

Bacterial Isolates and Their Antimicrobial Susceptibility Patterns in Chronic Suppurative Otitis Media: A Tertiary Care Hospital-Based Study

Pranat N. Majmudar¹, Dharmishtha Sutariya², Neel Devendra Parmar³, Druma Vaidya⁴

¹Associate Professor, Department of Otorhinolaryngology & Head & Neck surgery, GMERS Medical College, Dharpur, Patan, Gujarat, India

²Tutor, Department of Microbiology, GMERS Medical College, Navsari, Gujarat, India

³Assistant Professor, Department of Otorhinolaryngology, Gujarat Adani Institute of Medical Sciences, Bhuj, Kachchh, Gujarat, India

⁴Ph.D., Research Advisor, Department of Research and Development, KSKV Kachchh University, Bhuj, Kachchh, Gujarat, India

Abstract

Background: Chronic otitis media is a persistent inflammatory disease of the middle ear associated with recurrent ear discharge and may lead to significant morbidity if inadequately treated. The bacterial profile and antimicrobial susceptibility of causative organisms may vary between populations and healthcare settings. Knowledge of local bacterial patterns and antimicrobial susceptibility is therefore important for appropriate management. The aim is to analyze the bacterial profile and antimicrobial susceptibility patterns of isolates in patients with chronic otitis media and to examine the age and gender distribution of these patients. **Material and Methods:** A hospital-based descriptive cross-sectional study was conducted among 150 patients diagnosed with chronic otitis media. Demographic characteristics including age and gender were recorded. Ear discharge specimens were collected under aseptic precautions and subjected to bacteriological culture and identification. The isolated organisms were tested for antimicrobial susceptibility using standard susceptibility testing procedures. The distribution of bacterial isolates and their antimicrobial susceptibility patterns were expressed using frequencies and percentages. **Results:** Among the 150 patients, *Pseudomonas aeruginosa* was the predominant bacterial isolate, accounting for 120 (80.00%) isolates, while *Staphylococcus aureus* was isolated in 30 (20.00%) cases. The largest proportion of patients belonged to the 16–25-year age group (36.66%), followed by the 46–55-year age group (23.33%). Males constituted 56.67% of the study population and females 43.33%. The left ear was affected in 50.00% of patients, while bilateral involvement was observed in 3.33%. Mucosal chronic otitis media was predominant (80.00%). Among *P. aeruginosa*, sensitivity was highest to colistin (100%), followed by ceftazidime, piperacillin-tazobactam and meropenem (95.80% each). Ciprofloxacin showed 50.00% sensitivity. Among *S. aureus*, teicoplanin, vancomycin and linezolid demonstrated 100% sensitivity, whereas ciprofloxacin showed no sensitive isolates. **Conclusion:** *Pseudomonas aeruginosa* was the predominant bacterial isolate in patients with chronic otitis media. Substantial variation was observed in antimicrobial susceptibility among the isolated organisms, emphasizing the importance of bacteriological culture and susceptibility testing for appropriate antimicrobial selection and local surveillance of resistance patterns.

Keywords: Antimicrobial susceptibility, Chronic otitis media, *Pseudomonas aeruginosa*, *Staphylococcus aureus*.

Received: 05 September 2026

Revised: 20 September 2026

Accepted: 01 October 2026

Published: 08 October 2026

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a persistent inflammatory condition of the middle ear characterized by recurrent or continuous ear discharge through a perforated tympanic membrane. It remains an important otological problem, particularly in developing countries, where overcrowding, poor socioeconomic conditions, inadequate hygiene, recurrent upper respiratory tract infections, and limited access to healthcare may contribute to its occurrence. If inadequately treated, chronic infection may lead to persistent hearing impairment and potentially serious extracranial and intracranial complications. Identification of the microorganisms responsible for infection is therefore important for appropriate clinical management.^[1,2]

The microbiological profile of CSOM is diverse and may vary considerably according to geographical region, patient population, environmental factors, prior antibiotic exposure, and local prescribing practices. Both Gram-positive and Gram-negative organisms have been isolated from

chronically discharging ears. *Pseudomonas aeruginosa* and *Staphylococcus aureus* are among the organisms frequently reported in patients with CSOM, although other bacteria including *Proteus*, *Klebsiella*, *Escherichia coli*, and other Gram-negative bacilli may also be encountered.^[1,3] Such variation emphasizes the importance of determining the bacterial profile within individual healthcare settings rather than relying entirely on previously reported microbiological patterns.

