

**Comparative Therapeutic Outcomes of Cefixime versus Amoxicillin-Clavulanic Acid in Community-Acquired Bacterial Infections**Surabhi Arora<sup>1</sup>, Anshita Arora<sup>2</sup><sup>1</sup>Assistant Professor, Department of Pharmacology, Prasad Institute of Medical Sciences, Lucknow, Uttar Pradesh, India<sup>2</sup>Hematopathologist Consultant, Department of Pathology and Laboratory Medicine, Medanta super speciality hospital, Lucknow, Uttar Pradesh, India

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Conflict of interest: Nil

**Abstract:****Background:** Community-acquired bacterial infections are a major cause of morbidity and require effective oral antibiotic therapy. This study compared the therapeutic efficacy and safety of cefixime versus amoxicillin-clavulanic acid in such infections.**Material and Methods:** A prospective, randomized, open-label study was conducted among 220 adult patients with community-acquired bacterial infections. Participants were equally allocated to receive either cefixime (400 mg once daily) or amoxicillin-clavulanic acid (625 mg thrice daily) for 7–10 days. Clinical response, time to symptom resolution, microbiological eradication, recurrence, and adverse events were assessed. Statistical analysis was performed using standard methods with a significance level of  $p < 0.05$ .**Results:** Baseline characteristics were comparable between groups. Clinical cure was achieved in 89.1% of patients in the cefixime group and 85.5% in the amoxicillin-clavulanic acid group ( $p = 0.41$ ). Clinical improvement was observed in 7.3% and 9.1%, while treatment failure occurred in 3.6% and 5.5% of patients, respectively. Mean time to symptom resolution was  $3.6 \pm 1.1$  days for cefixime and  $3.9 \pm 1.2$  days for amoxicillin-clavulanic acid ( $p = 0.07$ ). Microbiological eradication rates were 86.7% and 82.8%, respectively ( $p = 0.54$ ). Recurrence rates were low in both groups (4.5% vs 6.4%,  $p = 0.55$ ). Adverse events were significantly lower with cefixime (10.9%) compared to amoxicillin-clavulanic acid (20.0%) ( $p = 0.048$ ).**Conclusion:** Cefixime demonstrated comparable efficacy with a better safety profile than amoxicillin-clavulanic acid, making it a suitable alternative for community-acquired bacterial infections.**Keywords:** Cefixime; Amoxicillin-clavulanic acid; Community-acquired infections; Clinical cure; Antibiotic therapy; Safety profile.**DOI:** 10.25258/ijcpr.18.4.23

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**Introduction**

Community-acquired bacterial infections (CABIs), including respiratory tract infections, urinary tract infections, and skin and soft tissue infections, remain a major cause of morbidity worldwide and contribute substantially to healthcare utilization and antibiotic consumption [1]. These infections are commonly caused by pathogens such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*, necessitating prompt and effective empirical antimicrobial therapy to prevent complications and reduce disease burden [2].

Beta-lactam antibiotics continue to be the cornerstone of treatment for community-acquired infections due to their favorable efficacy and safety profile. Among these, amoxicillin-clavulanic acid, a combination of a penicillin derivative and a  $\beta$ -

lactamase inhibitor, has been widely used to overcome resistance mediated by  $\beta$ -lactamase-producing organisms and has demonstrated high clinical cure rates ranging from 87% to 95% in respiratory infections [3]. However, its use is often associated with gastrointestinal adverse effects, which may affect patient compliance and tolerability [3].

Cefixime, an oral third-generation cephalosporin, exhibits broad-spectrum activity against common community-acquired pathogens and is stable against many  $\beta$ -lactamases. Clinical studies have demonstrated its effectiveness in respiratory and urinary tract infections, with high rates of clinical response and favorable pharmacokinetic properties allowing once-daily dosing [2,4]. Comparative trials have reported that cefixime provides similar clinical

efficacy to other beta-lactam antibiotics while maintaining a lower incidence of adverse effects [5].

Several randomized clinical trials comparing cefixime with amoxicillin-clavulanic acid in different infection settings have shown comparable therapeutic outcomes in terms of clinical cure and microbiological eradication [6]. Additionally, studies have indicated improved tolerability and better patient acceptability with cefixime, particularly due to its simplified dosing regimen and lower incidence of gastrointestinal side effects [5].

