Pravara Med Rev; March 2026, 18 (01), 69-72
DOI: 10.36848/PMR/2026/00000.10010

Original article

Assessment of Bacterial Pathogens and Antibiotic Sensitivity in Chronic Otitis Media: A Tertiary Care Hospital-Based Study

[1]Dr. Mayur H. Ingale , [2]Dr. Selvi Khajanchi, [3]Dr. Ishan Shevate*, [4]Dr. Vinod V. Shinde

[1]Professor, Department of Otorhinolaryngology, Dr. D.Y. Patil Medical College, Hospital & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, India.
[2]Junior Resident, Department of Orthopaedics, Dr. D.Y. Patil Medical College, Hospital & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, India
[3]Associate Professor, Department of Orthopaedics , Dr. D.Y. Patil Medical College, Hospital & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, India.
[4]Professor, Department of Otorhinolaryngology, Dr. D. Y. Patil Medical college, hospital & research centre, Dr. D. Y. Patil Vidyapeeth, primpri, Pune, India
*Corresponding Author**

Abstract

Background: *Chronic Otitis Media (COM) is a persistent infection of the middle ear, commonly associated with prolonged ear discharge and hearing loss. Accurate identification of causative bacterial pathogens and their antibiotic sensitivity patterns is essential for effective management and prevention of complications.*

Objectives: *To assess the bacteriological profile and antibiotic sensitivity patterns of pathogens isolated from patients with COM in a tertiary care hospital.*

Methods: *A prospective observational study was conducted over one year in the ENT department of a tertiary care hospital. A total of 40 patients clinically diagnosed with COM were included. Middle ear discharge was collected under aseptic precautions and processed for bacterial culture and sensitivity testing using standard microbiological techniques and the Kirby–Bauer disc diffusion method. Antibiotic susceptibility was interpreted according to CLSI guidelines.*

Results: *The most common bacterial isolate was Pseudomonas aeruginosa (35%), followed by Staphylococcus aureus (25%). Gram-negative isolates showed high sensitivity to amikacin (88.9%), piperacillin-tazobactam (92.6%), and imipenem (96.3%). Staphylococcus aureus showed 100% sensitivity to linezolid and 90% to gentamicin and clindamycin.*

Conclusion: *The study highlights the predominance of Pseudomonas aeruginosa and Staphylococcus aureus in COM and underscores the need for culture-based antibiotic selection to ensure effective and targeted therapy.*

Keywords: *Chronic otitis media, Bacterial pathogens, Antibiotic sensitivity*

Introduction

Chronic Otitis Media (COM) is a persistent inflammation of the middle ear and mastoid cavity, often characterized by recurrent ear discharge and hearing loss. (1) It remains a significant public health issue, especially in developing countries, due to poor hygiene, overcrowding, malnutrition, and inadequate access to medical care. COM can be classified into tubotympanic (safe) and atticoantral (unsafe) types, with the latter associated with greater risk of complications such as mastoiditis, facial nerve paralysis, and intracranial infections. Bacterial infection plays a pivotal role in the pathogenesis and perpetuation of the disease.(2,3,4) Common pathogens include *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus* species, and *Escherichia coli*. (5)

Accurate identification of these pathogens and their antibiotic susceptibility patterns is essential for effective treatment and to prevent the development of antimicrobial resistance. With the increasing emergence of multidrug-resistant organisms, empirical therapy based on local antibiograms has become increasingly relevant. This hospital-based study aims to assess the bacteriological profile of patients with COM and evaluate the antibiotic sensitivity patterns of isolated organisms. The findings of this study will help guide clinicians in choosing the most effective antimicrobial agents, promote rational use of antibiotics, and contribute to better clinical outcomes in patients suffering from chronic otitis media. (6,7)

Study Methodology

The present hospital-based, prospective study was conducted in the Department of Otorhinolaryngology of a tertiary-care teaching hospital over a period of one year (January 2024 – December 2024). All consecutive patients aged ≥5 years who presented to the ENT outpatient department or ward with clinically diagnosed chronic otitis media (persistent ear discharge through a perforated tympanic membrane for ≥3 months) were screened. After applying exclusion criteria—recent systemic or topical antibiotic use (within 7 days), immunocompromised status, and postoperative ear discharge—40 eligible participants were enrolled after obtaining written informed consent and institutional ethical-committee approval.

