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Original Research Article

Comparison of Oral versus Intravenous Antibiotics in Community-Acquired Pneumonia

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Abstract

Background: Community-acquired pneumonia (CAP) remains one of the leading causes of morbidity and hospitalization worldwide. Antibiotic therapy is the cornerstone of management, and both oral and intravenous (IV) routes are commonly employed depending on disease severity and patient condition. Recent evidence suggests that oral antibiotics may provide outcomes comparable to IV therapy in selected hospitalized patients while reducing healthcare costs, hospital stay, and IV-related complications.

Aim: To compare the clinical efficacy, safety, and treatment outcomes of oral versus intravenous antibiotics in patients with community-acquired pneumonia.

Methods: This prospective comparative study was conducted among 120 patients diagnosed with CAP in a tertiary care hospital. Patients were divided into two groups: Group O (oral antibiotics, n=60) and Group IV (intravenous antibiotics, n=60). Demographic details, clinical presentation, laboratory findings, duration of fever, length of hospital stay, radiological improvement, adverse drug reactions, and treatment success rates were assessed. Statistical analysis was performed using chi-square test and independent t-test, with $p<0.05$ considered statistically significant.

Results: The majority of patients belonged to the age group of 41–60 years with male predominance in both groups. Mean duration of fever resolution was significantly shorter in the IV group during the first 48 hours, but overall clinical recovery rates at day 7 and day 14 were comparable between groups ($p>0.05$). Mean hospital stay was significantly lower in the oral antibiotic group (4.2 ± 1.1 days) compared to the IV group (6.8 ± 1.7 days) ($p<0.001$). Adverse effects such as injection-site reactions and thrombophlebitis were significantly higher in the IV group. Treatment success was observed in 91.7% of oral therapy patients and 95% of IV therapy patients, without statistically significant difference ($p=0.512$).

Conclusion: Oral antibiotics demonstrated comparable clinical efficacy to intravenous antibiotics in selected patients with community-acquired pneumonia while significantly reducing hospital stay and treatment-related complications. Early transition to oral therapy may represent a safe and cost-effective strategy in stable CAP patients.

Keywords: Community-acquired pneumonia; Oral antibiotics; Intravenous antibiotics; Treatment outcomes; Hospital stay; CAP management.

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Introduction

Community-acquired pneumonia (CAP) is a major infectious disease burden worldwide and remains an important cause of morbidity, mortality, and healthcare utilization, particularly among elderly individuals and patients with comorbid conditions. CAP is defined as an acute infection of the pulmonary parenchyma acquired outside healthcare settings and is commonly caused by bacterial pathogens such as Streptococcus pneumoniae, Haemophilus influenzae, and atypical organisms including Mycoplasma pneumoniae and Chlamydia pneumoniae [1]. Despite advances in antimicrobial therapy and vaccination strategies, CAP continues to account for significant hospital admissions globally, especially in low- and middle-income countries [2]. The management of CAP primarily

depends on prompt diagnosis, severity assessment, and initiation of appropriate antibiotic therapy. Clinical guidelines traditionally recommend intravenous (IV) antibiotics for hospitalized patients because of presumed superior bioavailability and faster therapeutic action [3]. However, prolonged IV therapy is associated with several disadvantages including increased hospital stay, higher healthcare costs, catheter-related infections, thrombophlebitis, restricted patient mobility, and nursing workload [4]. In recent years, growing evidence has suggested that oral antibiotics with high bioavailability may achieve therapeutic concentrations comparable to IV therapy in clinically stable patients [5].

The concept of early switch therapy from IV to oral antibiotics has gained importance in modern antimicrobial stewardship programs. Oral therapy offers several benefits including convenience, improved patient comfort, reduced risk of nosocomial complications, and decreased hospitalization expenses [6].

Several randomized trials and meta-analyses have demonstrated that selected CAP patients can be safely managed with oral antibiotics without compromising treatment outcomes [7]. Nevertheless, IV therapy continues to be widely practiced due to physician preference, concerns regarding drug absorption, and perceived severity of illness.

The decision regarding the route of antibiotic administration is influenced by multiple factors such as severity scores, oxygen saturation, hemodynamic stability, gastrointestinal absorption, and associated comorbidities [8]. Patients with mild-to-moderate CAP who are hemodynamically stable and able to tolerate oral intake may not necessarily require prolonged IV antibiotics. Moreover, unnecessary IV therapy contributes to antimicrobial resistance, increased healthcare burden, and avoidable procedural complications [9].

India faces a substantial burden of respiratory infections due to population density, environmental pollution, smoking prevalence, malnutrition, and delayed healthcare access. CAP remains one of the most frequent causes of admission to internal medicine wards and intensive care units. Identifying effective and economical treatment strategies is therefore essential in resource-constrained healthcare settings [10].

Although several international studies have evaluated oral and IV antibiotic therapies in CAP, limited data are available from Indian tertiary care settings comparing their effectiveness and safety profiles.

