International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Antimicrobial Prescribing Patterns and Treatment Outcomes in Community-Acquired Pneumonia: A Retrospective Observational Study

Srinivasa K[1], Bhavya K,[2] Monica M. M[3]

[1] *Professor, Department of Pharmacology, Chamarajanagara Institute of Medical Sciences, Chamarajanagar-571313, Karnataka, India.*
[2] *Assistant Professor, Department of Anesthesiology, Mysuru, Medical College and Research Institute, Mysuru- 570001, Karnataka, India.*
[3] *Tutor, Department of Pharmacology, Chamarajanagara Institute of Medical Sciences, Chamarajanagar-571313, Karnataka, India.*

OPEN ACCESS

Corresponding Author:

Monica M M

Tutor, Department of Pharmacology, Chamarajanagara Institute of Medical Sciences, Chamarajanagar-571313, Karnataka, India.

Received: 16-01-2026
Accepted: 12-02-2026
Available online: 28-02-2026

ABSTRACT

Background: Community-acquired pneumonia (CAP) remains a major cause of hospital admission and preventable mortality in adults. Local microbiological variation and antimicrobial stewardship priorities make periodic prescribing audits clinically relevant.
Objectives: To evaluate empirical antimicrobial prescribing patterns and treatment outcomes among adults hospitalized with CAP, and to examine the association between disease severity and in-hospital mortality.
Materials and Methods: This retrospective observational study included 150 adults admitted with CAP in a general medicine unit over a 12-month period (January 2024 to January 2025). Demographic profile, comorbidities, CURB-65 score, culture results, empirical antibiotic regimens, length of stay, and discharge outcomes were analyzed. Descriptive statistics were reported as mean ± SD and n (%). Because there were no deaths in the lower CURB-65 strata, severity-outcome association was tested with Fisher's exact test after clinically meaningful regrouping (CURB-65 0-2 vs >=3).
Results: The mean age was 50.7 ± 16.5 years, and males constituted 93/150 (62.0%). At least one comorbidity was documented in 97/150 (64.7%) patients. CURB-65 scores were 0-1 in 60 (40.0%), 2 in 54 (36.0%), and 3-5 in 36 (24.0%). Cultures were positive in 58/150 (38.7%) cases; Klebsiella pneumoniae was the leading isolate (41.4% of culture-positive samples). Ceftriaxone plus azithromycin was the commonest empirical regimen (68.0%). Clinical cure occurred in 138/150 (92.0%), in-hospital mortality was 12/150 (8.0%), and mortality was significantly associated with severe CURB-65 category (>=3) (Fisher's exact test, p <0.001).
Conclusion: Dual-therapy prescribing with a third-generation cephalosporin and macrolide predominated and was accompanied by a high clinical cure rate. The pathogen profile showed a notable Gram-negative contribution, supporting the need for periodic local antibiogram review and continued stewardship-focused prescribing audits.

Keywords*: community-acquired pneumonia; antimicrobial stewardship; CURB-65; prescribing pattern; Klebsiella pneumoniae; treatment outcome.*

INTRODUCTION

The prevalence of community-acquired pneumonia (CAP) is one of the most common causes of infectious morbidity and mortality in adult patients in most countries and is a major cause of high rates of hospitalization, especially in low- and middle-income countries. The delayed healthcare-seeking behavior, high levels of multimorbidity, and lack of access to timely microbiological diagnostics add to the burden of CAP in India [1]. As a result, the antimicrobial therapy is often

commenced empirically prior to identifying the pathogen. Although this practice is clinically suitable to avoid initial degradation, it highlights the importance of a systematic assessment of local prescribing habits and the related clinical outcomes. [2]

The best approach to CAP management is the delicate balance between timely and efficient empirical treatment and compliance with the principles of antimicrobial stewardship. The modern national and international guidelines recommend risk-stratified treatment plans depending on the severity of diseases and patient traits, and periodically update them regarding the changes in local resistance patterns and pathogen distribution [3]. The severity measurement instruments such as the CURB-65 score continue to be incorporated in the initial assessment and prognostic stratification especially where the statistical approach to decision-making is crucial to inform admission and upgrading of services is inevitable in resource-limited environments [4-5].

