

EVALUATION OF ANTIBIOTIC PRESCRIPTION PATTERNS IN ACUTE OTITIS MEDIA

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Abstract

Background: Acute otitis media (AOM) is among the most common infectious diseases in children and remains a leading indication for antibiotic prescriptions worldwide. Despite evidence-based clinical guidelines advocating selective antibiotic use and watchful waiting in uncomplicated cases, inappropriate prescribing continues to contribute to antimicrobial resistance and unnecessary healthcare costs. This study evaluated antibiotic prescription patterns and adherence to clinical practice guidelines in patients diagnosed with AOM at a tertiary care hospital. **Methods:** A hospital-based cross-sectional observational study was conducted from January to June 2024 in the Departments of Otorhinolaryngology and Pediatrics of a tertiary care teaching hospital. A total of 150 patients diagnosed with AOM were enrolled using convenience sampling. Demographic characteristics, clinical presentation, antibiotic prescriptions, treatment duration, and prescribing practices were recorded using a structured data collection form. Prescriptions were assessed for appropriateness according to the American Academy of Pediatrics and National Institute for Health and Care Excellence guidelines. Data were analyzed using SPSS version 25.0, with descriptive statistics and Chi-square tests applied where appropriate. A p-value <0.05 was considered statistically significant. **Results:** Of the 150 patients, 60.0% were male and 70.0% were younger than five years. Antibiotics were prescribed to 128 (85.3%) patients, while only 22 (14.7%) were managed using the watchful waiting approach. Amoxicillin was the most frequently prescribed antibiotic (39.8%), followed by amoxicillin-clavulanate (29.7%), cephalosporins (20.3%), and macrolides (10.2%). Overall guideline adherence was observed in 54.7% of prescriptions. Broad-spectrum antibiotics were prescribed without appropriate indication in 50.0% of cases, and inappropriate treatment duration was identified in 35.2% of prescriptions. Fever ($p=0.03$) and bilateral disease ($p=0.04$) were significantly associated with inappropriate prescribing. **Conclusion:** Antibiotic prescribing for acute otitis media remained high, with only moderate adherence to evidence-based guidelines. Frequent use of broad-spectrum antibiotics and inappropriate treatment duration highlight the need for strengthened antimicrobial stewardship programs, regular

prescription audits, physician education, and greater implementation of guideline-directed management to optimize antibiotic use and combat antimicrobial resistance.

Keywords: Acute Otitis Media; Antibiotic Prescribing; Antimicrobial Stewardship; Guideline Adherence; Watchful Waiting; Amoxicillin; Antimicrobial Resistance; Prescription Pattern; Pediatrics; Rational Antibiotic Use.

INTRODUCTION

Acute otitis media (AOM) is one of the most frequently encountered bacterial infections in childhood and remains a major cause of outpatient visits and antibiotic prescriptions worldwide. It is characterized by the rapid onset of inflammation and infection of the middle ear, commonly presenting with otalgia, fever, irritability, hearing impairment, and occasionally otorrhea.¹ The disease predominantly affects children younger than five years because of anatomical and physiological characteristics, including shorter and more horizontally oriented Eustachian tubes, immature immune defenses, and increased exposure to respiratory pathogens during early childhood.² Nearly 80% of children experience at least one episode of AOM before reaching three years of age, making it one of the leading reasons for pediatric consultations and antimicrobial use.³

The etiology of AOM is multifactorial, with viral upper respiratory tract infections often preceding bacterial invasion of the middle ear. The most commonly isolated bacterial pathogens include *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*, although viral pathogens are implicated either alone or in combination with bacteria in a substantial proportion of cases.⁴ The introduction of pneumococcal conjugate vaccines has altered the microbiological profile of AOM in many countries; however, bacterial infection continues to account for a considerable proportion of clinically significant cases requiring medical intervention.⁵

