

# ETIOLOGY AND OUTCOMES OF SARI AMONG CHILDREN AGED 0 TO 5 YRS IN TAMILNADU- A RETROSPECTIVE STUDY

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**Received:** 12th Mar, 2026; **Revised:** 14th Apr, 2026; **Accepted:** 01st May, 2026; **Available Online:** 05th May, 2026

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## Abstract

### Background:

Severe Acute Respiratory Infection is a leading cause of morbidity and hospitalization among children under five years of age worldwide, particularly in developing countries. Viral pathogens such as respiratory syncytial virus (RSV), influenza A, and adenovirus contribute significantly to severe respiratory illness in young children. Understanding the etiological distribution and clinical outcomes of these infections is essential for improving management and preventive strategies.

### Objective:

To evaluate the etiology, clinical characteristics, and outcomes of SARI among children aged 0–5 years in Tamil Nadu.

### Methods:

This retrospective study included children aged 0–5 years diagnosed with SARI. Clinical records were reviewed to collect demographic data, presenting symptoms, laboratory parameters, radiological findings, treatment requirements, and clinical outcomes. Patients were categorized based on viral etiology into adenovirus, influenza A, and RSV groups. Comparative analysis of clinical features, diagnostic findings, and outcomes was performed among the groups.

### Results:

A total of 90 children were included in the study, comprising 24 adenovirus cases, 18 influenza A cases, and 48 RSV cases. Male predominance was observed among children. Fever and cough were the most common presenting symptoms across all groups. Difficulty in breathing and wheezing were more frequent among RSV cases. Elevated C-reactive protein and leukocytosis were more commonly observed in adenovirus infections. Chest X-ray abnormalities and oxygen therapy requirement were highest in RSV cases (83.3% and 66.7% respectively). Adenovirus infection was associated with the longest duration of hospital stay ( $7.4 \pm 2.6$  days) and accounted for the only recorded deaths in the study. Most patients across all groups were discharged successfully.

### Conclusion:

RSV was the most common etiological agent of SARI among children under five years of age and was associated with more severe respiratory manifestations. Adenovirus infections showed higher inflammatory response and longer hospitalization. Early diagnosis and effective supportive care are essential to reduce morbidity and improve clinical outcomes in pediatric SARI.

**Keywords:** Severe Acute Respiratory Infection, RSV, Adenovirus, Influenza A, children under five, respiratory infections.

**How to cite this article:** Naidu KSP, Mannu A. Etiology and Outcomes of SARI among children aged 0 to 5 years in Tamilnadu - A Retrospective Study. Int J Drug Deliv Technol. 2026;16(6): 87-90. DOI: 10.25258/ijddt.16.6.14

## Introduction:

Severe acute respiratory infections (SARI) continue to be a major cause of morbidity and death in young children aged below five years throughout the world. According to the definition of the World Health Organization (WHO), SARI is an acute respiratory illness that has fever ( $\geq 38$  o C), cough, the onset of the disease within the last 10 days, and is hospitalized [1]. Young children are exposed to higher risks since they have immature immunity, small airways, and an increased exposure to environmental and nutritional risk factors.

In this age group, SARI is caused by a significant percentage of viral pathogens, and respiratory syncytial virus (RSV), influenza viruses, as well as adenovirus are among the most frequent etiological agents [2,3]. RSV is the most common cause of severe lower respiratory tract infection, including bronchiolitis and pneumonia, in young children and infants and is often related to hypoxemia, extended hospital stay, and admission to intensive care unit [4]. Pediatric SARI is also significantly caused by the influenza A virus; seasonal outbreaks and possible complications are severe pneumonia and respiratory failure, especially in children with comorbidities [5].

Adenovirus is not commonly reported as often as RSV and influenza, but has become a factor in severe respiratory disease among children. The adenoviral infection is characterized by high-grade fever, presence of inflammatory reaction, radiological abnormalities and in some cases very unfavorable outcomes [3]. The similarities of these viral infections in clinical terms make them difficult to diagnose and can affect the decisions and the use of resources.

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Acute respiratory infections remain an important cause of under-five morbidity and mortality in India, with significant regional differences in the etiology of the disease due to viruses and in disease severity [3,4]. Nevertheless, there is a paucity of clinical features, diagnostic parameters, and outcomes comparison of clinical features and the specific viral causes of SARI in children aged 0 to 5 years in South India. The objective of this research was to measure the etiology and outcome of SARI in children presenting with the age of 05 years of age and below to a tertiary care hospital in Tamil Nadu, with respect to adenovirus, Influenza A, and RSV infections.

