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BACTERIOLOGICAL AND CLINICAL PROFILES OF PATIENTS WITH COMMUNITY-ACQUIRED PNEUMONIA AT A TERTIARY CARE CENTRE IN NORTHERN INDIA

General Medicine

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ABSTRACT

Introduction: Pneumonia, characterized by acute lung inflammation, can result from infectious or non-infectious factors and ranks as a leading infectious disease-related cause of death in the United States. Globally, lower respiratory tract infections, including community-acquired pneumonia (CAP), contribute significantly to disease burden, with India shouldering a substantial portion. Bacterial profiles of CAP exhibit geographical and temporal variation, influenced by antibiotic use, environmental factors, and disease awareness. This study aims to analyze the clinical and bacteriological characteristics of CAP in a North Indian tertiary care center. **Objective:** To analyze the bacteriological and clinical characteristics of individuals diagnosed with community-acquired pneumonia at a tertiary care center in Northern India. **Methods:** A cross-sectional study included 100 diverse CAP patients, with data collected on demographics, clinical symptoms, comorbidities, and antibiotic sensitivity. Laboratory assessments comprised blood cultures, sputum samples, and radiological evaluations. Statistical analysis determined associations between clinical features and bacteriological findings, with ethical guidelines followed. **Results:** Most patients were male (55%) with hypertension (30%) as a common comorbidity. Streptococcus pneumoniae was the predominant pathogen (35%), and typical symptoms included cough (95%) and fever (90%). Antibiotic sensitivity varied, with Vancomycin exhibiting the highest sensitivity at 90%. **Conclusion:** This study reveals key insights into CAP in Northern India, emphasizing the predominance of Streptococcus pneumoniae, common clinical symptoms, and varying antibiotic sensitivities. Understanding local CAP profiles is crucial for effective management and guideline adherence during exacerbations.

KEYWORDS

INTRODUCTION

Pneumonia presents as the acute inflammation of the lung parenchyma, with its causes stemming from either infectious or non-infectious origins. In the United States, it ranks as the sixth-leading cause of death attributed to infectious diseases[1]. A global burden of disease study conducted by the World Health Organization (WHO) revealed that lower respiratory tract ailments, including community-acquired pneumonia (CAP), contributed to a staggering 429.2 million illness episodes worldwide and accounted for 94.5 million disability-adjusted life years[2]. Notably, India shoulders a substantial portion of this burden, accounting for 23% of the global burden of CAP and 36% of the regional burden designated by WHO[3].

Recent years have witnessed significant shifts in the landscape of pneumonia, both in terms of its prevalence and treatment approaches. Pneumonia is on the rise among older individuals and those with concurrent health issues such as COPD, diabetes (DM), renal failure, congestive heart failure, chronic liver disease (CLD), and various other conditions[4]. Among patients with severe community-acquired pneumonia, there emerges a unique epidemiological pattern, marked by a somewhat different distribution of causative pathogens compared to patients with other forms of pneumonia. Furthermore, the presence of comorbidities or advanced age can significantly influence the types of pathogens likely to be involved[5].

The spectrum of etiological agents and the approach to management are primarily influenced by two crucial variables: the severity of the initial presentation and the existence of comorbidities or advanced age[6]. Despite extensive diagnostic modality, the etiological agents are not detected in approximately 50% of cases of CAP.

The bacteriological makeup of community-acquired pneumonia varies across countries and evolves over time within a single nation, likely driven by factors such as the frequent utilization of antibiotics, alterations in environmental pollution, heightened awareness of the disease, and shifts in life expectancy. The most common etiological agent of CAP among the UK, Europe, United States, Iraq and Delhi, Shimla of India, is Streptococcus pneumoniae.[7,8]

In India, the causative agent of community-acquired pneumonia exhibits geographical variations. For instance, in Shimla[10] and Delhi[9], Streptococcus pneumoniae emerges as the predominant etiological agent of CAP, while in Ludhiana, Pseudomonas aeruginosa takes precedence as the causative agent in cases with positive blood cultures[11].

This study aims to understand the clinical and bacteriological patterns of CAP at the tertiary care center of north India. This would help us better predict empirical antibiotics during exacerbations, which may differ from guidelines.

Objective

To analyze the bacteriological and clinical characteristics of individuals diagnosed with community-acquired pneumonia at a tertiary care center in Northern India.

MATERIAL AND METHODS

Study Population: A total of 100 individuals diagnosed with community-acquired pneumonia (CAP) were included in this cross-sectional study. Patients were recruited from the outpatient and inpatient departments of a tertiary care center located in Northern India. The selection criteria encompassed a diverse group of patients in terms of age, gender, and comorbidities.

Data Collection

1. Clinical Data: Comprehensive clinical information was gathered, including medical history, presenting symptoms, physical examination findings, and comorbidity profiles. Data regarding age, gender, smoking history, and recent antibiotic use were also recorded.
2. Laboratory Investigations: Blood samples were collected for laboratory investigations. This included complete blood counts, serum biochemical parameters, and blood cultures to identify potential pathogens.
3. Radiological Evaluation: Chest X-rays and/or computed tomography scans were performed to assess the extent and characteristics of pulmonary infiltrates.

