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Research Article

Clinico-Radiological and Microbiological Profile of Lower Respiratory Tract Infections in Children: A Prospective Study

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ABSTRACT

Background: Lower respiratory tract infections (LRTIs) remain one of the leading causes of illness and hospitalization among children, especially in developing countries. Early identification of clinical features along with radiological and microbiological assessment is essential for appropriate management.
Objective: To evaluate the clinical profile, radiological findings, and microbiological etiology of LRTIs in children admitted to a tertiary care center.
Methods: This prospective observational study was conducted at ESIC Medical College & PGIMSR, Rajajinagar, Bangalore, from September 2024 to March 2026. A total of 118 children aged 1 month to 12 years diagnosed with LRTI were included. Clinical details, chest radiographs, and microbiological investigations were recorded and analyzed.
Results: Most children belonged to the 1–5 years age group (44.9%). Cough (91.5%) and fever (83.9%) were the most common presenting symptoms. Radiological consolidation was observed in 46.6% of cases. Bacterial pathogens were identified in 53.4% cases, with Streptococcus pneumoniae being the most frequently isolated organism.
Conclusion: A combined clinico-radiological and microbiological approach improves diagnostic accuracy and facilitates appropriate treatment in pediatric LRTIs.

Keywords*: Lower respiratory tract infection, pediatric pneumonia, radiology, microbiology, tertiary care center, India.*

INTRODUCTION

Lower respiratory tract infections (LRTIs) continue to contribute significantly to childhood morbidity and hospital admissions worldwide, particularly in low- and middle-income countries [1]. Despite notable improvements in vaccination coverage and healthcare access, pneumonia remains a leading cause of mortality among children under five years of age [2]. The clinical presentation of LRTIs in children is highly variable, ranging from mild respiratory symptoms to severe respiratory distress requiring hospitalization. However, clinical features alone are often insufficient to reliably differentiate between bacterial and viral etiologies [3]. This diagnostic limitation frequently results in empirical treatment, which may not always be appropriate. Chest radiography plays a crucial role in the evaluation of suspected LRTIs, aiding in the identification of patterns such as consolidation, patchy infiltrates, and complications like pleural effusion [4]. In addition, microbiological investigations provide important insights into the causative pathogens, although their diagnostic yield may be influenced by prior antibiotic use and challenges in obtaining adequate samples [5]. In recent years, increasing emphasis has been placed on integrating clinical findings with radiological and microbiological data to enhance diagnostic accuracy and guide appropriate management [6,7]. However, region-specific data from tertiary care settings in India remain limited. Therefore, the present study was undertaken to evaluate the clinico-radiological and microbiological profile of lower respiratory tract infections in children.

MATERIALS AND METHODS

The present prospective observational study was conducted in the department of pediatrics at ESIC Medical College & PGIMSR, Rajajinagar, Bangalore, from September 2024 to March 2026. The study population comprised children aged 1 month to 12 years who were admitted with clinical features suggestive of lower respiratory tract infection.

Inclusion Criteria

- Children aged between 1 month and 12 years
- Presence of symptoms such as cough, fever, fast breathing, or respiratory distress
- Radiological findings suggestive of LRTI
- Informed consent obtained from parents or guardians

Exclusion Criteria

- Children with known congenital heart or lung disease
- Immunocompromised patients
- Chronic respiratory illnesses such as bronchial asthma on long-term treatment
- Patients with incomplete clinical or laboratory data

Data Collection

A pre-designed structured proforma was used to collect demographic details, presenting complaints, and clinical findings. Chest radiographs were evaluated by a qualified radiologist. Microbiological investigations included blood culture and respiratory samples (where feasible) for identification of pathogens.

Statistical Analysis

Data were entered and analyzed using IBM SPSS software, ver.27.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 118 children fulfilling the inclusion criteria were enrolled during the study period. The majority of patients were below 5 years of age, with a slight male predominance.