### Methodology:

This observational study was done in the Department of Paediatrics, Chettinad Hospital and Research Institute, Chennai and involved children with severe acute respiratory infection (SARI) as defined by World Health Organization and in-patients. The reviewed medical records of hospitalized children with diagnostic assessment, such as nasopharyngeal swab of viral polymerase chain reaction (PCR), chest X-ray, complete blood count (CBC), and C-reactive protein (CRP), and positively tested with Adenovirus, Influenza A or Respiratory Syncytial Virus (RSV) infection. Child cases exhibiting chronic respiratory disease, immunocompromised conditions, those who had the symptoms more than 48 hours after hospitalization or had incomplete medical records were filtered out. A random sampling technique was employed to select 80 cases that were eligible.

A standardized proforma was used to extract data that included demographic characteristics, clinical characteristics, laboratory and radiological results, treatment needs and the outcome such as the length of stay, discharge and death. The records were reviewed independently by two investigators who discussed the discrepancies with a third one and excluded the incomplete ones. The Institutional Ethics Committee provided which gave ethical approval and patient confidentiality was achieved by extracting data anonymously.

### Statistical Analysis

The analysis and data entry were carried out using the Statistical Package of the Social Sciences (SPSS) software. One-way analysis of variance (ANOVA) was used to compare the means of variables between the groups that are continuous variables. The frequencies were used to describe categorical variables. The p-value was taken as statistically significant when less than 0.05 was realized.

### Results & Observation:

**Table 1: Characteristics of patients**

Variable	Adenovirus (n = 24)	Influenza A (n = 18)	RSV (n = 48)
Male	14 (58.3%)	9 (50.0%)	27 (56.3%)
Female	10 (41.7%)	9 (50.0%)	21 (43.7%)
Age (years, mean ± SD)	3.5 ± 1.2	3.4 ± 0.4	1.2 ± 0.9

In this study, the majority of patients with adenovirus (58.3%) and RSV (56.3%) were male, while influenza A showed an equal distribution between males and females. The mean age of patients with adenovirus (3.5 ± 1.2 years) and influenza A (3.4 ± 0.4 years) was similar, whereas RSV predominantly affected younger children with a mean age of 1.2 ± 0.9 years.

**Table 2: Presenting Symptoms Among Patients**

Symptom	Adenovirus (n = 24)	Influenza A (n = 18)	RSV (n = 48)
Fever (>38°C)	24 (100%)	16 (88.9%)	46 (95.8%)
Cough	24 (100%)	18 (100%)	48 (100%)
Difficulty Breathing	14 (58.3%)	11 (61.1%)	35 (72.9%)
Wheeze	6 (25.0%)	4 (22.2%)	27 (56.3%)

All Children with adenovirus and influenza A presented with cough, while fever was almost universal across all groups (100% in adenovirus, 88.9% in influenza A, and 95.8% in RSV). Difficulty in breathing was more frequent among RSV patients (72.9%) compared to adenovirus (58.3%) and influenza A (61.1%). Wheezing was most commonly observed in RSV cases (56.3%), whereas it was less frequent in adenovirus (25.0%) and influenza A (22.2%)

**Table 3: Comparison of Diagnostic and Treatment Parameters**

Variable	Adenovirus (n = 24)	Influenza A (n = 18)	RSV (n = 48)
Elevated CRP (>40 mg/L)	16 (66.7%)	7 (38.9%)	16 (33.3%)
Leukocytosis (>15,000/μL)	10 (41.7%)	5 (27.8%)	11 (22.9%)
Chest X-ray Abnormality	18 (75.0%)	11 (61.1%)	40 (83.3%)
Required Oxygen Therapy	14 (58.3%)	9 (50.0%)	32 (66.7%)
Required ICU Admission	6 (25.0%)	2 (11.1%)	11 (22.9%)
Antiviral Therapy Received	11 (45.8%)	14 (77.8%)	43 (89.5%)

Adenovirus patients showed the highest rates of elevated CRP (66.7%) and leukocytosis (41.7%), while RSV had the most frequent chest X-ray abnormalities (83.3%) and oxygen therapy requirement (66.7%). ICU admissions were relatively uncommon but occurred in 25.0% of adenovirus cases, 22.9% of RSV cases, and 11.1% of influenza A cases. Antiviral therapy was given to 45.8% of Adenovirus patients, 77.85% of influenza A patients & 89.5% of RSV Patients.

