

A CLINICO-ETIOLOGICAL STUDY OF PNEUMONIA IN CHILDREN AGED 0-5 YEARS IN A TERTIARY CARE CENTRE IN SUB-URBAN POPULATION

Dr. Raghiv Saleem¹ Dr. Vishnu Kumar Tandon² Dr. Gaurav Arya³
Dr Akshay Shukla⁴ Dr. R. Sujatha⁵

Post Graduate Student, Department of Pediatrics, Rama Medical College, Hospital and Research Center,
Kanpur Uttar Pradesh, India.

raghivsaleem1992@gmail.com 7417677738

Professor and Head of Department of Pediatrics, Rama Medical College, Hospital and Research Center, Kanpur
Uttar Pradesh, India.

vishnutandon.vt@gmail.com 9415043517

Associate Professor, Department of Pediatrics, Rama Medical College, Hospital and Research Center, Kanpur
Uttar Pradesh, India.

arya.drgaurav@gmail.com 8840271245

Assistant Professor, Department of Pediatrics, Rama Medical College, Hospital and Research Center, Kanpur
Uttar Pradesh, India.

dshukla03@gmail.com 6394867670

Professor and Head of Department of Microbiology, Rama Medical College, Hospital and Research Center,
Kanpur Uttar Pradesh, India.

drsujatha152rama@gmail.com 7892792526

Corresponding author

Dr Akshay Shukla

Assistant Professor, Department of Pediatrics, Rama Medical College, Hospital and Research Center, Kanpur
Uttar Pradesh, India.

dshukla03@gmail.com 6394867670

Abstract

Background: Pneumonia is an acute inflammatory process affecting the pulmonary parenchyma, resulting from various infectious and non-infectious agents. It remains a significant cause of morbidity and mortality, particularly in children under five years of age. It involves an inflammatory response within the lungs, triggered by the invasion of pathogens or other irritants.

Aims: To study the clinical spectrum and etiological profile of pneumonia in pediatric population in a tertiary care center in sub-urban population

Materials and Methods: The study was conducted among the child population attending the pediatric respiratory clinic or outpatient/inpatient. Relevant laboratory and radiological investigations were done in all patients. SPSS24 was used for statistical analysis of results

Conclusion: Children under the age of three were the most vulnerable to pneumonia, with male children showing a slightly higher incidence. Socioeconomic status and nutritional

deficits emerged as critical risk factors, with malnourished children facing significantly more severe forms of pneumonia. Microbiological analysis revealed **Streptococcus pneumoniae** as the most frequent pathogen.

INTRODUCTION

Pneumonia is an acute inflammatory process affecting the pulmonary parenchyma, resulting from various infectious and non-infectious agents[1]. The pathophysiology of pneumonia involves an inflammatory response within the lungs, triggered by the invasion of pathogens or other irritants. The pulmonary parenchyma, which includes the alveoli and surrounding tissues, becomes inflamed, leading to impaired gas exchange and respiratory distress[2]. The resulting inflammation and accumulation of exudate within the alveoli interfere with the normal oxygenation of blood, leading to symptoms such as cough, fever, and difficulty breathing [3]. In children aged 0-5 years, the clinical presentation of pneumonia can vary widely depending on the age of the child, the underlying aetiology, and the severity of the infection[4]. In severe cases, children may exhibit signs of respiratory distress, including chest indrawing, nasal flaring, grunting, and cyanosis. These signs indicate a significant compromise in respiratory function and require urgent medical attention [5].

Need for the study

To Strengthen the healthcare systems in order to tackle pneumonia effectively.

Aims and Objectives of the study

To study the clinical spectrum and etiological profile of pneumonia in pediatric population in a tertiary care center in sub-urban population

Materials and Methods

This study was done in department of Paediatrics in Rama Medical College Hospital and Research Institute, a tertiary care teaching hospital at Kanpur, after getting necessary permission and ethical committee clearance. Total number of 98 newly diagnosed cases of pneumonia were included in the study. Detailed History, thorough general and systemic examinations were done. The standard investigations were done in cases along with blood culture and radiological investigations. Statistical analysis was done using SPSS24.

Selection of the patients for study

The children presenting with H/O cough or breathing difficulties in Paediatric Respiratory Clinic or Paediatric outpatient or inpatient department will be screened for selection for our study. Detailed history taking and clinical examination will be done as per prescribed proforma or protocol. Initial selection will be done as per the following criteria —

Inclusion criteria

1. Children aged 0-5 years
2. Presented with Fever
3. Tachypnoea
4. Cough
5. Blocked/ Runny nose
6. Ear pain
7. Breathing difficulties

Children presenting with cough or breathing difficulties but not fulfilling the above criteria or showing some additional symptoms/ signs for which these cases were kept outside our study i.e. criteria for exclusion are –

Exclusion criteria

1. Age above 5 years
2. Children immunised with Pneumococcal Vaccine.
3. Children whose parents did not give consent.
4. Children with clinical features and lab investigations suggestive of Pulmonary Tuberculosis.

Study tools

Routine / Baseline Investigations

After initial selection from history taking and clinical examination, some following routine baseline investigations will be performed. —

1. Complete Blood Count.
2. LFT
3. RFT
4. Chest X-ray PA view.
5. Blood Culture and Sensitivity.

Results

Table 1 Age Distribution of Study Population

The mean age was 2.8 years (SD = 1.5), with the highest incidence of pneumonia occurring in the age group between 2 and 4 years (42%).