New Indian data also confirm heterogeneity of etiological profiles with chronic preponderance of Streptococcus pneumoniae with a clinically meaningful burden of Gram-negative pathogens in selected groups [6-7]. This variability has therapeutic implications, since empirical regimens that are guided by guidelines can not give optimal results unless they are in accordance with the current local microbiological trends. In this regard, the current retrospective observational research was performed in a general medicine unit to describe the empirical prescribing trends, outlining microbiological results and short-term clinical outcomes of adults hospitalized with CAP [5].

Objectives

• To describe the demographic and clinical severity profile of hospitalized adults with CAP.
• To evaluate empirical antimicrobial prescribing patterns in routine inpatient care.
• To assess treatment outcomes (clinical cure, in-hospital mortality, and length of stay) and their association with disease severity.

MATERIALS AND METHODS

Study design and setting: This retrospective observational study was conducted in the General Medicine unit of **Chamarajanagara Institute of Medical Sciences**, Chamarajanagar, Karnataka, India, after obtaining approval from the Institutional Ethics Committee. (IEC/02/10/2023).
Study period: January 2024 to January 2025.
Participants: Adults aged 18 years or above admitted with a diagnosis of community-acquired pneumonia were included. The analyzed cohort comprised 150 patients.

Variables recorded: Age, sex, diabetes mellitus status, other comorbidity field, CURB-65 score, culture status, isolated organism (where available), empirical antimicrobial regimen, discharge outcome, and length of hospital stay.

Operational definitions: Clinical cure was defined as discharge after clinical improvement (recorded as 'Recovered'). In-hospital mortality was defined as death during the same admission (recorded as 'Mortality'). Severe CAP category for association testing was defined as CURB-65 score >=3.
Statistical analysis: Data were analyzed using descriptive statistics (mean ± SD, frequencies, and percentages). For severity-outcome association, mortality was cross-tabulated against a dichotomized CURB-65 category (0-2 vs >=3), and Fisher's exact test was used because there were zero mortality events in the lower severity stratum. A two-sided p-value <0.05 was considered statistically significant.

RESULTS

A total of 150 patients were included. The mean age was 50.7 ± 16.5 years, with male predominance (93/150, 62.0%). At least one comorbidity was documented in 97/150 (64.7%) patients. Disease severity by CURB-65 was concentrated in lower and intermediate strata, although 36/150 (24.0%) patients had scores 3-5 (Table 1; Figure 1).

Table 1. Baseline demographic and clinical severity characteristics (N = 150)

Characteristic	Value / Count (n)	Percentage (%)
Age (mean ± SD)	50.7 ± 16.5	-
Sex (Male / Female)	93 / 57	62.0 / 38.0
Any documented comorbidity	97	64.7
Diabetes mellitus	48	32.0
Hypertension (within comorbidity field)	36	24.0
CURB-65 score 0-1	60	40.0
CURB-65 score 2	54	36.0
CURB-65 score 3-5	36	24.0

