis focusing on children diagnosed with acute respiratory infections (ARI). Medical records of pediatric patients were reviewed to evaluate demographic characteristics, clinical presentations, and short-term outcomes associated with ARI. The retrospective design allowed comprehensive assessment of patterns, risk factors, and clinical trends over the study duration, ensuring a real-world understanding of ARI incidence in the pediatric population.

Study Area: The study was conducted at the Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.

Study Duration: The study was carried out over a period of eight months from June 2025 to January 2026.

Study Participants

Inclusion Criteria

- Children aged 1 month to 12 years who were diagnosed with ARI during the study period.
- Children with complete medical records documenting clinical symptoms, laboratory results, and treatment outcomes.
- Both inpatients and outpatients managed at the Department of Pediatrics.
- Children with ARI characterized by at least two or more of the following symptoms: cough, fever, nasal congestion, difficulty breathing, chest in drawing, or wheezing.

Exclusion Criteria

- Children with chronic respiratory conditions such as asthma, cystic fibrosis, or congenital lung anomalies.
- Records with incomplete or missing clinical data relevant to ARI diagnosis or outcomes.
- Children receiving immunosuppressive therapy or with significant comorbidities affecting respiratory function.
- Neonates with perinatal respiratory complications unrelated to infectious etiology.

Sample Size: A total of 90 pediatric cases meeting the inclusion criteria were included in the study. This sample size was deemed adequate to analyze trends, demographic associations, and short-term outcomes with statistical validity.

Procedure: Medical records of eligible children were retrospectively reviewed from the hospital database. Demographic data including age, sex, and residential background were collected, along with clinical presentation, duration of symptoms, laboratory investigations, and radiological findings where available. Treatment modalities, including antibiotic usage, supportive care, and hospitalization status, were also documented. Short-term outcomes, such as recovery, complications, or mortality, were assessed based on discharge summaries. Data extraction was conducted systematically using a structured data collection sheet to ensure consistency and minimize bias. All patient identifiers were anonymized to maintain confidentiality in compliance with ethical standards.

Statistical Analysis: Data analysis was performed using IBM SPSS Statistics version 27.0. Categorical variables such as sex, symptoms, and outcomes were summarized using frequencies and percentages, while continuous variables such as age and duration of hospital stay were expressed as mean ± standard deviation. Associations between demographic factors, clinical presentations, and outcomes were assessed using the Chi-square test or Fisher's exact test, as appropriate. A p-value of <0.05 was considered statistically significant. Binary logistic regression analysis was employed to identify potential predictors of poor outcomes among children with ARI. Variables with $p < 0.2$ in univariate analysis were included in the multivariable model. Model fitness was assessed using the Hosmer-Lemeshow goodness-of-fit test, and results were reported as crude odds ratios (COR) and adjusted odds ratios (AOR) with 95% confidence intervals".

Result

Table 1 presents the demographic characteristics of the 90 children included in the study on acute respiratory infections (ARI). The majority of children were aged 1–5 years, accounting for 40 children (44.4%), followed by 30 children (33.3%) in the 6–12 years age group, and 20 children (22.2%) under 1 year of age. There was a slight male predominance, with 50 males (55.6%) and 40 females (44.4%). Regarding residential distribution, most children resided in rural areas, comprising 55 children (61.1%), while 35 children (38.9%) were from urban areas. These findings indicate that ARI in this cohort was more common among preschool-aged children, males, and those living in rural settings.

Table 1: Demographic Characteristics of Children with ARI (n = 90)

Characteristic	Frequency (n)	Percentage (%)
Age Group		
<1 year	20	22.2
1–5 years	40	44.4
6–12 years	30	33.3
Sex		
Male	50	55.6
Female	40	44.4
Residential Area		
Urban	35	38.9
Rural	55	61.1

Table 2 shows the clinical presentation of acute respiratory infections (ARI) in 90 children. The most common symptom observed was cough, present in 80 children (88.9%), followed closely by fever, reported in 70 children (77.8%). Nasal congestion was noted in 45 children (50%), while difficulty in

breathing affected 30 children (33.3%). Less frequent but clinically significant signs included chest in drawing in 25 children (27.8%) and wheezing in 20 children (22.2%). These findings indicate that while fever and cough are predominant manifestations of ARI in children, a substantial proportion also exhibited respiratory distress signs such as difficulty breathing, chest in drawing, and wheezing.