For each participant, detailed demographic and clinical data, including age, sex, duration and laterality of ear discharge, hearing loss, and prior treatment history, were recorded in a pre-designed pro forma. Aural toilet was performed under aseptic precautions, and middle-ear discharge was collected using sterile cotton swabs without touching the external auditory canal. One swab was immediately transported to the microbiology laboratory for culture, while a paired swab was used for Gram staining to provide preliminary bacterial identification.

In the laboratory, specimens were inoculated onto blood agar, chocolate agar, and MacConkey agar plates, and incubated aerobically at 37 °C for 24–48 hours. Isolates were identified on the basis of colony morphology, Gram staining characteristics, and standard biochemical tests (oxidase, catalase, coagulase, IMViC, urease, and triple sugar iron reactions). Mixed growths or contaminants were handled according to CLSI guidelines, and only significant, pure isolates were subjected to sensitivity testing.

Antibiotic susceptibility was determined by the Kirby–Bauer disk diffusion method on Mueller–Hinton agar using a panel of commonly prescribed ototopical and systemic antibiotics (ampicillin, amoxicillin-clavulanate, ciprofloxacin, ofloxacin, gentamicin, amikacin, ceftriaxone, ceftazidime, piperacillin-tazobactam, and imipenem). Zone diameters were interpreted per CLSI 2023 standards. Data were entered in Microsoft Excel and analyzed with SPSS version 26. Descriptive statistics (frequency, percentage, mean ± SD) summarized the bacterial profile and resistance patterns; chi-square and Fisher's exact tests assessed associations between pathogen distribution and clinical variables, with $p < 0.05$ considered statistically significant.

Results :

Table 1: Demographic Profile of Patients with Chronic Otitis Media (n = 40)

Parameter	Number of Patients	Percentage (%)
Age Group (years)		
5–14	10	25%
15–30	14	35%
31–50	9	22.5%
>50	7	17.5%
Gender		
Male	23	57.5%
Female	17	42.5%
Laterality		
Unilateral	30	75%
Bilateral	10	25%

Table 2: Distribution of Bacterial Isolates in COM Patients (n = 40)

Bacterial Isolate	Number of Cases	Percentage (%)
Pseudomonas aeruginosa	14	35%
Staphylococcus aureus	10	25%
Proteus mirabilis	6	15%
Escherichia coli	4	10%
Klebsiella pneumoniae	3	7.5%
No growth	3	7.5%

Table 3: Antibiotic Sensitivity Pattern of Gram-Negative Isolates (n = 27)

Antibiotic	Sensitive Isolates (n)	Sensitivity (%)
Ciprofloxacin	20	74.1%
Gentamicin	22	81.5%
Amikacin	24	88.9%
Ceftazidime	18	66.7%
Piperacillin-Tazobactam	25	92.6%
Imipenem	26	96.3%

Table 4: Antibiotic Sensitivity Pattern of *Staphylococcus aureus* Isolates (n = 10)

Antibiotic	Sensitive Isolates (n)	Sensitivity (%)
Amoxicillin-Clavulanate	6	60%
Ceftriaxone	7	70%
Ciprofloxacin	8	80%
Gentamicin	9	90%
Clindamycin	9	90%
Linezolid	10	100%

Discussion

Chronic Otitis Media (COM) continues to be a prevalent health concern, particularly in developing nations, owing to its chronicity, potential complications, and association with hearing impairment. The present study was conducted to assess the bacteriological profile and antibiotic sensitivity patterns among COM patients in a tertiary care hospital setting, with a sample size of 40 patients over a one-year period. (8)

The demographic analysis revealed that COM was most common in the 15–30-year age group (35%), followed by children aged 5–14 years (25%). This distribution is consistent with previous studies that highlight the vulnerability of younger populations due to immature Eustachian tube function, recurrent upper respiratory tract infections, and poor hygienic conditions. A slight male predominance (57.5%) was noted in our study, which may reflect higher exposure of males to environmental risk factors or a gender-related disparity in healthcare-seeking behavior. (9,10)

The bacteriological profile in our study showed that *Pseudomonas aeruginosa* was the most frequently isolated organism, accounting for 35% of cases. This finding aligns with existing literature where *Pseudomonas* is recognized as the predominant pathogen in chronic suppurative otitis media, especially in cases with persistent otorrhea. The organism's ability to thrive in moist environments and form biofilms makes it particularly difficult to eradicate. *Staphylococcus aureus* was the second most common isolate (25%), followed by *Proteus mirabilis* (15%), *Escherichia coli* (10%), and *Klebsiella pneumoniae* (7.5%). Notably, 7.5% of cases yielded no bacterial growth, which could be attributed to prior empirical antibiotic use or inadequate sampling.