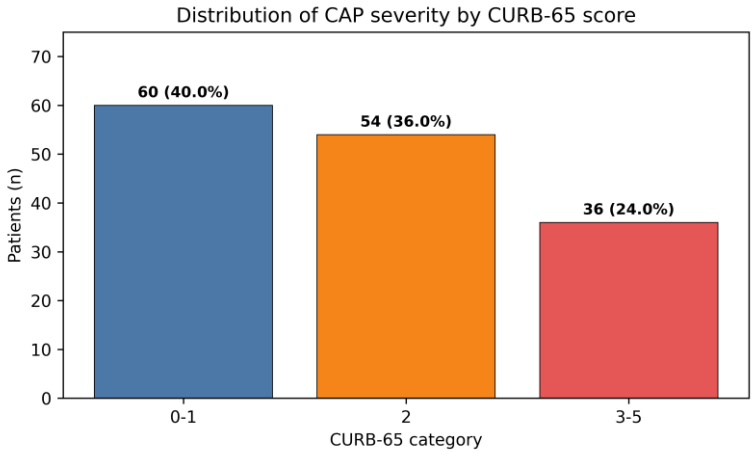


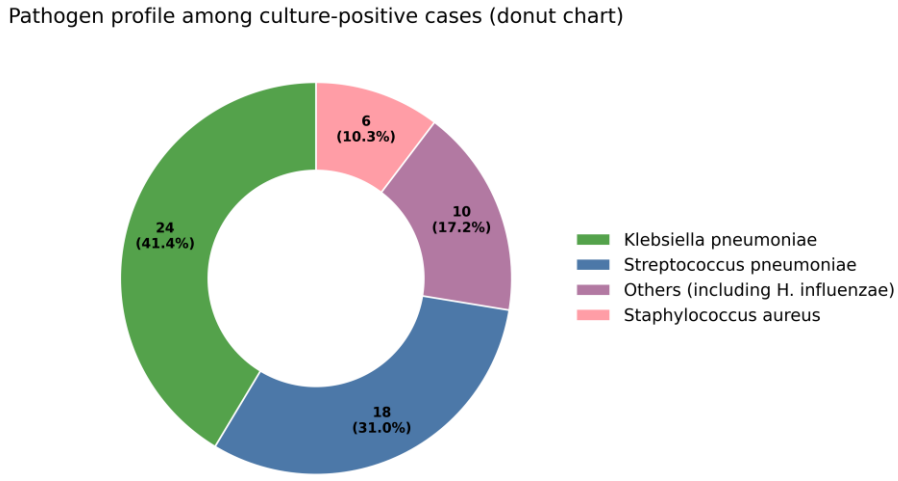
Figure 1. Distribution of CAP severity by CURB-65 score

Bars show counts and percentages for each severity category.

Microbiological cultures were positive in 58/150 (38.7%) patients. Among culture-positive cases, Klebsiella pneumoniae was the most frequent isolate (24/58, 41.4%), followed by Streptococcus pneumoniae (18/58, 31.0%) (Table 2; Figure 2).

Table 2. Bacterial pathogen distribution in culture-positive cases (n = 58)

Pathogen	Count	Percentage (%)
Klebsiella pneumoniae	24	41.4
Streptococcus pneumoniae	18	31.0
Staphylococcus aureus	6	10.3
Others (including H. influenzae)	10	17.2



Fgure 2. Pathogen profile among culture-positive cases

Segment labels show count and proportion within culture-positive isolates.

The most frequently prescribed empirical regimen was ceftriaxone plus azithromycin (102/150, 68.0%), followed by amoxicillin-clavulanate plus azithromycin (24/150, 16.0%). Piperacillin-tazobactam and levofloxacin monotherapy were used less often (Table 3; Figure 3).

Table 3. Empirical antimicrobial regimens prescribed (N = 150)

Regimen	Count	Percentage (%)
Ceftriaxone + Azithromycin	102	68.0
Amoxicillin-Clavulanate + Azithromycin	24	16.0

