



ORIGINAL RESEARCH PAPER

Paediatrics

A STUDY OF SERUM IL-6 LEVELS AND ITS CORRELATION WITH CLINICAL PROFILE AND OUTCOME IN CHILDREN WITH PNEUMONIA

KEY WORDS: Pneumonia, Interleukin-6, Biomarker, Pediatric, Disease Severity

M K Mohiudddin Moiz*

Post Graduate, Department of Paediatrics, Rajarajeshwari Medical College & Hospital, Bangalore, Karnataka, India*Corresponding Author

Rajanish KV

Professor and HOD, Department of Paediatrics, Rajarajeshwari Medical College & Hospital, Bangalore, Karnataka, India

Adarsh E

Professor, Department of Paediatrics, Rajarajeshwari Medical College & Hospital, Bangalore, Karnataka, India

ABSTRACT

Pneumonia remains a leading cause of morbidity and mortality in children under five, particularly in low-resource settings. This prospective observational study evaluated 50 children aged 1 month to 5 years with WHO-defined pneumonia to assess the role of serum Interleukin-6 (IL-6) as a prognostic biomarker. IL-6 levels were significantly higher in severe pneumonia cases (68.95 pg/mL) compared to non-severe cases (55.30 pg/mL; $p = 0.038$), and elevated levels were associated with prolonged hospitalization, oxygen therapy, ICU admission, and poor outcomes. ROC analysis showed high diagnostic accuracy (AUC 0.872, sensitivity 86.7%, specificity 80.5%). IL-6 outperformed traditional markers like WBC and CRP, suggesting its utility for early risk stratification in pediatric pneumonia.

INTRODUCTION

Pneumonia is a leading cause of morbidity and mortality in children under five, especially in low- and middle-income countries like India. It accounts for nearly 15% of all under-five deaths globally, with about 740,000 deaths annually, and contributes significantly to hospital and ICU admissions in India, straining healthcare resources. The disease presents a wide clinical spectrum, from mild illness to life-threatening complications. Early identification of severe cases is essential, but conventional markers such as leukocyte count, C-reactive protein (CRP), and radiography lack sufficient sensitivity and specificity for early risk prediction. Interleukin-6 (IL-6), a pro-inflammatory cytokine central to the acute-phase response, is released rapidly in response to infection, often preceding elevations in conventional markers. Its early rise and correlation with disease severity make IL-6 a promising biomarker for pediatric pneumonia. Recent studies support its diagnostic and prognostic value. Ahmed et al. (2018) reported a strong association between elevated IL-6 levels and disease severity in community-acquired pneumonia, while Raziq et al. (2021) demonstrated IL-6's role in predicting prolonged hospital stays and respiratory support needs. These findings highlight IL-6's potential in improving early detection and clinical decision-making.

In light of these developments, the current study was undertaken to evaluate serum IL-6 levels in children aged 1 month to 5 years diagnosed with WHO-defined pneumonia and assess their correlation with disease severity, clinical profile, and outcomes. The study aims to determine the reliability of IL-6 as a prognostic marker and explore its role in facilitating timely intervention, optimizing resource use, and improving outcomes in pediatric pneumonia. If validated, IL-6 could be incorporated into standard diagnostic protocols to enhance early risk stratification and individualized care in paediatric pneumonia.

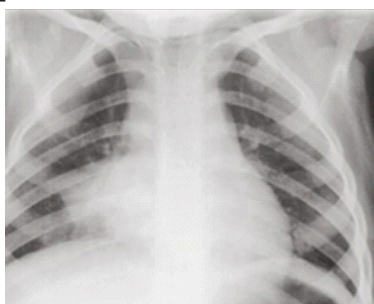


FIGURE 1 : Chest radiograph showing right lower lobe pneumonia:

METHODOLOGY

Study Design

This was a hospital-based prospective observational study. Study Setting The study was conducted in the Department of Pediatrics, Rajarajeshwari Medical College and Hospital, Bangalore, Karnataka, a tertiary care center equipped with pediatric intensive care facilities and laboratory diagnostic services.

Study Duration

The study was carried out over a period of 18 months, allowing adequate time for recruitment, data collection, and analysis.

Participants

A total of 50 pediatric patients, aged between 1 month and 5 years, who were admitted with WHO-defined clinical pneumonia, were enrolled consecutively during the study period. The age distribution showed that the majority (48%) were between 1–3 years, 26% between 2 months to 1 year, 16% between 3–5 years, and 10% between 1–2 months.

Inclusion Criteria :

- Children aged 1 month to 5 years
- Diagnosed with pneumonia based on WHO criteria
- Admitted to the pediatric department
- Informed consent obtained from parents or guardians

Exclusion Criteria :

- Children with congenital heart disease, immunodeficiencies, or chronic lung disease
- Prior antibiotic use for more than 48 hours
- Children with concurrent infections (e.g., meningitis, urinary tract infections)

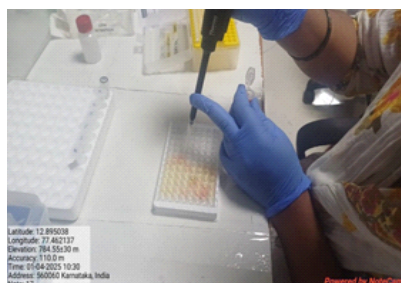


FIGURE 2: ELISA test for IL-6

DATA COLLECTION:

Clinical severity (per WHO), WBC, hemoglobin, neutrophils, lymphocytes, CRP, and IL-6 measured via ELISA. IL-6 levels were correlated with severity and outcomes.