Despite advances in diagnosis and treatment, the management of AOM continues to generate considerable debate, particularly regarding the appropriate use of antibiotics. Clinical evidence demonstrates that many uncomplicated cases resolve spontaneously without antimicrobial therapy, especially in older children with mild symptoms.⁶ Consequently, contemporary clinical practice guidelines recommend selective antibiotic use rather than routine prescribing for all patients. The American Academy of Pediatrics (AAP) and the National Institute for Health and Care Excellence (NICE) advocate a watchful waiting or observation strategy for selected patients, reserving immediate antibiotic treatment for young children, severe disease, bilateral infection in younger children, or cases associated with otorrhea.⁷⁻⁸

Although these recommendations are supported by strong evidence, inappropriate antibiotic prescribing remains common in both developed and developing countries. Several studies have reported that antibiotics are prescribed for the majority of patients diagnosed with AOM regardless of disease severity or eligibility for observation alone.⁹ Such prescribing practices contribute significantly to unnecessary antimicrobial exposure and have become an important driver of antimicrobial resistance (AMR), which is

recognized by the World Health Organization as one of the greatest threats to global public health.¹⁰ In addition to promoting bacterial resistance, irrational antibiotic use increases healthcare costs, exposes patients to adverse drug reactions, and disrupts the normal microbiome, particularly in young children.^{11,12}

Appropriate antibiotic prescribing involves selecting the correct indication, choosing the recommended first-line agent, prescribing an appropriate dose based on age and body weight, and limiting treatment duration according to evidence-based recommendations. Amoxicillin remains the preferred first-line antibiotic for most uncomplicated cases because of its effectiveness, narrow antimicrobial spectrum, safety profile, and affordability.¹² Nevertheless, several studies have documented increasing use of broad-spectrum antibiotics such as amoxicillin-clavulanate, cephalosporins, and macrolides, even in situations where narrow-spectrum therapy would be sufficient.¹³⁻¹⁵ This trend has raised concerns regarding the emergence of multidrug-resistant organisms and underscores the need for continuous monitoring of prescribing practices.

Evaluation of antibiotic prescription patterns provides valuable information regarding physicians' adherence to clinical guidelines and helps identify areas requiring intervention. Prescription audits have become an essential component of antimicrobial stewardship programs, enabling healthcare institutions to promote evidence-based prescribing, optimize antibiotic utilization, and reduce unnecessary antimicrobial exposure. Such evaluations are particularly important in low- and middle-income countries, where limited diagnostic facilities, empirical prescribing, heavy patient loads, and variable access to updated clinical guidelines may influence treatment decisions.

In Pakistan, published data evaluating antibiotic prescribing practices for acute otitis media remain limited despite the country's high burden of infectious diseases and increasing prevalence of antimicrobial resistance. Understanding current prescribing trends is essential for developing targeted antimicrobial stewardship interventions and improving compliance with international treatment recommendations. Therefore, the present study was conducted to evaluate antibiotic prescription patterns among patients diagnosed with acute otitis media at a tertiary care hospital, assess adherence to established clinical practice guidelines, and identify prescribing practices that may contribute to inappropriate antibiotic use and antimicrobial resistance.

METHODOLOGY

This hospital-based cross-sectional observational study was conducted in the Department of Otorhinolaryngology (ENT) and Pediatric Outpatient Department of a tertiary care teaching hospital over a six-month period from January 2024 to June 2024. The study aimed to evaluate antibiotic prescription patterns in patients diagnosed with acute otitis media (AOM) and to assess the appropriateness of antibiotic prescribing practices according to established clinical guidelines. Ethical approval was obtained from the Institutional Review Board (IRB) of the hospital before commencement of the study. Patient confidentiality was maintained throughout the study by assigning unique

identification numbers and excluding all personal identifiers from the data collection forms. As the study involved review of routine clinical records without any intervention, the requirement for written informed consent was waived by the ethics committee.