Piperacillin-Tazobactam	15	10.0
Levofloxacin monotherapy	9	6.0

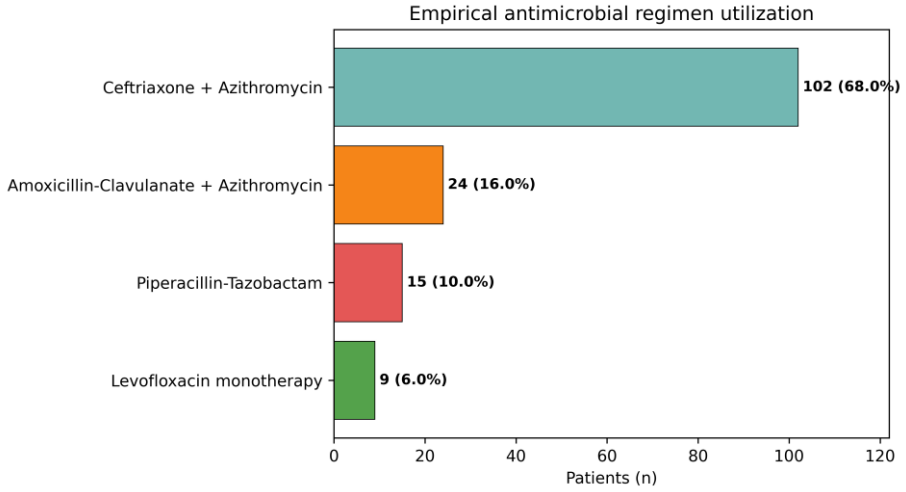


Figure 3. Empirical antimicrobial utilization pattern

Bars display count and percentage of the total cohort.

Overall clinical cure (discharge after recovery) was observed in 138/150 (92.0%) patients, while in-hospital mortality was 12/150 (8.0%). Mean length of stay was 6.4 ± 2.0 days (median 6.0, IQR 5.0-8.0). All mortality events occurred in the CURB-65 >=3 group. On dichotomized analysis (CURB-65 0-2 vs >=3), mortality was significantly associated with severe disease (Fisher's exact test, p <0.001) (Table 4; Figure 4).

Table 4. Clinical outcomes and severity-stratified mortality

Severity group	Recovered, n (%)	Mortality, n (%)	Total
CURB-65 0-2	114 (100.0)	0 (0.0)	114
CURB-65 >=3	24 (66.7)	12 (33.3)	36
Overall outcome	138 (92.0)	12 (8.0)	150

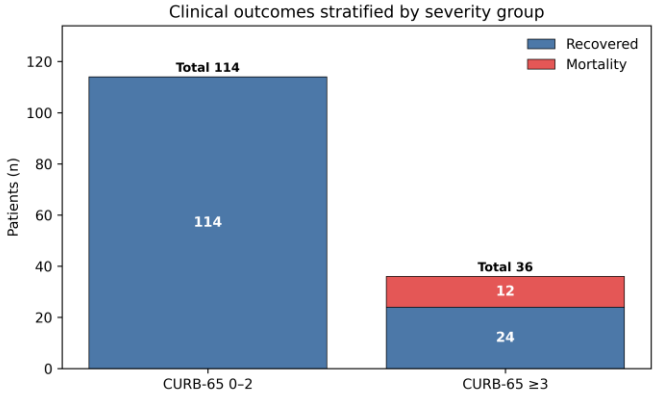


Figure 4. Clinical outcomes stratified by severity group

Red segment represents deaths, all of which occurred in the CURB-65 >=3 category.

DISCUSSION

This retrospective audit shows a clinically familiar but still important pattern in hospitalized CAP care: empiric dual therapy was used in most patients, short-term outcomes were generally favorable, and severity at presentation strongly tracked mortality risk. The cohort had a mean age of 50.7 years, a substantial comorbidity burden (64.7% with at least one documented comorbidity), and a clear clustering of deaths within the severe CURB-65 stratum. That distribution supports continued use of bedside severity scoring for triage and escalation decisions in general medicine units [8].

The microbiology signal is equally relevant. Although cultures were positive in only 38.7% of admissions, the isolate profile showed a notable contribution from Klebsiella pneumoniae (41.4% of culture-positive cases), with Streptococcus pneumoniae remaining prominent. This mixed pattern is broadly in line with Indian reports describing heterogeneity in CAP etiology across regions and healthcare settings rather than a single uniform pathogen distribution [4,9,10]. For practice, this means empirical choices should remain locally responsive rather than purely protocol-driven.