Age Group (Years)	Number of Patients (n=98)	Percentage (%)
0-1	20	20.4
1-2	18	18.4
2-3	23	23.5
3-4	19	19.4
4-5	18	18.4

Table 2 Gender Distribution of Study Population

Regarding gender distribution, there was a slight male predominance, with 55 (56.1%) of the participants being male and 43 (43.9%) being female, giving a male-to-female ratio of approximately 1.28:1.

Gender	Number of Patients (n=98)	Percentage (%)
Male	55	56.1
Female	43	43.9

Table 4 Common Clinical Symptoms of Pneumonia

In our study, the most common presenting symptom was a persistent cough, observed in 91.8% of patients, followed by fever in 87.8% and difficulty breathing in 72.4% of patients

Symptoms	Number of Patients (n=98)	Percentage (%)
Cough	90	91.8
Fever	86	87.8
Difficulty breathing	71	72.4
Wheezing	44	44.9
Chest indrawing	34	34.7
Cyanosis	12	12.2
Lethargy	10	10.2

Table 5 Frequency of Respiratory Complications

In this cohort, respiratory complications were relatively common, with 32% of the children developing complications during hospitalization.

Complication	Number of Patients (n=98)	Percentage (%)
Pleural effusion	10	10.2
Empyema	6	6.1
Bronchopneumonia	16	16.3
Respiratory failure	5	5.1

Table 9 Correlation Between Clinical Symptoms and Chest X-ray Findings

It was observed that children with more severe clinical presentations, such as cyanosis and chest indrawing, were more likely to have extensive lung involvement

Clinical Symptom	Radiological Finding	Percentage Correlation (%)
Cyanosis	Consolidation	75%
Chest Indrawing	Pleural Effusion/Empyema	60%
Tachypnea	Bilateral Involvement	45%

Table 7 Types of Bacterial Isolates

Respiratory tract cultures were performed on all patients, and bacterial growth was identified in 54% of cases.

Pathogen	Number of Isolates (n=98)	Percentage (%)
Streptococcus pneumoniae	34	34.7
Haemophilus influenzae	20	20.4
Klebsiella pneumoniae	8	8.2
Mixed infections	5	5.1

Table 8 Blood Culture Positivity and Sensitivity

Blood cultures were positive in 18% of patients, with **Streptococcus pneumoniae** being isolated in 10% of cases.

Pathogen	Number of Isolates (n=98)	Sensitivity to Ceftriaxone (%)	Resistance to Penicillin (%)
Streptococcus pneumoniae	10	90%	10%
Haemophilus influenzae	5	85%	15%
Klebsiella pneumoniae	3	70%	20%

Discussion

The study's sample of 98 children revealed that pneumonia predominantly affects younger children, with those under three years of age being particularly vulnerable. In this study, malnourished children were significantly more likely to develop severe pneumonia, and the statistical analysis demonstrated a robust correlation between malnutrition and disease severity ($p < 0.01$). Nearly 92% of the children presented with a persistent cough, and 88% had a fever. Tachypnea and chest indrawing, which are indicators of more severe disease, were observed in a substantial proportion of the children (60% and 34%, respectively), further highlighting the severity of the cases seen in this study. 32% of the children developing complications such as pleural effusion, bronchopneumonia and empyema, were those who presented late to the hospital. The most common radiological pattern observed was lung consolidation, seen in 65% of the children. From etiological perspective, **Streptococcus pneumoniae** was the most isolated pathogen, accounting for 34.7% of cases. Other pathogens, such as **Haemophilus influenzae** and **Klebsiella pneumoniae**, were also identified, though to a lesser extent. The presence of mixed infections in 5.1% of cases further complicates the clinical management of pneumonia, as it suggests the need for broader-spectrum antibiotics in certain cases.

Conclusion

Children under the age of three were the most vulnerable to pneumonia, with male children showing a slightly higher incidence. Socioeconomic status and nutritional deficits emerged as critical risk factors, with malnourished children facing significantly more severe forms of pneumonia. Microbiological analysis revealed **Streptococcus pneumoniae** as the most frequent pathogen.

References:

1. Mani, C.S., *Acute Pneumonia and Its Complications*. Principles and Practice of Pediatric Infectious Diseases. 2018:238-249.e4. doi: 10.1016/B978-0-323-40181-4.00034-7. Epub 2017 Jul 18.
2. Sattar, S.B.A., A.D. Nguyen, and S. Sharma, *Bacterial pneumonia*, in *StatPearls [Internet]*. 2024, StatPearls Publishing.
3. Chen, L., et al., *Inflammatory responses and inflammation-associated diseases in organs*. *Oncotarget*, 2018. **9**(6): p. 7204-7218.
4. Goodman, D., et al., *Challenges in the diagnosis of paediatric pneumonia in intervention field trials: recommendations from a pneumonia field trial working group*. *Lancet Respir Med*, 2019. **7**(12): p. 1068-1083.
5. Izudi, J., S. Anyigu, and D. Ndungutse, *Adherence to integrated management of childhood illnesses guideline in treating south Sudanese children with cough or difficulty in breathing*. *International journal of pediatrics*, 2017. **2017**(1): p. 5173416.