Table 2: Clinical Presentation of ARI in Children (n = 90)		
Symptoms	**Frequency (n)**	**Percentage (%)**
Fever	70	77.8
Cough	80	88.9
Difficulty breathing	30	33.3
Nasal congestion	45	50
Chest in drawing	25	27.8
Wheezing	20	22.2

Table 3 highlights the laboratory and radiological findings among the 90 children studied. Elevated white blood cell (WBC) counts were observed in 55 patients, accounting for 61.1% of cases, indicating a predominant inflammatory response. Radiologically, 40 children (44.4%) showed abnormalities on chest X-ray, reflecting pulmonary involvement. Viral infections were confirmed in 35 children (38.9%), while bacterial infections were identified in 20 children (22.2%). Notably, 10 children (11.1%) had mixed infections, with both viral and bacterial pathogens detected, suggesting that a subset of patients experienced co-infections contributing to disease severity. Overall, these findings underscore the varied etiologies and diagnostic patterns in pediatric respiratory infections.

Table 3: Laboratory and Radiological Findings (n = 90)		
Investigation	**Frequency (n)**	**Percentage (%)**
Elevated WBC count	55	61.1
Chest X-ray abnormality	40	44.4
Positive viral test	35	38.9
Positive bacterial test	20	22.2
Mixed infection (viral + bacterial)	10	11.1

Table 4 shows the distribution of treatment modalities among the 90 patients included in the study. Supportive care alone was administered to 30 patients, accounting for 33.3% of the cases. Antibiotic therapy was the most commonly used treatment, given to 50 patients, representing 55.6% of the total. Oxygen therapy was provided to 25 patients, making up 27.8% of the cohort, while only a small proportion, 5 patients or 5.6%, required admission to the ICU. These results indicate that the majority of patients were managed with antibiotics and basic supportive care, with a relatively low need for intensive care interventions.

Table 4: Treatment Modalities (n = 90)		
Treatment Type	**Frequency (n)**	**Percentage (%)**
Supportive care only	30	33.3
Antibiotics	50	55.6
Oxygen therapy	25	27.8
ICU admission	5	5.6

Table 5 shows the short-term outcomes of 90 children with acute respiratory infections (ARI). A majority of the children, 70 (77.8%), experienced a favorable recovery, indicating effective management in most cases. However, 15 children (16.7%) developed complications, reflecting a notable proportion at risk for adverse events. Unfortunately, 5 children (5.5%) succumbed to their illness, highlighting the potential severity of ARI in the pediatric population. The average hospital stay for these children was 5.2 ± 2.1 days, suggesting that while most cases resolved relatively quickly, a subset required longer care due to complications or critical illness. Overall, the data emphasizes the generally favorable prognosis of ARI but also underlines the importance of close monitoring and timely intervention for high-risk patients.

Table 5: Short-term Outcomes of Children with ARI (n = 90)		
Outcome	**Frequency (n)**	**Percentage (%)**
Recovered (favorable)	70	77.8
Complications	15	16.7
Death	5	5.5
Average length of stay (days)	5.2 ± 2.1	-

Discussion

The study analyzed 90 pediatric patients who suffered from acute respiratory infections. The study found that children between 1 and 5 years of age represented the largest affected group while male children showed slightly higher rates of infection in rural areas. The demographic patterns of the study match results from multiple worldwide research studies. The study from Bhuyan et al. (2017) [7] found that ARI mainly affected children who were under 5 years old and between 1 to 5 years old with a male percentage of 54.6. The study found that males between 1 and 5 years old presented higher risk of disease because their immune system development had not yet reached full strength while they encountered environmental dangers. The study of Kenmoe et al. (2016) [8] discovered that in a Cameroon cohort male child under five years old showed higher ARI rates, but the study found that urban rural differences in ARI rates were less pronounced because residents faced different healthcare access and environmental dangers in various areas. Some studies found that sex differences showed minimal effect, which indicated that biological susceptibility became less important because other factors, including nutritional status and household crowding, played a bigger role".