Prescribing patterns in the present study were dominated by ceftriaxone plus azithromycin (68.0%), a regimen commonly used for hospitalized non-ICU CAP and generally consistent with risk-stratified recommendations in national and international guidance [5,7,12]. The smaller use of broader-spectrum or alternative regimens in this cohort may reflect clinical judgment based on severity, comorbidity, prior exposure, or early bedside assessment. At the same time, stewardship remains central, especially in settings where antibiotic overuse and inappropriate escalation can accelerate resistance pressure [6,11].

Outcome patterns were clinically reassuring but should be interpreted with design limitations in mind. Mean length of stay was moderate (6.4 ± 2.0 days), clinical cure was high (92.0%), and overall in-hospital mortality was 8.0% (12/150), not 0%. The mortality concentration in CURB-65 >=3 patients reinforces the prognostic utility of severity stratification in routine care. However, this analysis does not establish causal superiority of any specific antibiotic regimen because treatment allocation was non-random and severity-sensitive.

Strengths of this study include a complete inpatient cohort with directly analyzable prescribing, microbiology, and outcome variables, along with explicit severity-outcome stratification. The limitations are equally important: retrospective single-unit design, dependence on routinely documented variables, limited organism recovery, lack of antibiotic timing/de-escalation data, and absence of viral diagnostics. These constraints reduce external generalizability and limit causal inference, but the findings remain useful for local antimicrobial stewardship review and future prospective audit design.

CONCLUSION

In this inpatient CAP cohort, empirical ceftriaxone plus azithromycin was the dominant prescribing pattern and was accompanied by a high recovery rate. The microbiology profile showed a meaningful Gram-negative contribution, particularly Klebsiella pneumoniae, alongside Streptococcus pneumoniae. Severe CURB-65 scores were strongly associated with in-hospital mortality. Periodic unit-level audits linking prescribing, microbiology, and outcomes can support safer empiric choices and more responsive stewardship policies.

REFERENCES

1. World Health Organization. Pneumonia. World Health Organization; 2025. Available from: https://www.who.int/health-topics/pneumonia
2. Ghimire M, Bhattacharya SK, Narain JP. Pneumonia in South-East Asia Region: public health perspective. Indian J Med Res. 2012;135(4):459-468.
3. Musher DM, Thorner AR. Community-acquired pneumonia. N Engl J Med. 2014;371(17):1619-1628.
4. Eshwara VK, Mukhopadhyay C, Rello J. Community-acquired bacterial pneumonia in adults: an update. Indian J Med Res. 2020;151(4):287-302.
5. Indian Council of Medical Research. Treatment guidelines for antimicrobial use in common syndromes. Indian Council of Medical Research; 2022. Available from: https://amrtg.icmr.org.in/
6. World Health Organization. WHO AWaRe system for antimicrobial stewardship. World Health Organization; 2023. Available from: https://www.who.int/teams/surveillance-prevention-control-AMR/control-and-response-strategies/AWaRe
7. Metlay JP, Waterer GW, Long AC, Anzueto A, Brozek J, Crothers K, et al. Diagnosis and treatment of adults with community-acquired pneumonia: an official clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67.
8. Lim WS, van der Eerden MM, Laing R, Boersma WG, Karalus N, Town GI, et al. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. Thorax. 2003;58(5):377-382.
9. Vikhe VB, Faruqi AA, Patil RS, Patel H, Khandol D, Reddy A. A study on the etiology and clinical manifestations of community-acquired pneumonia in adults in Western India. Cureus. 2024;16(6):e63132.
10. Vikhe VB, Faruqi AA, Patil RS, Reddy A, Khandol D. A systematic review of community-acquired pneumonia in Indian adults. Cureus. 2024;16(7):e63976.
11. Sulis G, Daniels B, Kwan A, Gandra S, Daftary A, Das J, et al. Antibiotic overuse in the primary health care setting: a secondary data analysis of standardised patient studies from India, China and Kenya. BMJ Glob Health. 2020;5(9):e003393.
12. Nayar S, Hasan A, Waghray P, Ramananthan S, Ahdal J, Jain R. Management of community-acquired bacterial pneumonia in adults: limitations of current antibiotics and future therapies. Lung India. 2019;36(6):525-533.