Therefore, the present study was conducted to compare oral versus intravenous antibiotics in community-acquired pneumonia with respect to clinical recovery, hospital stay, adverse effects, and treatment outcomes.

Materials and Methodology

This prospective comparative observational study was conducted in the Department of General Medicine at a tertiary care teaching hospital over a period of 18 months after obtaining approval from the Institutional Ethics Committee.

Study Population: A total of 120 patients diagnosed with community-acquired pneumonia were included in the study. Patients were divided equally into two groups:

- **Group O:** Patients receiving oral antibiotics (n=60)
- **Group IV:** Patients receiving intravenous antibiotics (n=60)

Inclusion Criteria

1. Patients aged above 18 years.
2. Clinically and radiologically confirmed community-acquired pneumonia.
3. Patients willing to provide informed consent.
4. Hemodynamically stable patients.

Exclusion Criteria

1. Hospital-acquired pneumonia.
2. Severe sepsis or septic shock.
3. Immunocompromised patients.
4. Patients requiring mechanical ventilation.
5. Pregnant women.
6. Known hypersensitivity to study antibiotics.

Data Collection

Detailed demographic and clinical history was recorded including age, gender, smoking history, fever, cough, dyspnea, chest pain, and associated comorbidities. Physical examination findings and vital parameters were documented.

Baseline laboratory investigations included:

- Complete blood count
- ESR and CRP
- Liver and renal function tests
- Sputum examination
- Chest radiography

Treatment Protocol: Patients in the oral antibiotic group received guideline-based oral antimicrobial therapy such as amoxicillin-clavulanate or respiratory fluoroquinolones.

Patients in the IV group received intravenous ceftriaxone, azithromycin, or equivalent regimens according to institutional protocol.

Outcome Measures

The following parameters were assessed:

- Time to fever resolution
- Clinical improvement
- Length of hospital stay
- Radiological recovery
- Adverse drug reactions
- Treatment success or failure

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as percentages. Chi-square test and independent t-test were applied where appropriate. A p-value <0.05 was considered statistically significant.

Results

A total of 120 patients with community-acquired pneumonia were enrolled in the study and equally distributed into oral antibiotic and intravenous antibiotic groups. Both groups were comparable regarding baseline demographic and clinical characteristics.

Table 1: Demographic and Clinical Characteristics of Study Population

Parameter	Oral Group (n=60)	IV Group (n=60)	p-value
Mean age (years)	49.2 ± 13.4	51.1 ± 14.2	0.462
Male patients	38 (63.3%)	40 (66.7%)	0.701
Smokers	24 (40.0%)	27 (45.0%)	0.576
Diabetes mellitus	18 (30.0%)	20 (33.3%)	0.694
Hypertension	15 (25.0%)	17 (28.3%)	0.683
Fever	56 (93.3%)	58 (96.7%)	0.402
Cough with expectoration	48 (80.0%)	50 (83.3%)	0.637
Dyspnea	29 (48.3%)	33 (55.0%)	0.464

Most patients in both groups belonged to middle-age categories with a slight male predominance. Fever and cough were the most common presenting symptoms. Smoking history and comorbidities such as diabetes and hypertension were similarly distributed in both groups. No statistically significant baseline difference was observed between the groups (p>0.05), indicating comparability of study populations.

Table 2: Comparison of Treatment Outcomes

Outcome Parameter	Oral Group	IV Group	p-value
Mean fever resolution time (days)	3.1 ± 1.0	2.4 ± 0.8	0.001*
Mean hospital stay (days)	4.2 ± 1.1	6.8 ± 1.7	<0.001*
Clinical recovery at day 7	52 (86.7%)	55 (91.7%)	0.381
Radiological improvement	49 (81.7%)	53 (88.3%)	0.309
Treatment success	55 (91.7%)	57 (95.0%)	0.512
Treatment failure	5 (8.3%)	3 (5.0%)	0.512

Patients receiving IV antibiotics showed slightly faster fever resolution compared to oral therapy, which was statistically significant. However, overall treatment success and clinical recovery rates were comparable between groups. Importantly, the oral antibiotic group demonstrated significantly shorter hospital stay, highlighting the economic and logistical advantages of oral therapy.

Table 3: Adverse Effects and Complications

Adverse Effect	Oral Group (%)	IV Group (%)	p-value
Nausea/vomiting	6 (10.0%)	7 (11.7%)	0.766
Diarrhea	5 (8.3%)	4 (6.7%)	0.728
Injection-site pain	0 (0%)	15 (25.0%)	<0.001*
Thrombophlebitis	0 (0%)	9 (15.0%)	0.002*
Secondary infection	1 (1.7%)	5 (8.3%)	0.092
Drug discontinuation	2 (3.3%)	4 (6.7%)	0.402

Gastrointestinal adverse effects were similar in both groups. However, injection-site pain and thrombophlebitis were significantly higher among patients receiving IV antibiotics. This finding indicates that oral therapy may reduce treatment-related procedural complications and improve patient comfort. Overall, the study findings demonstrated that oral antibiotics provided comparable therapeutic outcomes to IV antibiotics in selected CAP patients while significantly reducing hospital stay and IV-related complications.