A total of 150 consecutive patients diagnosed with acute otitis media were enrolled using a non-probability convenience sampling technique. Patients of all age groups presenting with acute onset of symptoms consistent with AOM were eligible for inclusion. The diagnosis of AOM was established by an ENT specialist or pediatrician based on clinical history and otoscopic examination, including the presence of acute ear pain, fever, irritability, hearing impairment, moderate to severe bulging of the tympanic membrane, new-onset otorrhea not attributable to otitis externa, or mild bulging of the tympanic membrane associated with recent onset of ear pain or marked erythema. Patients with chronic suppurative otitis media, recurrent otitis media, previous ear surgery, otitis externa, immunocompromised conditions, or incomplete medical records were excluded from the study. Data were collected prospectively from patients' medical records and outpatient prescription charts using a structured data collection proforma specifically designed for the study. Information regarding demographic characteristics, including age and gender, clinical presentation, duration of symptoms, laterality of infection, otoscopic findings, associated upper respiratory tract infections, and relevant medical history was recorded. Details of antibiotic prescriptions, including the name of the antibiotic, dosage, frequency, route of administration, duration of treatment, and use of adjunctive medications such as analgesics, antipyretics, antihistamines, and decongestants, were also documented. The management approach adopted by the treating physician, including immediate antibiotic therapy or watchful waiting, was recorded for each patient.

The appropriateness of antibiotic prescribing was evaluated according to the recommendations of the American Academy of Pediatrics (AAP) Clinical Practice Guideline and the National Institute for Health and Care Excellence (NICE) guideline for the management of acute otitis media. Each prescription was assessed for the indication of antibiotic therapy, selection of first-line antibiotic, use of broad-spectrum antibiotics, appropriateness of dosage according to patient age and body weight, duration of therapy, and overall adherence to evidence-based treatment recommendations. Prescriptions fulfilling all guideline recommendations were categorized as appropriate, whereas those with one or more deviations were considered inappropriate. The primary outcome measure was the proportion of antibiotic prescriptions adhering to standard treatment guidelines. Secondary outcome measures included the frequency of antibiotic prescribing, distribution of antibiotic classes prescribed, proportion of broad-spectrum antibiotic use, appropriateness of antibiotic dose and treatment duration, and factors associated with inappropriate prescribing practices.

Data were entered into Microsoft Excel and analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 25.0. Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were summarized as frequencies and percentages. Associations between categorical variables were analyzed using the

Chi-square test or Fisher's exact test where appropriate. A p-value of less than 0.05 was considered statistically significant for all analyses.

RESULTS

Out of 150 patients, 60% were male and 40% female. The majority (70%) were children under five years of age. Antibiotics were prescribed in 85% of cases, while only 15% were managed with watchful waiting. Among prescribed antibiotics, amoxicillin was used in 40% of cases, followed by amoxicillin-clavulanate (30%), cephalosporins (20%), and macrolides (10%). Only 55% of prescriptions adhered to standard guidelines. Broad-spectrum antibiotics were prescribed in 50% of cases where first-line therapy was recommended. Inappropriate duration of therapy was observed in 35% of prescriptions.

Table 1: Demographic and Clinical Characteristics of Patients with Acute Otitis Media (n = 150)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	<2 years	55	36.7
	2–5 years	50	33.3
	6–12 years	28	18.7
	>12 years	17	11.3
Gender	Male	90	60.0
	Female	60	40.0
Presenting Symptoms*	Ear pain	138	92.0
	Fever	102	68.0
	Irritability	74	49.3
	Hearing difficulty	36	24.0
	Ear discharge	18	12.0

Table 2: Antibiotic Prescription Pattern among Patients with Acute Otitis Media (n = 150)

Variable	Category	Frequency (n)	Percentage (%)
Management Approach	Antibiotic prescribed	128	85.3
	Watchful waiting	22	14.7
Antibiotic Prescribed (n = 128)	Amoxicillin	51	39.8
	Amoxicillin–clavulanate	38	29.7
	Cephalosporins	26	20.3