Antimicrobial therapy plays an important role in controlling

Address for correspondence: Dr. Dharmishtha Sutariya, Tutor, Department of Microbiology, GMERS Medical College, Navsari, Gujarat, India.
E-mail: dharusutariya7@gmail.com

DOI:
10.21276/amit.2026.v13.i3.1103

How to cite this article: Majmudar PN, Sutariya D, Parmar ND, Vaidya D. Bacterial Isolates and Their Antimicrobial Susceptibility Patterns in Chronic Suppurative Otitis Media: A Tertiary Care Hospital-Based Study. *Acta Med Int.* 2026;13(3):537-541.

active infection in CSOM. However, empirical antibiotic treatment without knowledge of the causative organism and its susceptibility profile may result in inadequate therapeutic response. Vishwanath et al. emphasized the importance of microbiological assessment for optimizing initial antimicrobial therapy in patients with chronic suppurative otitis media.^[2] Similarly, studies evaluating ear discharge cultures have demonstrated substantial differences in antimicrobial susceptibility among bacterial isolates, indicating that antibiotic selection should ideally be guided by locally available bacteriological and susceptibility data.^[4] The emergence of antimicrobial resistance has further complicated the management of chronic ear infections. Repeated or inappropriate use of antibiotics, incomplete treatment courses, and widespread empirical antimicrobial therapy can contribute to the selection of resistant organisms. Studies from tertiary care settings have demonstrated changing bacterial profiles and variable susceptibility to commonly prescribed antimicrobial agents.^[5,6] Periodic surveillance of bacterial isolates and their antimicrobial susceptibility patterns is therefore essential for monitoring local resistance trends and supporting rational antibiotic use. The spectrum of organisms associated with CSOM may also change over time. Shilpa et al. reported contemporary microbiological trends in patients with CSOM and highlighted the importance of understanding prevailing organisms and their antimicrobial sensitivity patterns.^[7] Mofatteh et al. similarly demonstrated that bacterial pathogens isolated from patients with chronic suppurative otitis media exhibit varying antibiotic susceptibility patterns, reinforcing the need for culture and susceptibility testing in the management of persistent ear discharge.^[8]

In addition to microbiological characteristics, the demographic distribution of CSOM is clinically relevant. The condition can affect individuals across different age groups, while age-related exposure to predisposing factors and healthcare-seeking behaviour may influence its observed distribution. Differences according to sex have also been reported across study populations. Evaluation of age and gender together with bacteriological findings can therefore provide a broader epidemiological profile of patients presenting to a tertiary care facility.^[9,10]

Considering the variation in bacterial isolates and antimicrobial susceptibility across populations and healthcare settings, institution-specific surveillance is important for guiding empirical therapy until culture results become available. The present study was therefore undertaken to analyze the bacterial profile and antimicrobial susceptibility patterns of isolates obtained from patients with chronic otitis media and to examine the age and gender distribution of these patients.

MATERIALS AND METHODS

This hospital-based descriptive cross-sectional study was conducted among 150 patients diagnosed with chronic otitis media who presented to the Department of Otorhinolaryngology of a tertiary care hospital during the study period. Patients of all eligible age groups and both

genders who presented with persistent or recurrent ear discharge and fulfilled the clinical diagnostic criteria for chronic otitis media were considered for inclusion. Patients who were unwilling to participate, those with inadequate specimens, and those in whom an appropriate ear discharge specimen could not be obtained were excluded from the study. A total of 150 eligible patients were enrolled after obtaining informed consent.

Demographic and clinical information was recorded using a structured data collection form. Details including age, gender, presenting complaints, affected ear, duration of ear discharge, and relevant treatment history were documented. The patients were categorized into appropriate age groups to assess the age distribution of chronic otitis media, and the distribution according to gender was also determined.

Ear discharge specimens were collected under aseptic precautions using sterile swabs, taking care to minimize contamination from the external auditory canal. The collected specimens were transported promptly to the microbiology laboratory for bacteriological examination. Samples were inoculated onto appropriate culture media and incubated under standard laboratory conditions. Bacterial isolates obtained after incubation were identified on the basis of colony morphology, Gram staining, and appropriate biochemical tests according to standard microbiological procedures. The frequency and percentage distribution of individual bacterial species were recorded to determine the bacterial profile of the study population.

