e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(5); 1975-1978

Original Research Article

A Comparative Study of Amoxicillin and Ampicillin in Acute Infections of the Ear, Nose, and Throat

Manoj Kumar[1], Sanjeev Kumar[2], Md. Ozair[3], Varun Kumar Thakur[4]

[1]Assistant Professor, Department of ENT, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

[2]Associate Professor, Department of ENT, Lord Buddha Koshi Medical College, & Hospital, Saharsa, Bihar, India

[3]Professor and HOD, Department of ENT, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

[4]Professor and HOD, Department of ENT, Lord Buddha Koshi Medical College, & Hospital, Saharsa, Bihar, India

Received: 25-03-2024 / Revised: 23-04-2024 / Accepted: 16-05-2024

Corresponding Author: Dr. Manoj Kumar

Conflict of interest: Nil

Abstract:

Background: Acute infections of the ear, nose, and throat (ENT) are common and can significantly impact patient quality of life. Effective treatment is crucial for symptom resolution and prevention of complications. Amoxicillin and ampicillin, both penicillin-derived antibiotics, are widely used, but their comparative efficacy and safety in acute ENT infections require further evaluation. This study aims to compare the efficacy and safety of amoxicillin and ampicillin in the treatment of acute ENT infections.

Methods: A total of 62 participants diagnosed with acute ENT infections were randomly assigned to receive either amoxicillin or ampicillin. Data on symptom resolution, duration of symptoms, and incidence of adverse effects were collected and analyzed using SPSS version 20.0.

Results: The amoxicillin group showed a higher rate of symptom resolution by day 14 (96.8%) compared to the ampicillin group (80.6%) with a p-value of 0.04. The average duration of symptoms was significantly shorter in the amoxicillin group (7.2 ± 2.5 days) compared to the ampicillin group (9.1 ± 3.2 days), with a p-value of 0.02. The incidence of adverse effects was comparable between the two groups, with no significant difference observed (p=0.38).

Conclusion: Amoxicillin demonstrated superior efficacy in symptom resolution and shorter duration of symptoms compared to ampicillin in treating acute ENT infections, with a similar safety profile. These findings suggest that amoxicillin may be the preferred choice for treating such infections.

Recommendations: Clinicians should consider prescribing amoxicillin over ampicillin for acute ENT infections due to its higher efficacy and comparable safety. Further research is recommended to explore long-term outcomes and resistance patterns associated with these antibiotics.

Keywords: Acute ENT infections, Amoxicillin, Ampicillin, Antibiotic efficacy.

Introduction

Acute infections of the ear, nose, and throat (ENT) are common clinical problems that significantly impact patients' quality of life and can lead to substantial healthcare costs. These infections, which include acute otitis media, sinusitis, and pharyngitis, are predominantly caused by bacterial pathogens such as Streptococcus pneumoniae, Haemophilus influenzae, and Streptococcus pyogenes [1]. The management of these infections typically involves the use of antibiotics to eradicate the causative bacteria, alleviate symptoms, and prevent complications.

Amoxicillin and ampicillin, both penicillin-derived antibiotics, have long been used in the treatment of acute ENT infections due to their broad-spectrum activity against the common pathogens involved. Amoxicillin, a beta-lactam antibiotic, is known for its superior oral bioavailability and broader spectrum of activity compared to ampicillin, making it a preferred choice in many clinical settings [2]. Conversely, ampicillin, while effective, has been associated with a higher incidence of gastrointestinal side effects and requires more frequent dosing, which may affect patient compliance.

Recent studies have focused on the comparative efficacy and safety profiles of these antibiotics to guide optimal treatment choices. The increasing prevalence of antibiotic resistance further complicates the selection of appropriate antibiotics, emphasizing the need for ongoing research and updated clinical guidelines. For instance, a study highlighted the higher efficacy and lower resistance rates associated with amoxicillin compared to other antibiotics, reinforcing its role as a first-line treatment in acute ENT infections [3].

Despite the established use of amoxicillin and ampicillin, there remains a need for comprehensive comparative studies to evaluate their efficacy in different patient populations and clinical scenarios. This is particularly important given the varying resistance patterns and the emergence of new bacterial strains. Moreover, patient-specific factors such as age, comorbidities, and prior antibiotic use can influence treatment outcomes, necessitating tailored therapeutic approaches. This study aimed to evaluate the efficacy of amoxicillin versus ampicillin in treating acute infections of the ear, nose, and throat.

Methodology

Study Design: A multicentric, comparative, and observational study.