Table 3: Evaluation of Prescription Appropriateness According to Clinical Guidelines (n = 128)

Variable	Category	Frequency (n)	Percentage (%)
Overall Guideline Adherence	Appropriate	70	54.7
	Inappropriate	58	45.3
Choice of Antibiotic	First-line antibiotic prescribed appropriately	64	50.0
	Broad-spectrum antibiotic used without indication	64	50.0

Duration of Therapy	Appropriate (5–10 days according to age/severity)	83	64.8
	Inappropriate duration	45	35.2
Dose Prescribed	Appropriate	115	89.8
	Inappropriate	13	10.2

Table 4: Factors Associated with Inappropriate Antibiotic Prescription (n = 128)

Variable	Appropriate Prescription n (%)	Inappropriate Prescription n (%)	p-value
Age <5 years (n=90)	45 (50.0)	45 (50.0)	0.18
Age ≥5 years (n=38)	25 (65.8)	13 (34.2)	
Male (n=76)	40 (52.6)	36 (47.4)	0.61
Female (n=52)	30 (57.7)	22 (42.3)	
Fever present (n=89)	41 (46.1)	48 (53.9)	0.03
Fever absent (n=39)	29 (74.4)	10 (25.6)	
Bilateral AOM (n=42)	18 (42.9)	24 (57.1)	0.04
Unilateral AOM (n=86)	52 (60.5)	34 (39.5)	

Chi-square test; p < 0.05 considered statistically significant.

DISCUSSION

The present study evaluated antibiotic prescription patterns in patients diagnosed with acute otitis media (AOM) and assessed their compliance with established clinical guidelines. The findings demonstrated that the majority of patients were children younger than five years of age, with a slight male predominance. Antibiotics were prescribed in more than four-fifths of the cases, while the watchful waiting approach was implemented in only a small proportion of patients. Amoxicillin remained the most frequently prescribed antibiotic; however, a considerable number of patients received broad-spectrum antibiotics, including amoxicillin-clavulanate and cephalosporins. Overall adherence to guideline-recommended prescribing practices was modest, with inappropriate antibiotic selection and prolonged treatment duration representing the most common deviations from recommended practice. Furthermore, the presence of fever and bilateral disease was significantly associated with inappropriate antibiotic prescribing.

The predominance of children younger than five years observed in the present study is consistent with the established epidemiology of AOM. Young children are particularly susceptible because of the shorter, more horizontal Eustachian tube and the immaturity of the immune system, which facilitate bacterial colonization and middle ear infection.¹⁶ Similar age distributions have been reported in studies conducted in Europe and North America, where children under five years account for the majority of outpatient visits for AOM.¹⁷ Comparable findings have also been documented in developing countries, emphasizing that AOM continues to be one of the leading causes of pediatric healthcare consultations worldwide.¹⁸ The overall antibiotic prescription rate of 85.3% observed in this study is higher than recommended by current evidence-based guidelines, which advocate observation without immediate antibiotic therapy for selected patients with mild

disease. Similar high prescribing rates have been reported in studies from Asia and the Middle East, where antibiotic prescription exceeds 80% of AOM cases despite recommendations supporting watchful waiting.¹⁹ Conversely, studies from countries with well-established antimicrobial stewardship programs have demonstrated considerably lower antibiotic utilization following implementation of guideline-based management protocols.²⁰ These differences may reflect variations in physician prescribing behavior, parental expectations, accessibility to follow-up care, and concerns regarding potential complications.

