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Original Research Article

Study of Modifiable Risk Factors for Acute Lower Respiratory Tract Infection in Children Aged 2 Months to 5 Years

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Abstract

Background: Acute lower respiratory tract infections (ALRTI) remain a leading cause of under-five mortality globally, particularly in low- and middle-income countries where preventable socioeconomic and environmental risk factors persist.

Objective: To identify modifiable determinants associated with ALRTI severity among children aged 2 months to 5 years.

Methods: This hospital-based cross-sectional study included 100 children diagnosed with ALRTI over a one-year period. Sociodemographic variables, immunization status, breastfeeding practices, and environmental exposures were assessed using a structured proforma. Statistical analysis was performed and chi-square test; $p<0.05$ was considered statistically significant.

Results: Low socioeconomic status, incomplete immunization, and exposure to polluting domestic fuels demonstrated significant association with ALRTI severity ($p<0.05$).

Conclusion: Strengthening vaccination coverage, promoting clean household energy use, and improving socioeconomic conditions are essential strategies to reduce childhood ALRTI burden.

Keywords: Acute Lower Respiratory Tract Infection, Risk Factors, Immunization.

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Introduction

Acute lower respiratory tract infection (ALRTI) is a major contributor to childhood morbidity and mortality worldwide [1]. Despite improvements in vaccination programs and access to antibiotics, pneumonia continues to account for a substantial proportion of preventable deaths, particularly in developing countries [2].

India bears a considerable share of this burden due to persistent socioeconomic disparities and environmental exposures. Risk factors such as incomplete immunization, malnutrition, overcrowding, and indoor air pollution have been consistently implicated in increasing susceptibility to respiratory infections [3–6]. Identifying locally relevant modifiable determinants is essential for designing targeted public health interventions aimed at reducing under-five mortality.

Materials and Methods

Inclusion Criteria:

1. Children aged 2 months to 5 years.
2. Children diagnosed with acute lower respiratory tract infection (ALRTI) according to IMNCI criteria.
3. Children admitted to the Department of Paediatrics during the study period.

Exclusion Criteria:

1. Children with known chronic respiratory diseases such as bronchial asthma or cystic fibrosis.
2. Children with congenital heart disease or other significant congenital anomalies.
3. Children with known immunodeficiency disorders.

This cross-sectional study was conducted in the Department of Paediatrics, Sree Balaji Medical College and Hospital, Chennai, from January 2020 to January 2021. A total of 100 children aged 2 months to 5 years diagnosed with ALRTI as per IMNCI criteria were enrolled. Data regarding socioeconomic status (Modified Kuppuswamy scale), immunization status, birth weight, breastfeeding practices, overcrowding, and domestic fuel exposure were collected after obtaining informed consent. Children with chronic respiratory illness or congenital anomalies were excluded. Data were analyzed using SPSS version 22.0 with chi-square test; $p<0.05$ was considered statistically significant.

Results

A total of 100 children aged between 2 months and 5 years diagnosed with acute lower respiratory tract infection (ALRTI) were included in the study. The majority of cases presented with pneumonia 63%, while 28% were classified as severe pneumonia based on IMNCI criteria, indicating a considerable burden of moderate to severe respiratory illness in the study population (Figure 1). Analysis of immunization status revealed that only 18% of children were completely immunized for age, whereas a large proportion (79%) were partially immunized, suggesting gaps in routine immunization coverage (Figure 2).

Sociodemographic evaluation showed that most participants belonged to the lower socioeconomic class (69%) according to the Modified Kuppuswamy scale, highlighting the role of socioeconomic disadvantage in childhood respiratory infections (Figure 3). Environmental assessment demonstrated that kerosene was the predominant household fuel used by the families (46%), followed by other polluting fuels, indicating significant exposure to indoor air pollution among affected children (Figure 4). Overall, low socioeconomic status, incomplete immunization, and exposure to polluting domestic fuels were commonly observed among children with ALRTI in the present study.

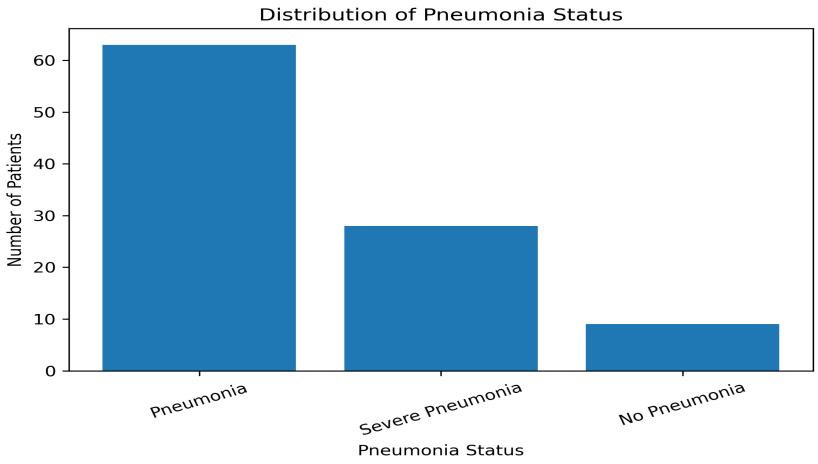

Figure 1: Distribution of pneumonia status among study participants.

Only 18% were completely immunized, while 79% were partially immunized (Figure 2).