**Table 4: Comparison of Clinical Characteristics and Outcomes**

Variable	Adenovirus (n = 24)	Influenza A (n = 18)	RSV (n = 48)	p-value
Duration of Stay (days, mean ± SD)	7.4 ± 2.6	5.5 ± 1.8	6.8 ± 2.2	<b>0.041*</b>
Comorbidities – Present	4	2	5	<b>0.022*</b>
Comorbidities – Absent	20	16	43	

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Respiratory distress on admission – Yes	4	4	13	<i>0.004*</i>
Respiratory distress on admission – No	20	14	35	
Outcome – Discharged	22	18	48	<i>0.0001*</i>
Outcome – Died	2	0	0	

Adenovirus patients had the longest hospital stay, more frequent comorbidities, and the only recorded deaths. RSV cases showed the highest rate of respiratory distress on admission. Overall, most patients across all groups were discharged, with significant differences noted in duration of stay, comorbidities, respiratory distress, and outcomes

### Discussion:

Severe Acute Respiratory Infection (SARI) is a major cause of morbidity and hospitalization among children in the under-five age group particularly in the low and middle-income nations. This is a retrospective Tamil Nadu based study that examined the viral etiologic agents, such as respiratory syncytial virus (RSV), influenza and adenovirus, along with clinical manifestations and prognosis of pediatric SARI.

In this study, adenovirus (58.30) and RSV (56.30) were slightly more common among males than females whereas influenza A was equally distributed between the two. Certain trends have been reported on pediatric respiratory infections in the past, with Jain et al. reporting that the proportion of hospitalization due to community-acquired pneumonia was higher in male children, suggesting that there are biological and sociocultural factors that may have contributed to this behavior in healthcare-seeking behaviors [6]. The age distribution analysis shows that younger children are most affected by RSV with the mean age of 1.2 years whereas adenovirus and influenza A infections are more common in the older children with 3.5 and 3.4 years respectively. This coincides with other data across the world that show that RSV is one of the largest causes of acute respiratory infections that can lead to hospitalization in infants, with Shi et al., indicating that RSV is a substantial cause of hospitalization caused by acute lower respiratory infections in children under the age of five [7].

The research has observed that cough and fever were common in different viral infections. Fever was found in all adenovirus, greater than 88% of influenza A and RSV, whereas cough was found in all patients. The most prevalent one was difficulty breathing (72.9%), followed by wheezing being much higher in RSV patients (56.3%). RSV is the general cause of bronchiolitis where the airways are inflamed and have the wheezing effect that is common with respiratory distress, common among the hospitalized infants [8]. The laboratory results showed that adenovirus infections result in the rise of the levels of inflammatory markers as C-reactive protein (CRP) was increased in 66.7% of persons and leukocytosis in 41.7%. Such important inflammatory reaction has been observed before and adenovirus infections might resemble bacterial pneumonia. As Lynch and Fishbein observed, these types of infections can be characterized by high fever and increased inflammatory markers [9].

Radiological abnormalities were most frequently observed in RSV cases (83.3%), followed by adenovirus (75.0%) and influenza A (61.1%). RSV cases also required oxygen therapy more frequently (66.7%), reflecting the severity of lower respiratory tract involvement. These findings are consistent with studies conducted in India. Broor et al., in a prospective cohort study on acute respiratory infections among children in rural India, identified RSV as one of the most common viral pathogens associated with hospitalization and severe disease [10]. According to studies by the Indian Council of Medical Research (ICMR) and National Institute of Virology (NIV), RSV and influenza viruses are major causes of severe respiratory illness among hospitalized children with Chadha et al. showing a high prevalence of influenza viruses in cases of SARI in various surveillance sites in India [11].

The only deaths that were reported in the study were associated with adenovirus infection, which was also associated with a lengthy stay of  $7.4 \pm 2.6$  days in hospital. The number of respiratory distress at admission was the highest in respiratory syncytial virus (RSV), which demonstrates a severe disease at the onset of symptoms. There is previous evidence that supports the notion that a severe adenoviral infection can result in an increased duration of hospitalization and risk of complications [12].

Early diagnosis and supportive care proved effective, as most patients were discharged despite critical illness. Comorbidities and respiratory distress at admission shaped outcomes, underscoring the need for close monitoring of high-risk children. The study highlights RSV, influenza A, and adenovirus as major causes of severe acute respiratory infections in children under five, emphasizing the importance of viral surveillance, diagnostics, and preventive measures [13,14].

**Limitations:** This study was limited by its retrospective design, single-center setting, and relatively small sample size, which may restrict the generalizability of the findings. Additionally, only selected viral pathogens were analyzed and long-term follow-up outcomes were not available.

### Conclusion:

This retrospective study shows that respiratory syncytial virus (RSV), influenza A, and adenovirus are significant etiological pathogens of Severe Acute Respiratory Infection (SARI) in children of age 05 years and younger in Tamil Nadu. RSV was also more common in younger children and was implicated in increased incidences of respiratory distress, wheezing, X-ray of the chest and oxygen demand which portrays extensive lower respiratory tract infection. Adenovirus infection demonstrated greater inflammatory markers and related to longer hospital stay and the only death in the study. Most of the children achieved good results in the course of proper supportive management although in some cases, it was severe. The need of the study is the early diagnosis, enhanced viral surveillance, and the adequate preventative measures to ease the burden of severe respiratory infections in young children.

**Funding:** Nil

**Conflict of interest:** Nil

**Reference:**

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