Table 1: Age distribution of study population

Age Group	Number (n=118)	Percentage (%)
<1 year	28	23.7%
1–5 years	53	44.9%
6–12 years	37	31.4%

The highest proportion of cases was observed in the 1–5 years age group, indicating increased susceptibility in younger children. (Table 1)

Table 2: Clinical features of study population

Symptom	Frequency	Percentage (%)
Cough	108	91.5%
Fever	99	83.9%
Tachypnea	92	78%
Chest indrawing	66	55.9%

Cough and fever were the most frequently reported symptoms, followed by tachypnea. (Table 2)

Table 3: Radiological findings in children with LRTI

Finding	Frequency	Percentage (%)
Consolidation	55	46.6%
Patchy infiltrates	34	28.8%
Hyperinflation	17	14.4%
Pleural effusion	12	10.2%

Consolidation was the most common radiological finding, suggesting a predominance of bacterial pneumonia. (Table 3)

Table 4: Microbiological profile of study population

Organism	Frequency	Percentage (%)
Streptococcus pneumoniae	30	25.4%
Haemophilus influenzae	18	15.3%
Staphylococcus aureus	15	12.7%

Viral pathogens	32	27.1%
No growth	23	19.5%

Bacterial pathogens were identified in a significant proportion of cases, with Streptococcus pneumoniae being the most common isolate. (Table 4)

Table 5: Association between age group and disease severity

Age Group	Mild	Moderate	Severe	Total	p-value
<1 year	6	14	8	28	
1–5 years	18	25	10	53	0.041
6–12 years	20	14	3	37	

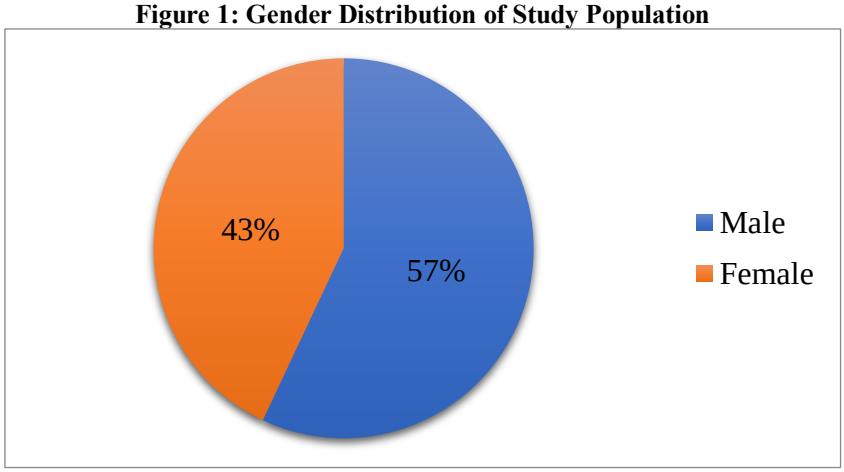
A statistically significant association was observed between age group and disease severity ($p < 0.05$). Younger children, particularly those below 5 years of age, showed a higher proportion of moderate to severe disease. (Table 5)

Table 6: Association between microbiological etiology and clinical outcome

Organism	Recovered	Complications	Mortality	p-value
Streptococcus pneumoniae	25	4	1	
Haemophilus influenzae	15	2	1	
Staphylococcus aureus	11	3	1	0.048
Viral pathogens	30	2	0	
No growth	24	1	0	