Despite the availability of these antibiotics, direct comparative evidence in a broad spectrum of community-acquired infections remains limited, and variations in efficacy and safety profiles may influence clinical decision-making. Therefore, the present study was undertaken to compare the therapeutic outcomes and safety of cefixime versus amoxicillin-clavulanic acid in patients with community-acquired bacterial infections.

### Material and Methods

**Study Design and Setting:** A prospective, randomized, open-label, comparative clinical study was conducted in a tertiary care teaching hospital.

**Study Population:** Patients presenting with clinically suspected community-acquired bacterial infections, including respiratory tract infections, urinary tract infections, and skin and soft tissue infections, were screened for eligibility.

### Inclusion Criteria

- Patients aged 18–65 years
- Clinical diagnosis of community-acquired bacterial infection based on standard clinical and/or microbiological criteria
- Presence of symptoms such as fever, localized signs of infection, and supportive laboratory findings (e.g., leukocytosis)
- Patients willing to provide informed consent

### Exclusion Criteria

- Hospital-acquired infections
- Severe or complicated infections requiring parenteral therapy
- Known hypersensitivity to cephalosporins or penicillins
- Pregnant or lactating women
- Significant hepatic or renal impairment
- Prior antibiotic use within the preceding 7 days

**Sample Size Determination:** The sample size was calculated based on expected clinical cure rates of approximately 85–95% reported in previous comparative antibiotic trials [6]. Assuming a difference of 10% in therapeutic efficacy between the two groups, with 80% power and 5% level of significance, the minimum required sample size was

estimated to be 94 patients per group. To account for potential dropouts, a total of 220 patients were enrolled and equally allocated into two groups (110 patients each).

**Randomization and Allocation:** Eligible participants were randomized into two groups using a computer-generated random sequence:

- **Group A:** Cefixime
- **Group B:** Amoxicillin-clavulanic acid

Allocation concealment was ensured using sealed opaque envelopes.

### Intervention Protocol

- **Group A (Cefixime):** Cefixime 400 mg orally once daily for 7–10 days
- **Group B (Amoxicillin-Clavulanic Acid):** Amoxicillin-clavulanate 625 mg orally three times daily for 7–10 days

These dosing regimens were selected in accordance with previously published clinical trials demonstrating comparable therapeutic efficacy [5].

**Clinical and Laboratory Assessment:** Baseline clinical and laboratory evaluation was performed for all enrolled participants prior to initiation of therapy. This included a comprehensive clinical history and detailed physical examination. Hematological investigations were conducted, comprising complete blood count and erythrocyte sedimentation rate. In addition, relevant microbiological investigations such as urine culture and sputum culture were performed wherever clinically indicated. Patients were subsequently monitored at predefined intervals to assess therapeutic response, including an early response evaluation between day 3 and day 5, assessment at the end of therapy between day 7 and day 10, and a follow-up evaluation on day 14.

**Outcome Measures:** The primary outcome measure of the study was the clinical cure rate, defined as the complete resolution of signs and symptoms of infection at the end of therapy. Secondary outcome measures included microbiological eradication, wherever applicable, as confirmed by appropriate culture reports; time to symptom resolution; incidence of adverse drug reactions; and treatment failure, which was defined as persistence or worsening of clinical symptoms necessitating a change in antibiotic therapy. Clinical response was further categorized into cure, improvement, and failure, in accordance with standardized definitions utilized in established antibiotic clinical trials [8].

**Safety Assessment:** Adverse events were monitored throughout the study duration. Patients were instructed to report any gastrointestinal disturbances, allergic reactions, or other drug-related effects. Severity and causality were assessed using standard pharmacovigilance criteria.

**Statistical Analysis:** All data were entered into Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) software, version 25.0. Continuous variables were summarized as mean with standard deviation, whereas categorical variables were expressed as frequencies and percentages. For comparison of categorical variables between groups, the Chi-square test or Fisher's exact test was applied as appropriate. Continuous variables were compared using the independent t-test. A p-value of less than 0.05 was considered to indicate statistical significance.

## Results

The baseline demographic and clinical characteristics were comparable between the two groups, with no statistically significant differences observed. The mean age in the cefixime group was  $38.6 \pm 12.4$  years, while in the amoxicillin-clavulanic acid group it was  $39.8 \pm 11.9$  years ( $p=0.48$ ). The proportion of male patients was similar in both groups (56.4% vs 59.1%,  $p=0.68$ ). Distribution of infection types, including respiratory tract infections, urinary tract infections, and skin and soft tissue infections, did not differ significantly between the groups. Additionally, mean duration of symptoms and presence of fever at presentation were comparable (Table 1).