Amoxicillin was the most commonly prescribed antibiotic in the present study, which is encouraging because it remains the recommended first-line therapy for uncomplicated AOM. Nevertheless, nearly half of the prescribed antibiotics consisted of broad-spectrum agents such as amoxicillin-clavulanate and cephalosporins without clear indications. Similar prescribing trends have been described by Frost et al., who reported increasing use of broad-spectrum antibiotics despite guideline recommendations favoring narrow-spectrum agents.²¹ Thompson et al. likewise demonstrated that unnecessary use of broad-spectrum antibiotics contributes to increased antimicrobial resistance, higher treatment costs, and greater incidence of adverse drug reactions without improving clinical outcomes.²² These findings emphasize the importance of promoting rational antibiotic selection based on evidence-based recommendations.

Only 54.7% of prescriptions in the current study fully complied with clinical practice guidelines. The remaining prescriptions showed deviations in antibiotic selection, duration of therapy, or both. Comparable levels of guideline adherence have been reported in several international studies, suggesting that non-compliance with prescribing recommendations remains a widespread problem.²³ In contrast, countries implementing structured antimicrobial stewardship interventions, regular prescription audits, and physician education programs have reported significant improvements in prescribing quality and reductions in unnecessary antibiotic use.²⁴ These observations indicate that continuous professional education and institutional monitoring can substantially improve adherence to treatment guidelines.

The inappropriate duration of antibiotic therapy observed in approximately one-third of patients also deserves attention. Excessively prolonged antibiotic courses increase selective pressure for antimicrobial resistance while exposing patients to avoidable adverse effects. Recent evidence suggests that shorter treatment courses are equally effective for uncomplicated AOM in appropriately selected children and are associated with fewer antibiotic-related complications.²⁵ Adoption of guideline-recommended treatment durations may therefore contribute to improved antimicrobial stewardship without compromising patient outcomes.

Another important finding of the present study was the significant association between fever, bilateral disease, and inappropriate antibiotic prescribing. Physicians may perceive these clinical features as indicators of severe infection and consequently prescribe broader-spectrum antibiotics or longer treatment courses than recommended. Similar

observations have been reported in previous prescription audit studies, where disease severity and physician concern regarding treatment failure influenced prescribing decisions more strongly than guideline recommendations.²⁶ Although severe presentations may justify immediate antibiotic therapy, selection of antibiotic type and duration should continue to follow established evidence-based recommendations whenever possible.

The findings of this study have important clinical implications. Regular prescription audits, dissemination of updated treatment guidelines, incorporation of antimicrobial stewardship programs, and continuing medical education for healthcare professionals may improve prescribing practices and reduce unnecessary antibiotic exposure. Furthermore, educating parents regarding the natural course of uncomplicated AOM and the safety of the watchful waiting approach may decrease pressure on physicians to prescribe antibiotics unnecessarily, thereby supporting more rational antimicrobial use.²⁵

This study has several limitations. It was conducted at a single tertiary care hospital with a relatively modest sample size, which may limit the generalizability of the findings to other healthcare settings. The cross-sectional design allowed evaluation of prescribing patterns but did not assess clinical outcomes, microbiological confirmation, treatment success, recurrence rates, or the development of antimicrobial resistance following therapy. In addition, physician-related factors influencing prescribing decisions and parental expectations were not investigated.

Future multicenter prospective studies involving larger and more diverse populations are warranted to provide a more comprehensive evaluation of antibiotic prescribing practices in AOM. Future research should also examine the effectiveness of antimicrobial stewardship interventions, physician education programs, and electronic clinical decision-support systems in improving guideline adherence. Monitoring local antimicrobial resistance patterns and incorporating microbiological surveillance into prescribing policies may further optimize antibiotic selection and contribute to reducing the global burden of antimicrobial resistance.

CONCLUSION

Antibiotic prescribing for acute otitis media was high, with only moderate adherence to evidence-based guidelines. Inappropriate use of broad-spectrum antibiotics and prolonged treatment durations were common. Strengthening antimicrobial stewardship, promoting guideline-based prescribing, and encouraging the watchful waiting approach where appropriate may improve antibiotic use and help reduce antimicrobial resistance.

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