Antimicrobial susceptibility testing of the bacterial isolates was performed using the standard Kirby–Bauer disc diffusion method on Mueller–Hinton agar. Antibiotics appropriate for the isolated Gram-positive and Gram-negative organisms were tested, and the zones of inhibition were measured and interpreted according to the applicable laboratory standards. Each bacterial isolate was categorized as susceptible, intermediate, or resistant to the antimicrobial agents tested. The susceptibility and resistance patterns of individual bacterial species were subsequently analyzed to identify the antibiotics demonstrating the greatest in-vitro activity against the predominant isolates.

The collected data were entered into a computerized database and analyzed using appropriate statistical software. Continuous variables such as age were summarized using mean and standard deviation or other appropriate descriptive measures, while categorical variables including age groups, gender, bacterial isolates, and antimicrobial susceptibility patterns were expressed as frequencies and percentages. Appropriate statistical tests were applied wherever required, and a p-value of <0.05 was considered statistically significant. The study was conducted after obtaining approval from the Institutional Ethics Committee, and confidentiality of patient information was maintained throughout the study.

RESULTS

[Table 1] shows that *Pseudomonas aeruginosa* was the predominant bacterial isolate, identified in 120 (80.00%) samples, whereas *Staphylococcus aureus* was isolated from 30 (20.00%) samples. Thus, Gram-negative *P. aeruginosa* constituted the majority of bacterial isolates in the study population.

As shown in [Table 2], the largest proportion of patients belonged to the 16–25 years age group, comprising 55 (36.66%) patients, followed by the 46–55 years group with 35 (23.33%) patients. The 26–35 years and 36–45 years groups comprised 25 (16.67%) and 20 (13.34%) patients, respectively, while the 5–15 years group accounted for 15 (10.00%) patients. Males constituted 85 (56.67%) of the study population, while females accounted for 65 (43.33%). [Table 3] demonstrates the distribution according to the affected ear and type of chronic otitis media. The left ear was involved in 75 (50.00%) patients, followed by the right ear in 70 (46.67%) patients, while bilateral involvement was observed in 5 (3.33%) patients. With regard to the type of chronic otitis media, the mucosal type was predominant, accounting for 120 (80.00%) patients, whereas the squamousal type was observed in 30 (20.00%) patients. The antimicrobial susceptibility pattern of *Pseudomonas*

aeruginosa is presented in [Table 4]. The highest sensitivity was observed with colistin, to which all 120 (100.00%) isolates were sensitive. Ceftazidime, piperacillin-tazobactam and meropenem each demonstrated sensitivity in 115 (95.80%) isolates. Cefepime, cefoperazone and tobramycin showed sensitivity in 90 (75.00%) isolates each, while amikacin showed sensitivity in 85 (70.80%) isolates. Ciprofloxacin demonstrated comparatively lower sensitivity, with 60 (50.00%) isolates being sensitive. [Table 5] presents the antimicrobial susceptibility pattern of *Staphylococcus aureus*. Teicoplanin, vancomycin and linezolid demonstrated 100.00% sensitivity, with all 30 isolates being sensitive to each antibiotic. Cotrimoxazole showed sensitivity in 25 (83.34%) isolates. Penicillin G, clindamycin and gentamicin demonstrated sensitivity in 15 (50.00%) isolates each. Erythromycin showed sensitivity in 5 (16.67%) isolates, whereas none of the *S. aureus* isolates showed sensitivity to ciprofloxacin.

Table 1: Distribution of Bacterial Isolates

Organism isolated	Frequency (n=150)	Percentage (%)
<i>Pseudomonas aeruginosa</i>	120	80.00
<i>Staphylococcus aureus</i>	30	20.00
Total	150	100.00

Table 2: Age and Sex Distribution of Patients with Chronic Otitis Media

Variable	Category	Frequency (n=150)	Percentage (%)
Age group (years)	5–15	15	10.00
	16–25	55	36.66
	26–35	25	16.67
	36–45	20	13.34
	46–55	35	23.33
Sex	Male	85	56.67
	Female	65	43.33
Total		150	100.00

Table 3: Distribution According to Ear Affected and Type of Chronic Otitis Media

Variable	Category	Frequency (n=150)	Percentage (%)
Ear involved	Left	75	50.00
	Right	70	46.67
	Bilateral	5	3.33
Type of COM	Mucosal	120	80.00
	Squamosal	30	20.00