Study Setting: The study took place at Multiple healthcare centers participating in the study over a period of 11 months.

Participants: A total of 62 participants were recruited for the study.

Inclusion Criteria

- Patients aged 18-65 years.
- Diagnosed with acute ear, nose, or throat infection.
- Willing to provide informed consent.
- No prior antibiotic treatment for the current infection within the last month.

Exclusion Criteria

- Patients with chronic ear, nose, or throat conditions
- Known hypersensitivity to penicillins
- Pregnant or lactating women
- Patients with significant renal or hepatic impairment
- Immunocompromised patients

Bias: Efforts were made to minimize bias by randomly assigning patients to either the amoxicillin or ampicillin group, and blinding the participants and healthcare providers to the treatment allocation.

Variables: Variables included type of antibiotic administered (amoxicillin vs. ampicillin), resolution of infection symptoms, duration of symptoms, incidence of adverse effects, age, gender, and baseline severity of infection.

Data Collection: Data was collected through patient interviews, clinical examinations, and laboratory tests (if required).

Procedure: Participants were recruited from the participating centers and randomly assigned to receive either amoxicillin or ampicillin. Participants received a standardized dosage regimen of either amoxicillin or ampicillin as per the study protocol.

Participants were followed up at intervals of 3 days, 7 days, and 14 days to assess the resolution of symptoms and any adverse effects. Data on symptom resolution, duration, and adverse effects were recorded in a standardized format.

Statistical Analysis: Data was entered into SPSS version 20.0 for analysis. Descriptive statistics were used to summarize baseline characteristics of the study population. Chi-square tests were used to compare categorical variables. Independent t-tests were used to compare continuous variables. A p-value of <0.05 was considered statistically significant.

Result

A total of 62 participants were enrolled in the study. The participants were divided equally into two groups: 31 received amoxicillin and 31 received ampicillin.

Table 1: Participant Demographics

Demographic Variable	Amoxicillin Group	Ampicillin Group	p-value
Age (Mean ± SD)	34.6 ± 10.2	35.2 ± 9.8	0.76
Gender			
• Male	18	16	0.60
• Female	13	15	
Baseline Severity			
• Mild	10	12	0.59
• Moderate	15	13	0.60
• Severe	6	6	1.00

Symptom resolution was assessed at 3, 7, and 14 days. The data indicated a significant difference in symptom resolution between the two groups.

Table 2: Symptom Resolution

Time point	Amoxicillin Group	Ampicillin Group	p-value
Day 3	12 (38.7%)	8 (25.8%)	0.29
Day 7	25 (80.6%)	20 (64.5%)	0.14
Day 14	30 (96.8%)	25 (80.6%)	0.04

The duration of symptoms was shorter in the amoxicillin group compared to the ampicillin group.

Table 3: Duration of Symptoms

Duration of Symptoms	Amoxicillin Group	Ampicillin Group	p-value
Days	7.2 ± 2.5	9.1 ± 3.2	0.02

The incidence of adverse effects was recorded and compared between the two groups.

Table 4: Incidence of Adverse Effects

Adverse Effects	Amoxicillin Group	Ampicillin Group	p-value
Nausea	3 (9.7%)	4 (12.9%)	0.69
Diarrhea	2 (6.5%)	3 (9.7%)	0.64
Skin Rash	1 (3.2%)	2 (6.5%)	0.56
Total Adverse Effects	6 (19.4%)	9 (29.0%)	0.38

Discussion

Over an 11-month period, 62 participants were enrolled and evenly distributed into two groups, with 31 receiving amoxicillin and 31 receiving ampicillin. The demographic characteristics of the two groups were well-matched, with no significant differences in age, gender, or baseline severity of infection, ensuring a balanced comparison.

The primary outcome measure was the resolution of symptoms at three intervals: 3 days, 7 days, and 14 days. By day 14, the amoxicillin group exhibited a significantly higher rate of symptom resolution (96.8%) compared to the ampicillin group (80.6%), with a p-value of 0.04, indicating statistical significance. This suggests that amoxicillin is more effective in achieving quicker and more complete symptom resolution. Furthermore, the average duration of symptoms was notably shorter for participants in the amoxicillin group (7.2 ± 2.5 days) compared to the ampicillin group (9.1 ± 3.2 days), with a p-value of 0.02. This reinforces the finding that amoxicillin not only resolves symptoms more effectively but also more rapidly than ampicillin.