The antibiotic sensitivity pattern revealed a concerning yet informative picture. Among gram-negative organisms, *Pseudomonas* and *Proteus* species exhibited high sensitivity to amikacin (88.9%), piperacillin-tazobactam (92.6%), and imipenem (96.3%). Gentamicin (81.5%) and ciprofloxacin (74.1%) also showed

considerable efficacy. However, resistance to ceftazidime (66.7% sensitivity) indicates emerging resistance to third-generation cephalosporins, likely due to their widespread use in both hospital and community settings. These results suggest that aminoglycosides and carbapenems remain highly effective against gram-negative pathogens in COM, although cautious use is warranted to prevent resistance development. (11)

Staphylococcus aureus isolates demonstrated good sensitivity to gentamicin (90%), clindamycin (90%), and linezolid (100%). The universal sensitivity to linezolid underscores its role as a reserve drug for resistant gram-positive infections. Ciprofloxacin and ceftriaxone showed moderate sensitivity (80% and 70%, respectively), while amoxicillin-clavulanate had relatively lower efficacy (60%), possibly due to widespread over-the-counter use.

The findings of this study emphasize the importance of culture-directed antibiotic therapy in managing COM, especially in an era of increasing antimicrobial resistance. Empirical therapy should be based on local antibiograms to ensure appropriate coverage and reduce treatment failure. Moreover, regular surveillance of microbial patterns and resistance trends is crucial for updating treatment protocols.

Conclusion:

In conclusion, *Pseudomonas aeruginosa* and *Staphylococcus aureus* remain the principal pathogens in COM. Amikacin, piperacillin-tazobactam, imipenem, and linezolid showed the highest sensitivity in gram-negative and gram-positive organisms, respectively. These results highlight the necessity of routine microbial analysis and rational antibiotic use to improve patient outcomes and minimize resistance.

References:

1. Wan Draman WNA, Md Daud MK, Mohamad H, Hassan SA, Abd Rahman N. Evaluation of the current bacteriological profile and antibiotic sensitivity pattern in chronic suppurative otitis media. Laryngoscope Investig Otolaryngol. 2021 Oct 18;6(6):1300-1306.
2. Md Daud MK, Noor M, Abd Rahman N, Sidek DS, Mohamad A. The effect of mild hearing loss on academic performance in primary school children. Int J Pediatr Orl. 2010;74:67-70. [DOI]
3. Church DL. Biochemical tests for the identification of aerobic bacteria. Clinical Microbiology Procedures Handbook. 4th ed. Washington, DC: American Society of Microbiology; 2016:3-17.
4. Wayne PA. Performance Standards for Antimicrobial Disc Susceptibility Testing. Vol 12. National Committee for Clinical Laboratory Standards; 2002:1-53.
5. Bakari AA, Adoga AA, Afolabi OA, Kodiya AM, Ahmad BM. Pattern of chronic suppurative otitis media at the National Ear Care Centre Kaduna, Nigeria. J Med Trop. 2010;12:22-25.
6. Chirwa M, Mulwafu W, Aswani JM, Masinde PW, Mkakosya R, Soko D. Microbiology of chronic suppurative otitis media at Queen Elizabeth central hospital, Blantyre, Malawi: a cross-sectional descriptive study. Malawi Med J. 2015;27:120-124.
7. Ayson PN, Lopez JEG, Llanes EGDV. Chronic suppurative otitis media: bacteriology and drug sensitivity patterns at the Quirino Memorial Medical Center (2004-2005): a preliminary study. Philipp J Otolaryngol Head Neck Surg. 2006;21:20-23.
8. Loy AHC, Tan AL, Lu PKS. Microbiology of chronic suppurative otitis media in Singapore. Singapore Med J. 2002;43:296-299.
9. Zahid T, Zeba A, Aqeel Z. Microbiology of chronic suppurative otitis media (CSOM) in tertiary care setup, Civil Hospital Karachi, Pakistan. Pak J Surg. 2016;32:176-180.
10. Mansoor T, Musani MA, Khalid G, Kamal M. Pseudomonas aeruginosa in chronic suppurative otitis media: sensitivity spectrum against various antibiotics in Karachi. J Ayub Med Coll Abbottabad. 2009;21:120-123. [PubMed] [Google Scholar]
11. Mohamad H, Md Daud MK, Hasan H, Wong CY. Does fungal infection is the main cause for persistent middle ear otorrhea? Egypt J Ear Nose Throat Allied Sci. 2017;18:79-82.