Bias Control:

Consecutive sampling and blinded statistical analysis ensured objectivity.

RESULTS

Demographics

Age: 48% aged 1–3 years; most vulnerable group
 Gender: 54% male, 46% female
 WHO Grading: 80% pneumonia, 20% severe pneumonia

Hospital Stay

78% stayed <7 days; median stay longer in severe cases (9 vs. 5 days, $p=0.005$)

Laboratory Findings

Parameter	Mean $\pm$ SD
WBC ($\times 10^9/L$)	14.32 $\pm$ 7.88
Hemoglobin (g/dL)	10.8 $\pm$ 1.5
Neutrophils (%)	70.0 $\pm$ 5.6
Lymphocytes (%)	62.0 $\pm$ 8.5

- WBC significantly higher in severe pneumonia (17.55 vs. 13.45; $p=0.035$)
- CRP +24 most common in severe cases (50%; $p=0.002$).

IL-6 and Pneumonia Severity

- IL-6 significantly higher in severe pneumonia (68.95 vs. 55.30 pg/mL; $p=0.038$)
- Higher IL-6 seen in bilateral pneumonia than lobar (69.35 vs. 56.10 pg/mL; $p=0.01$)

5. IL-6 and Outcomes

Outcome	Mean IL-6	p-value
Hospital Stay >7 days	72.6	0.003
Oxygen need	70.6	0.004
ICU admission	77.85	0.001
Poor Outcome	74.22	0.001

- Elevated IL-6 correlated strongly with adverse outcomes

6. Diagnostic Accuracy

- ROC analysis: AUC = 0.872
- IL-6 cut-off: 62 pg/mL
- Sensitivity: 86.7%, Specificity: 80.5%

7. Outliers

Three cases deviated from expected IL-6 patterns, highlighting the need for clinical context:

- Case A: High IL-6, mild disease
- Case B: Low IL-6, severe pneumonia
- Case C: Moderate IL-6, prolonged stay

DISCUSSION

The study confirms IL-6 as a reliable biomarker for pneumonia severity in children. Toddlers (1–3 years) were most affected. Severe pneumonia cases had longer hospitalization and higher IL-6 levels.

IL-6 outperformed WBC and CRP in predicting adverse outcomes. Children with elevated IL-6 had higher chances of requiring oxygen, ICU care, and longer stays. Bilateral pneumonia showed higher IL-6, suggesting a link with disease extent.

ROC analysis confirmed high diagnostic accuracy. However, three outlier cases showed mismatch between IL-6 and

clinical severity, suggesting that IL-6, while useful, should complement clinical judgment.

CONCLUSION

Serum IL-6 levels correlate with disease severity, oxygen requirement, ICU admission, and outcome in pediatric pneumonia. IL-6 is a promising early biomarker with high diagnostic accuracy. However, clinical context remains essential for interpretation.

RECOMMENDATIONS

- Routine IL-6 measurement may aid early identification of severe pneumonia.
- Larger multi-center studies are needed to validate these findings.

REFERENCES:

- World Health Organization. Pneumonia. Geneva:WHO;2021.
- Bhattacharya PK, Dubey AP, Ranjan A. Epidemiology and clinical profile of pneumonia in hospitalized children under five in Eastern India. Indian J Child Health. 2019;6(5):218–21.
- Jain S, Williams DJ, Arnold SR, Ampofo K, Bramley AM, Self WH, et al. Community-acquired pneumonia requiring hospitalization among U.S. children. N Engl J Med. 2020;372(9):835–45.
- Tanaka T, Narazaki M, Kishimoto T. IL-6 in inflammation, immunity, and disease. Cold Spring Harb Perspect Biol. 2019;11(2):a016295.
- Shaikh N, Irfan M, Khan SA, Hussain Z. Diagnostic value of interleukin-6 in pediatric lower respiratory tract infections. Pak J Med Sci. 2020;36(4):695–700.
- Ahmed A, Khattab M, El-Mekkawy MS. Clinical study of serum interleukin-6 in children with community-acquired pneumonia. Egypt J Hosp Med. 2018;70(11):1951–56.
- Raziq A, Nazir T, Amin S, Bukhari MH. Prognostic significance of IL-6 in hospitalized children with severe pneumonia. J Pediatr Infect Dis. 2021;16(1):33–8.
- Khattab A, El-Mekkawy M, Shehata A, Whdan NA. Clinical study of serum interleukin-6 in children with community-acquired pneumonia. Egypt Pediatr Assoc Gaz. 2018;66(2):67–73.