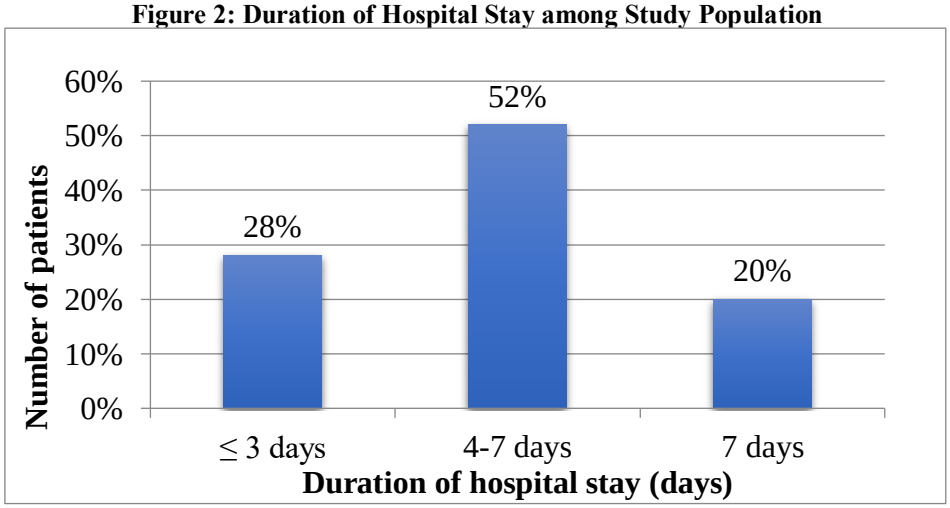
There was a statistically significant association between microbiological etiology and clinical outcome ($p < 0.05$). Due to small cell frequencies, Fisher's exact test was applied for analysis. Bacterial infections, particularly Streptococcus pneumoniae, were associated with relatively higher rates of complications compared to viral infections. (Table 6)

Figure 1: Gender Distribution of Study Population



A slight male predominance was observed among children with LRTIs. (Figure 1)

Figure 2: Duration of Hospital Stay among Study Population



Most children had a hospital stay of 4–7 days, indicating moderate disease severity. A smaller proportion required shorter or prolonged hospitalization. (Figure 2)

DISCUSSION

In the present study, the majority of cases were observed in children between 1 and 5 years of age, highlighting the increased vulnerability of this age group. This finding is in line with global estimates, which suggest a higher burden of LRTIs among younger children due to immature immune responses and greater exposure to environmental risk factors [8].

Cough and fever were the most common presenting complaints in our study population. These findings are comparable with previously published data, where similar symptom patterns have been consistently reported in pediatric LRTIs [3]. Tachypnea was also frequently observed and continues to be a reliable clinical indicator of disease severity.

Radiological evaluation revealed consolidation as the predominant finding. This observation is comparable with other hospital-based studies, where consolidation has been associated with bacterial pneumonia and more severe disease presentations [9]. The presence of patchy infiltrates and hyperinflation in a subset of patients may reflect viral or mixed infections.

Microbiological analysis demonstrated that bacterial pathogens were identified in a significant proportion of cases, with Streptococcus pneumoniae being the most common isolate. This pattern is consistent with existing literature, which identifies pneumococcus as a leading cause of pediatric pneumonia worldwide [10]. In addition, viral pathogens accounted for a considerable number of cases, supporting the growing recognition of viral etiologies in LRTIs [11].

The overall clinical outcome in this study was favorable, with most children responding well to treatment and a low mortality rate observed. Most patients required a hospital stay of 4–7 days, suggesting moderate disease severity in the majority [12].

Taken together, the findings of this study emphasize the importance of a comprehensive approach that combines clinical assessment with radiological and microbiological evaluation to guide appropriate management.

CONCLUSION

Lower respiratory tract infections remain a major cause of morbidity among children, particularly in younger age groups. The present study shows that reliance on clinical features alone may be insufficient for accurate diagnosis. Correlation with radiological findings and microbiological investigations provides better understanding of the underlying etiology.

A combined clinico-radiological and microbiological approach can help in early diagnosis, guide appropriate antimicrobial therapy, and reduce unnecessary antibiotic use. Strengthening such integrated evaluation in tertiary care settings may contribute to improved patient outcomes and reduced complications.

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