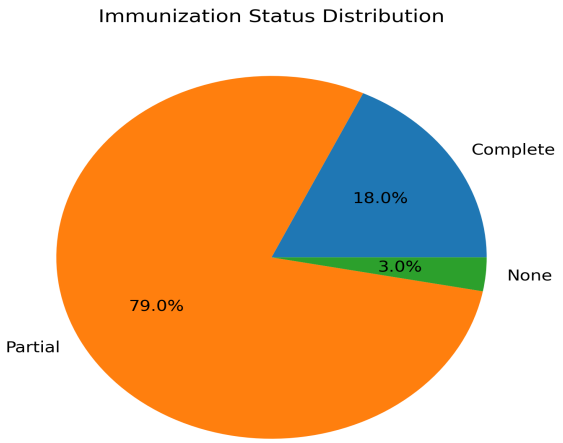

Figure 2: Immunization status distribution among participants.

Majority (69%) belonged to lower socioeconomic class (Figure 3).

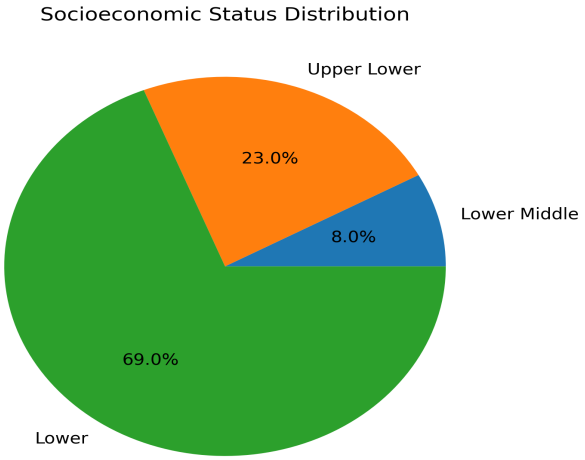

Figure 3: Socioeconomic status distribution based on Modified Kuppuswamy scale.

Kerosene was the predominant domestic fuel used (46%) (Figure 4).

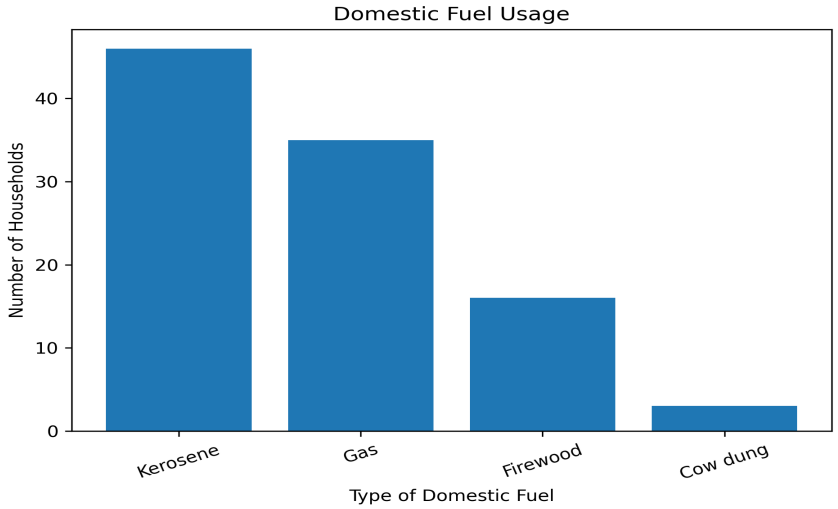

Figure 4: Distribution of domestic fuel usage among households.

Discussion

The present study highlights the significant contribution of modifiable socioeconomic and environmental determinants in influencing ALRTI severity. Children belonging to lower socioeconomic strata demonstrated higher disease severity, consistent with prior Indian and global studies [3,5]. Limited healthcare access, nutritional deficiencies, and suboptimal living conditions may explain this association.

Incomplete immunization emerged as a major determinant in this cohort. Vaccination against pneumococcus, Haemophilus influenzae type b, measles, and pertussis has been shown to substantially reduce pneumonia-related morbidity and mortality [1,2,8]. The predominance of partially immunized children underscores the need for strengthening routine immunization services. Exposure to indoor air pollution due to kerosene and biomass fuel combustion was significantly associated with ALRTI severity. Particulate matter and toxic gases impair mucociliary clearance and predispose children to infection [6,7,9]. Large-scale epidemiological studies have consistently demonstrated the association between household air pollution and increased pediatric respiratory morbidity [6,9,10].

Although overcrowding and passive smoking were not statistically significant in this study, previous literature supports their biological plausibility in contributing to respiratory infections [4,11]. The limited sample size may have reduced statistical power to detect these associations.

Overall, the findings reinforce the need for integrated preventive strategies combining socioeconomic upliftment, universal immunization coverage, nutritional improvement, and clean household energy transition. Such measures are critical for achieving Sustainable Development Goals related to child survival and health equity [12].

Conclusion

Low socioeconomic status, incomplete immunization, and exposure to polluting domestic fuels are significant modifiable risk factors for ALRTI among under-five children.

Strengthening primary healthcare services and promoting clean energy use can substantially reduce preventable childhood morbidity and mortality.

Limitations

This hospital-based study with a relatively small sample size may limit generalizability to the wider community. Multivariate regression analysis was not performed, and potential confounders could not be fully adjusted.

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