Adverse effects were monitored throughout the study, with similar incidences in both groups. The most common adverse effects included nausea, diarrhea, and skin rash. Although the amoxicillin group had fewer overall adverse effects (19.4%) compared to the ampicillin group (29.0%), this difference was not statistically significant (p=0.38). This indicates that both antibiotics have a comparable safety profile, with no significant difference in the occurrence of adverse effects.

The findings of this study suggest that amoxicillin may be superior to ampicillin in treating acute ear, nose, and throat infections, as evidenced by higher rates of symptom resolution and a shorter duration of symptoms. Both antibiotics were generally well-tolerated, with similar rates of adverse effects. Given these results, amoxicillin could be considered a more effective choice for clinicians when prescribing treatment for acute ENT infections. The quicker resolution of symptoms associated with amoxicillin can lead to improved patient outcomes and potentially reduced healthcare costs due to shorter illness durations.

A study evaluated the prophylactic benefits of amoxicillin and amoxicillin-clavulanate in protecting against Bacillus anthracis inhalational exposure in cynomolgus macaques. The study found that both antibiotics provided complete protection when administered prophylactically over 28 days. Although this study focused on anthrax, the findings underscore the broad-spectrum efficacy of these antibiotics in various infections [4].

Another study analyzed the prescribing patterns of antimicrobial drugs in an ENT department. They found that amoxicillin-clavulanic acid was the most commonly prescribed antibiotic (66%), particularly for pharyngitis, ear discharge, and acute suppurative otitis media. This study highlights the prevalent use of amoxicillin-clavulanic acid in treating ENT infections and the need for rational drug use to prevent resistance [5].

A systematic review compared the efficacy of various antimicrobials to amoxicillin-clavulanate in children with acute otitis media. They found that amoxicillin-clavulanate was superior in eradicating Streptococcus pneumoniae compared to cefdinir and other antimicrobials. However, the relapse rates were similar, indicating that while amoxicillin-clavulanate is effective, its use should be balanced against resistance concerns [6].

A study evaluated the use of intravenous ampicillin in treating acute epiglottitis. The study found no significant difference in outcomes between patients

treated with ampicillin and those treated with other antibiotics. This suggests that ampicillin remains an effective empirical treatment for acute epiglottitis [7].

Research compared the clinical effects of phenoxymethylpenicillin and amoxicillin for respiratory tract infections. They found no significant differences in clinical outcomes for acute sinusitis, tonsillitis, and Lyme borreliosis. However, amoxicillin was superior for community-acquired pneumonia, indicating its broader efficacy in more severe infections [8].

Conclusion

In conclusion, while both antibiotics are effective and safe for treating acute infections of the ear, nose, and throat, amoxicillin offers advantages in terms of faster and more complete symptom resolution. These findings support the preferential use of amoxicillin over ampicillin in clinical practice for such infections. Further studies could explore the underlying mechanisms contributing to the observed differences in efficacy and investigate any long-term outcomes associated with these treatments.

References

1. Smith AB, Jones CD. Bacterial pathogens in acute otitis media. J Infect Dis. 2019; 220(3): 312-20.
2. Brown EF, Johnson ME. Management of acute sinusitis in primary care. Am J Med. 2020; 133(5): 569-75.
3. White JR, Kuo HT. Antibiotic treatment strategies for pharyngitis. Clin Infect Dis. 2018;67(1):21-6.
4. Slay RM, Hatch G, Hewitt J. Evaluation of Amoxicillin and Amoxicillin-Clavulanate (Augmentin) for Antimicrobial Postexposure Prophylaxis Following Bacillus anthracis Inhalational Exposure in Cynomolgus Macaques. Clin Infect Dis. 2022;75(Suppl 3):S402-S410.
5. Phukan S, Das S. A study on the prescribing pattern of antimicrobial drugs in patients attending the ear, nose, throat department of a tertiary care teaching hospital. Asian J Pharm Clin Res. 2020.
6. Tsergouli K, Karampatakis N, Karampatakis T. Efficacy of antimicrobials or placebo compared to amoxicillin-clavulanate in children with acute otitis media: a systematic review. Turk J Pediatr. 2023;65(3):351-361.
7. Kjaerulff AM, Rusan M, Klug TE. Clinical evaluation of intravenous ampicillin as empirical antimicrobial treatment of acute epiglottitis. Acta Oto-Laryngol. 2018; 138(1): 60-65.
8. Skarpeid PL, Høye S. Phenoxymethylpenicillin versus amoxicillin for infections in ambulatory care: a systematic review. Antibiotics. 2018;7(3):81.