Table 4: Antibiotic Susceptibility Pattern of *Pseudomonas aeruginosa*

S. No.	Antibiotic	Number of sensitive strains	Resistant strains	Percentage of sensitive strains (%)
1	Ceftazidime	115	5	95.80
2	Ciprofloxacin	60	55	50.00
3	Cefepime	90	15	75.00
4	Cefoperazone	90	10	75.00
5	Piperacillin-tazobactam	115	5	95.80
6	Tobramycin	90	30	75.00
7	Amikacin	85	35	70.80
8	Meropenem	115	5	95.80
9	Colistin	120	0	100.00

Table 5: Antibiotic Susceptibility Pattern of *Staphylococcus aureus*

S. No.	Antibiotic	Number of sensitive strains	Resistant strains	Percentage of sensitive strains (%)
1	Ciprofloxacin	0	30	0.00
2	Cotrimoxazole	25	5	83.34
3	Erythromycin	5	25	16.67
4	Penicillin G	15	15	50.00
5	Clindamycin	15	15	50.00
6	Gentamicin	15	5	50.00
7	Teicoplanin	30	0	100.00

8	Vancomycin	30	0	100.00
9	Linezolid	30	0	100.00

DISCUSSION

The present study evaluated the bacterial profile and antimicrobial susceptibility patterns among 150 patients with chronic otitis media, along with their age and gender distribution. The microbiological analysis demonstrated that *Pseudomonas aeruginosa* was the predominant isolate, accounting for 120 (80.00%) isolates, whereas *Staphylococcus aureus* accounted for 30 (20.00%). The predominance of *P. aeruginosa* indicates an important role of Gram-negative organisms in chronic ear infections and is consistent with the microbiological variation reported in different healthcare settings. Previous studies have also emphasized that the bacterial spectrum of chronic suppurative otitis media may vary according to geographical location, patient characteristics and local antimicrobial exposure.^[11,12]

In the present study, patients aged 16–25 years constituted the largest age group, accounting for 36.66% of the study population, followed by those aged 46–55 years. Males represented 56.67% of the participants, while females constituted 43.33%. This distribution demonstrates that chronic otitis media was encountered across a broad age range, with a modest male predominance. Varshney et al. emphasized that the microbiological characteristics of chronic suppurative otitis media have changed over time and that demographic characteristics form an important component of epidemiological assessment.^[12]

The left ear was involved in 50.00% of patients, while right-sided involvement was observed in 46.67% and bilateral disease in 3.33%. The mucosal type of chronic otitis media predominated, accounting for 80.00% of cases, whereas the squamous type accounted for 20.00%. The predominance of mucosal disease in the present study provides useful information regarding the clinical pattern of chronic otitis media in the study population.

The antimicrobial susceptibility findings demonstrated considerable variation among the bacterial isolates. Among *P. aeruginosa*, colistin showed 100% sensitivity, while ceftazidime, piperacillin-tazobactam and meropenem each showed 95.80% sensitivity. Cefepime, cefoperazone and tobramycin demonstrated 75.00% sensitivity, whereas amikacin showed 70.80% sensitivity. Ciprofloxacin showed comparatively lower sensitivity, with only 50.00% of isolates being sensitive. These findings demonstrate that susceptibility to commonly used antimicrobial agents can vary substantially and support the importance of culture-based susceptibility testing in patients with persistent or recurrent ear discharge. Studies examining contemporary bacterial patterns in chronic suppurative otitis media have similarly highlighted changing antimicrobial susceptibility profiles.^[11,13]

The comparatively lower susceptibility to ciprofloxacin observed in *P. aeruginosa* is of particular interest because fluoroquinolones are commonly used in the management of chronic ear infections. Increasing resistance to frequently

used antimicrobial agents can reduce the effectiveness of empirical treatment and may necessitate modification of therapy according to microbiological findings. Kawatra et al. also emphasized the importance of determining the prevailing bacterial pathogens and their antibiogram in chronic suppurative otitis media to support appropriate antimicrobial selection.^[14] Among *S. aureus* isolates, teicoplanin, vancomycin and linezolid demonstrated 100% sensitivity. Cotrimoxazole showed sensitivity in 83.34% of isolates, while penicillin G, clindamycin and gentamicin showed 50.00% sensitivity each. Erythromycin demonstrated sensitivity in only 16.67% of isolates, while no sensitivity to ciprofloxacin was observed. The marked variation in susceptibility among *S. aureus* isolates highlights the importance of local antimicrobial surveillance. Wan Draman et al. similarly demonstrated variability in bacterial susceptibility patterns among patients with chronic suppurative otitis media and stressed the importance of current local microbiological data for antibiotic selection.^[13]