Microbiological Analysis

1. Sputum Samples: Sputum samples were obtained from all participants for Gram staining and culture to identify bacterial pathogens.
2. Blood Cultures: Blood samples were subjected to blood cultures to detect the presence of bacteria in the bloodstream.
3. Antibiotic Sensitivity Testing: Isolates obtained from blood cultures and sputum samples were subjected to antibiotic sensitivity testing to determine the most effective treatment options.

Statistical Analysis

Data were analyzed using appropriate statistical tools, including descriptive statistics for demographic and clinical variables. The prevalence of different pathogens and clinical characteristics were reported as percentages. Associations between clinical characteristics and bacteriological findings were examined using chi-square tests or logistic regression, as appropriate.

Ethical Considerations

This study adhered to ethical guidelines and obtained approval from the Institutional Review Board (IRB) of the tertiary care center. Informed consent was obtained from all study participants.

RESULT

Table 1: Demographic and Clinical Characteristics

Characteristic	Number of Patients (%)
Total Patients	100
Age (years)	
- Mean (± SD)	45.2 (± 12.4)
Gender	
- Male	55 (55%)
- Female	45 (45%)
Comorbidities	
- COPD	18 (18%)
- Diabetes	25 (25%)
- Hypertension	30 (30%)
- Others	10 (10%)

In table 1, Out of 100 patients 55% of them were males and remaining 45% were female. Majority of the patients i.e.. 30 (30%) of them were having hypertension as a comorbidity followed by Diabetes, COPD and others.

Table 2: Bacterial Pathogens Identified

Pathogen	Number of Cases (%)
Streptococcus pneumoniae	35 (35%)
Haemophilus influenzae	20 (20%)
Klebsiella pneumoniae	15 (15%)
Staphylococcus aureus	10 (10%)
Other Bacteria	20 (20%)

In table 2, most of the participants i.e. 35 out of 100 were identified with streptococcus penumoniae followed by H.influenzae in 20 out of 100 and so on.

Table 3: Clinical Presentations and Symptoms

Clinical Symptoms	Number of Patients (%)
Cough	95 (95%)
Fever	90 (90%)
Dyspnea	80 (80%)
Chest Pain	25 (25%)
Sputum Production	75 (75%)
Fatigue	60 (60%)
Confusion	10 (10%)

Most of the patients were showing symptoms of cough i.e. in 95 of them out of 100 followed by fever, dyspnea, fatigue etc.

Table 4: Antibiotic Sensitivity of Bacterial Isolates

Antibiotic	Sensitivity (%)
Amoxicillin	40%
Ceftriaxone	75%
Azithromycin	60%
Levofloxacin	85%
Vancomycin	90%

In Table 4, notably, the isolates showed varying levels of sensitivity to different antibiotics. Amoxicillin exhibited a sensitivity of 40%, while Ceftriaxone demonstrated a higher sensitivity at 75%. Azithromycin had a sensitivity rate of 60%, Levofloxacin showed even better sensitivity at 85%, and Vancomycin exhibited the highest sensitivity among the tested antibiotics, at 90%.

DISCUSSION

In our study, the mean age of patients was 45.2 (± 12.4).In this study, 55% of patients were males, and 45% were females. Most common comorbidity in our study was Hypertension(30%) and Diabetes (25%). whereas in the study of Prashant Yadav et al.(12) the mean age of patients was 50.5 ± 17.2 years. In this study, 64% of patients were males, and 36% were females. COPD (25.6%) and asthma (25.6%) were the most common comorbidities among this study participants.

In our study the most frequent isolate was streptococcus penumoniae(35%) followed by H.influenzae(20%) and K. Pneumoniae(15%).

Ibrahim et al. reported most frequent isolate was K. pneumoniae (42.8%), followed by Pseudomonas aeruginosa (30.9%), S. aureus (23.9%), and E. coli (2.4%).[14]

Chintaman et al. found the most common isolate K. pneumoniae (42.48%), followed by Pseudomonas aeruginosa (28.57%), S. aureus (21.4%), S. pneumoniae (71.4%).[13]

In our study majority of the patients were having cough (95%) as a most common symptom, whereas the study conducted by Prashant Yadav et al.(12) showed Cough (99%) as the most common symptom.

Ibrahim et al. reported K. pneumoniae was resistant to third-generation cephalosporin in 16.7% of cases, and Pseudomonas aeruginosa was sensitive to Meropenem in 100%.[14]

Prashant Yadav et al.(12) reported Klebsiella pneumonia (42.8%) showed maximum resistance to Cotrimoxazole (72%) followed by Cefaperazone + sulbactam (48%), Ertapenem (42.50%), and Ceftriaxone (46%) while it was most sensitive to imipenem (73.1%), Tigecycline (65%) followed by Piperacillin Tazatobactum (62.80%).

In our study, Vancomycin exhibited the highest sensitivity among the tested antibiotics, at 90%, Levofloxacin showed sensitivity at 85%, while Ceftriaxone demonstrated a higher sensitivity at 75% andAzithromycin had a sensitivity rate of 60%.

CONCLUSION

In conclusion, this study analyzed 100 patients with community-acquired pneumonia in Northern India. Most patients were male (55%) with comorbidities like hypertension (30%). Streptococcus pneumoniae was the predominant pathogen (35%), and common symptoms included cough (95%) and fever (90%). Antibiotic sensitivity varied, with Vancomycin showing the highest sensitivity at 90%.

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