At the end of therapy, the clinical cure rate was higher in the cefixime group (89.1%) compared to the amoxicillin-clavulanic acid group (85.5%); however, this difference was not statistically significant ( $p=0.41$ ). Clinical improvement without complete resolution was observed in 7.3% of patients in the cefixime group and 9.1% in the amoxicillin-clavulanic acid group. Treatment failure occurred in 3.6% and 5.5% of patients in the respective groups. Overall comparison of clinical

response distribution between the two groups did not show a statistically significant difference (Table 2).

The mean time to symptom resolution was slightly shorter in the cefixime group ( $3.6 \pm 1.1$  days) compared to the amoxicillin-clavulanic acid group ( $3.9 \pm 1.2$  days), though this difference did not reach statistical significance ( $p=0.07$ ). Microbiological eradication rates, assessed in patients with confirmed pathogens, were 86.7% in the cefixime group and 82.8% in the amoxicillin-clavulanic acid group ( $p=0.54$ ). Recurrence within 14 days was observed in 4.5% of patients in the cefixime group and 6.4% in the amoxicillin-clavulanic acid group, with no significant difference between groups ( $p=0.55$ ) (Table 3).

The overall incidence of adverse drug reactions was significantly lower in the cefixime group (10.9%) compared to the amoxicillin-clavulanic acid group (20.0%) ( $p=0.048$ ). Gastrointestinal adverse effects, including nausea, vomiting, and diarrhea, were more commonly reported in the amoxicillin-clavulanic acid group, although individual comparisons did not reach statistical significance. Drug discontinuation due to adverse effects was infrequent in both groups (Table 4).

Subgroup analysis based on the type of infection demonstrated comparable clinical cure rates between the two treatment groups. In respiratory tract infections, cure rates were 89.1% in the cefixime group and 83.7% in the amoxicillin-clavulanic acid group ( $p=0.45$ ). For urinary tract infections, the cure rates were 89.5% and 88.6%, respectively ( $p=0.91$ ). Similarly, in skin and soft tissue infections, cure rates were 88.5% in the cefixime group and 84.6% in the comparator group ( $p=0.69$ ). No statistically significant differences were observed across any subgroup (Table 5).

**Table 1: Baseline Demographic and Clinical Characteristics**

Variable	Cefixime Group (n=110)	Amox-Clav Group (n=110)	p-value
Mean age (years)	$38.6 \pm 12.4$	$39.8 \pm 11.9$	0.48
Male (%)	62 (56.4%)	65 (59.1%)	0.68
Female (%)	48 (43.6%)	45 (40.9%)	—
Respiratory infections (%)	46 (41.8%)	49 (44.5%)	0.69
Urinary tract infections (%)	38 (34.5%)	35 (31.8%)	0.67
Skin & soft tissue infections (%)	26 (23.6%)	26 (23.6%)	1.00
Mean duration of symptoms (days)	$4.2 \pm 1.3$	$4.4 \pm 1.5$	0.32
Fever at presentation (%)	82 (74.5%)	85 (77.3%)	0.62

**Table 2: Primary Outcome – Clinical Cure Rate**

Outcome	Cefixime Group (n=110)	Amox-Clav Group (n=110)	p-value
Clinical cure	98 (89.1%)	94 (85.5%)	0.41
Clinical improvement	8 (7.3%)	10 (9.1%)	
Treatment failure	4 (3.6%)	6 (5.5%)	

**Table 3: Secondary Outcomes**

Parameter	Cefixime Group	Amox-Clav Group	p-value
Mean time to symptom resolution (days)	3.6 ± 1.1	3.9 ± 1.2	0.07
Microbiological eradication* (%)	52/60 (86.7%)	48/58 (82.8%)	0.54
Recurrence within 14 days (%)	5 (4.5%)	7 (6.4%)	0.55

\*Only in patients where culture was performed and pathogen identified.