The main symptoms that our study group showed with cough and fever matched the results of previous research. Chen et al. (2018) [9] documented that approximately 81% of hospitalized children with ARI in China experienced cough while approximately 76% of these patients showed fever, which indicates that these two symptoms occur in nearly all pediatric respiratory cases. The presence of respiratory distress manifestations such as chest in drawing and wheezing appeared frequently, which matched the findings from Simusika et al. (2015) [10] who reported that Zambian patients with lower respiratory signs showed extended hospital stays and required greater medical assistance. The research conducted by Lagare et al. (2015) [11] in Niger showed less severe distress symptoms, which might result from different community protection levels and disease patterns within the local population. The traditional clinical signs that doctors use to identify ARI show consistent patterns across different parts of the world, yet their intensity and pattern of symptoms display differences between various regions.

The laboratory results from this research study show that more than 50 percent of patients had increased white blood cell counts and nearly 50 percent of patients displayed abnormal chest X ray results which match the established inflammation patterns found in acute respiratory infections. Bhuyan et al. (2017) found that most patients with acute respiratory infections showed increased levels of inflammatory markers which included neutrophils and CRP because these markers showed systemic body reactions. Bezerra et al. (2011) [12] and other studies discovered that patients showed high rates of viral detection but did not develop leukocytosis which indicates that bacterial co infections produce stronger inflammatory responses than viral infections do.

The study results showed that most ARI cases in children were caused by viruses. The study found that 76.7% of cases were caused by viruses, which included HRV/EV and FluA H3 and RSV as the primary pathogens. Li et al. (2018) [13] showed that in China rhinoviruses occupied 29% of pediatric ARI cases while RSV made up 22% thus these viruses ranked as the most common lower respiratory infection pathogens among hospitalized children. Tsagarakis et al. (2018) [14] found that rhinovirus and RSV appeared in multiplex panels for children under 5 years old thus showing these pathogens function as primary causes of pediatric ARI. Some regions demonstrate different viral patterns because Botti et al. (2018) [15] found that Influenza A and Parainfluenza viruses occurred more frequently than RSV in Italy due to seasonal and geographical factors. The existing differences demonstrate how viruses circulate dynamically thus creating a need for monitoring programs in specific areas.

Our study found that 20.6% of cases showed co-infection with multiple pathogens, which matches global data. Hoffmann et al. (2012) [16] conducted research on a rural tropical population, which revealed co-infection rates of approximately 18% with HRV and EV being the most common viruses. Bezerra et al. (2011) found that co-infection occurred most frequently in children who showed symptoms of illness, and they proposed that the presence of multiple infectious agents would determine how severe a disease would become. Rowlinson et al. (2017) [17] observed lower co-infection rates of approximately 12% in Egypt, which resulted from different testing methods and pathogen spread patterns that occurred in various areas.

The study discovered that FluA H3 showed higher infection rates among children aged 1 to 4 years which matched existing research about which age

groups show greater susceptibility to the virus. The research by Luniewska et al. (2019) [18] showed that preschool children experienced higher influenza A H3 infection rates during epidemic seasons which confirmed the existing age distribution pattern. The study by Odun Ayo et al. (2018) [19] found that influenza rates showed no differences between various age groups in Nigeria because the combination of host contact with the virus and their previous immunity developed different patterns of disease spread.

In summary, the current findings largely resonate with global literature, underscoring the predominance of viral etiologies, characteristic clinical manifestations, and the impact of demographic and environmental risk factors on pediatric ARI. However, geographic and methodological differences explain variations in pathogen prevalence, co-infection rates, and seasonal patterns, reinforcing the need for ongoing local surveillance and tailored preventive strategies.

Conclusion

This retrospective study of 90 children with acute respiratory infections highlights that ARIs predominantly affect preschool-aged children, with a slight male predominance and higher incidence in rural areas. Clinically, cough and fever were the most frequent symptoms, while a notable proportion exhibited signs of respiratory distress, such as difficulty breathing, chest in drawing, and wheezing. Laboratory and radiological findings revealed that viral infections were the leading cause, though bacterial and mixed infections contributed to disease severity in some cases. Most children responded well to supportive care and antibiotics, with a majority recovering fully; however, complications occurred in 16.7% and mortality was 5.5%, emphasizing the potential seriousness of ARIs. These findings underscore the importance of early recognition, appropriate management, preventive strategies, and targeted interventions for high-risk pediatric populations to reduce morbidity and mortality.

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