Discussion

Community-acquired pneumonia remains one of the most common infectious diseases requiring hospitalization worldwide. Appropriate antibiotic selection and route of administration are crucial determinants of clinical outcome, healthcare expenditure, and patient satisfaction. The present study compared oral and intravenous antibiotic therapies in patients with CAP and demonstrated that oral therapy achieved clinical outcomes comparable to IV therapy in selected stable patients.

The mean age of participants in the present study was approximately 50 years, with male predominance observed in both groups. Similar demographic patterns have been reported in earlier studies where CAP was more common among middle-aged and elderly men due to higher smoking prevalence, occupational exposure, and associated comorbidities [2]. Smoking history was present in nearly half of the study population, reinforcing its established role as a major risk factor for lower respiratory tract infections [3].

Fever, productive cough, and dyspnea were the predominant presenting symptoms in the current study. Comparable findings were observed by File and Marrie, who reported fever and cough as the most frequent manifestations among hospitalized CAP patients [4]. The clinical characteristics were equally distributed between both groups, ensuring unbiased comparison of treatment outcomes.

One of the important findings of the present study was that intravenous antibiotics achieved faster fever resolution during the initial treatment phase. This may be attributed to immediate systemic drug availability and higher peak serum concentrations associated with parenteral administration. However, despite earlier fever resolution, overall clinical recovery and treatment success rates were not significantly different between oral and IV groups. Similar findings were reported by Oosterheert et al., who demonstrated equivalent cure rates between early oral switch therapy and prolonged IV therapy in hospitalized CAP patients [6].

The treatment success rate in the oral antibiotic group was 91.7%, compared to 95% in the IV group, without statistically significant difference. This observation supports growing evidence that oral antibiotics with high bioavailability can effectively treat mild-to-moderate CAP [7]. Castro-Guardiola et al. also reported no significant difference in mortality or clinical improvement between oral and IV regimens among non-severe CAP patients [8].

A major advantage identified in the present study was the significantly shorter duration of hospital stay among patients receiving oral antibiotics. The mean hospital stay was reduced by approximately 2.5 days in the oral therapy group. Reduced hospitalization decreases healthcare costs, minimizes exposure to nosocomial infections, and improves bed availability in resource-limited settings [9]. Siegel et al. similarly reported that early transition to oral antibiotics significantly reduced inpatient stay without compromising clinical safety [10].

Adverse effects associated with IV therapy represented another important finding in this study. Injection-site pain and thrombophlebitis were significantly more common in the IV group. These complications increase patient discomfort and may prolong hospitalization or necessitate additional interventions [11]. Oral therapy eliminates catheter-related complications and reduces nursing workload. Gastrointestinal adverse effects were comparable between both groups, indicating acceptable tolerability of oral agents.

The concept of antimicrobial stewardship has become increasingly relevant in modern healthcare systems. Unnecessary use of IV antibiotics contributes to increased healthcare expenditure and promotes inappropriate antibiotic utilization [12]. Rational use of oral therapy can help optimize antimicrobial practices while preserving clinical effectiveness. International guidelines from the Infectious Diseases Society of America and American Thoracic Society recommend switching from IV to oral therapy once patients achieve clinical stability [13].

The findings of the present study are particularly important in developing countries such as India, where healthcare resources are often limited and hospital overcrowding remains a challenge. Oral antibiotics offer a cost-effective alternative for selected CAP patients while maintaining comparable therapeutic efficacy. Early discharge strategies combined with oral therapy may substantially reduce economic burden on both hospitals and patients.

The study had certain limitations. The sample size was relatively modest, and microbiological confirmation of pathogens was not available in all cases. Long-term follow-up and mortality analysis were also limited. Additionally, the study primarily included clinically stable CAP patients, and therefore results may not be generalizable to severe pneumonia requiring intensive care support.

Despite these limitations, the study provides valuable evidence supporting oral antibiotic therapy in appropriately selected CAP patients. Future multicentric randomized controlled trials with larger populations and microbiological

profiling may further strengthen evidence regarding optimal antibiotic strategies in CAP management.

Conclusion

The present study demonstrated that oral antibiotics are comparable to intravenous antibiotics in achieving clinical recovery and treatment success in selected patients with community-acquired pneumonia. Although IV therapy resulted in slightly faster fever resolution, oral therapy significantly reduced hospital stay and avoided IV-related complications such as thrombophlebitis and injection-site pain. These findings support the use of oral antibiotics as a safe, effective, and economical alternative in clinically stable CAP patients. Early oral therapy and IV-to-oral switch strategies may help improve antimicrobial stewardship and reduce healthcare burden.

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