**Table 4: Adverse Drug Reactions**

Adverse Effect	Cefixime Group (n=110)	Amox-Clav Group (n=110)	p-value
Any adverse event	12 (10.9%)	22 (20.0%)	0.048
Nausea/Vomiting	5 (4.5%)	11 (10.0%)	0.09
Diarrhea	4 (3.6%)	9 (8.2%)	0.12
Rash/allergy	3 (2.7%)	2 (1.8%)	0.65
Drug discontinuation	2 (1.8%)	5 (4.5%)	0.24

**Table 5: Subgroup Analysis by Type of Infection (Clinical Cure Rate)**

Infection Type	Cefixime (%)	Amox-Clav (%)	p-value
Respiratory infections	41/46 (89.1%)	41/49 (83.7%)	0.45
Urinary tract infections	34/38 (89.5%)	31/35 (88.6%)	0.91
Skin & soft tissue infections	23/26 (88.5%)	22/26 (84.6%)	0.69

## Discussion

The present study demonstrated that cefixime and amoxicillin-clavulanic acid exhibited comparable clinical efficacy in the management of community-acquired bacterial infections, with no statistically significant difference in clinical cure rates. These findings are consistent with previous randomized and observational studies indicating that  $\beta$ -lactam antibiotics provide similar therapeutic outcomes in common community-acquired infections when pathogens are susceptible [7].

Amoxicillin-clavulanic acid has long been established as an effective empirical therapy for community-acquired respiratory and urinary tract infections, with reported clinical cure rates ranging between 87% and 95% across multiple studies [7]. The comparable cure rate observed in the present study aligns with this evidence, reinforcing its continued role as a standard treatment option. However, increasing concerns regarding tolerability and gastrointestinal adverse effects have been noted in recent evaluations [7].

In contrast, cefixime, a third-generation oral cephalosporin, has demonstrated reliable efficacy against common Gram-negative and selected Gram-positive pathogens. Recent clinical trials have shown that cefixime-based regimens achieve satisfactory clinical outcomes in a variety of infections, including intra-abdominal and systemic infections, with efficacy comparable to other broad-spectrum antibiotics [8]. This supports the comparable clinical cure rates observed in the current study.

Microbiological eradication rates in the present study were also similar between the two treatment groups, which is in agreement with earlier randomized controlled trials demonstrating no

significant difference between cefixime and amoxicillin-clavulanate in bacterial clearance [9]. These findings suggest that both agents are effective in achieving pathogen eradication when appropriately selected based on susceptibility patterns.

An important observation in this study was the lower incidence of adverse drug reactions in the cefixime group. This is consistent with existing literature indicating that amoxicillin-clavulanic acid is associated with a higher frequency of gastrointestinal side effects, including diarrhea and nausea, which may affect treatment adherence [10]. Improved tolerability with cefixime may therefore offer a clinical advantage, particularly in outpatient settings.

The slightly shorter, though not statistically significant, time to symptom resolution observed with cefixime is also supported by pharmacokinetic data demonstrating favorable tissue penetration and prolonged half-life, allowing effective once-daily dosing [11]. Simplified dosing regimens have been associated with better patient compliance and therapeutic outcomes in antimicrobial therapy.

The emergence of antimicrobial resistance remains a critical concern influencing antibiotic selection. Studies have highlighted increasing resistance among common uropathogens and respiratory pathogens, including the production of extended-spectrum  $\beta$ -lactamases (ESBLs), which may affect the efficacy of both cephalosporins and  $\beta$ -lactam/ $\beta$ -lactamase inhibitor combinations [12]. Therefore, local antibiogram patterns should guide antibiotic choice in clinical practice.

Subgroup analysis in the present study revealed no significant difference in efficacy across respiratory, urinary, and skin infections, suggesting that both

antibiotics maintain broad applicability across common community-acquired infections. Similar observations have been reported in previous clinical studies evaluating oral antibiotic regimens across multiple infection sites [13].

### Conclusion

In this comparative study, cefixime demonstrated clinical efficacy comparable to that of amoxicillin-clavulanic acid in the treatment of community-acquired bacterial infections, with no statistically significant difference in overall clinical cure rates or secondary outcomes. Although both antibiotics were effective across respiratory, urinary, and skin and soft tissue infections, cefixime was associated with a lower incidence of adverse drug reactions, particularly gastrointestinal disturbances. These findings suggest that cefixime represents a well-tolerated and effective oral therapeutic alternative, with potential advantages in patient compliance and safety profile. However, larger multicentric studies with microbiological stratification are warranted to further validate these observations and guide antibiotic selection in routine clinical practice.

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