The findings of the present study are also relevant in the context of antimicrobial resistance. Chronic ear infections may require repeated antimicrobial treatment, and repeated exposure to antibiotics can contribute to the selection of resistant organisms. The presence of reduced susceptibility to several commonly used agents in the current study suggests that empirical therapy should be considered carefully, particularly in patients who fail to respond to initial treatment. Mofatteh et al. reported differences in susceptibility among bacterial pathogens isolated from chronic suppurative otitis media, supporting the need for bacteriological examination and antimicrobial susceptibility testing in appropriate cases.^[11]

The predominance of *P. aeruginosa* and the observed antimicrobial susceptibility pattern in the present study should, however, be interpreted within the context of the study population and hospital setting. Microbiological profiles can differ between institutions and geographic regions because of differences in patient characteristics, antibiotic prescribing practices and local resistance patterns. Therefore, hospital-specific surveillance remains useful for guiding empirical treatment while culture and susceptibility results are awaited. Recent studies have similarly emphasized the continuing need for periodic assessment of bacterial isolates and their antimicrobial susceptibility patterns in chronic suppurative otitis media.^[12,14,15]

CONCLUSION

The present study demonstrated that *Pseudomonas aeruginosa* was the predominant bacterial isolate among patients with chronic otitis media, followed by *Staphylococcus aureus*. The study population showed a slight male predominance, with the 16–25-year age group representing the largest proportion of patients. Mucosal chronic otitis media was more frequently observed than the squamous type. *P. aeruginosa* showed high susceptibility to colistin, ceftazidime, piperacillin-tazobactam and meropenem, whereas reduced susceptibility was observed with ciprofloxacin. Among *S. aureus*, complete sensitivity was observed to teicoplanin, vancomycin and linezolid, while lower

susceptibility was observed with erythromycin and ciprofloxacin. These findings highlight the importance of local bacterial surveillance and antimicrobial susceptibility testing for guiding appropriate treatment of chronic otitis media.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Sharma S, Rehan HS, Goyal A, Jha AK, Upadhyaya S, Mishra SC. Bacteriological profile in chronic suppurative otitis media in Eastern Nepal. *Trop Doct*. 2004;34(2):102-4.
2. Vishwanath S, Mukhopadhyay C, Prakash R, Pillai S, Pujary K, Pujary P. Chronic suppurative otitis media: optimizing initial antibiotic therapy in a tertiary care setup. *Indian J Otolaryngol Head Neck Surg*. 2012;64(3):285-9.
3. Prakash R, Juyal D, Negi V, Pal S, Adekhandi S, Sharma M, et al. Microbiology of chronic suppurative otitis media in a tertiary care setup of Uttarakhand state, India. *N Am J Med Sci*. 2013;5(4):282-7.
4. Agarwal A, Kumar D, Goyal A, Goyal S, Singh N, Khandewal G. Microbiological profile and their antimicrobial sensitivity pattern in patients of otitis media with ear discharge. *Indian J Otol*. 2013;19(1):5-8.
5. Harshika YK, Sangeetha S, Prakash R. Microbiological profile of CSOM and their antibiotic sensitivity pattern in a tertiary care hospital. *Int J Curr Microbiol Appl Sci*. 2015;4(12):735-43.
6. Govindaraj S, Iype JV, Srinivasa V, Jayendiran S. Bacteriological profile and their antibiotic susceptibility pattern in chronic suppurative otitis media (TTD) in a tertiary care hospital. *Int J Otorhinolaryngol Head Neck Surg*. 2019;5(4):871-5.
7. Shilpa C, Sandeep S, Thanzeemunisa U, Prakash BG, Radhika S, Virender S. Current microbiological trends of chronic suppurative otitis media in a tertiary care centre, Mysuru, India. *Indian J Otolaryngol Head Neck Surg*. 2019;71(Suppl 2):1449-52.
8. Mofatteh MR, Shahabian Moghaddam F, Yousefi M, Namaei MH. A study of bacterial pathogens and antibiotic susceptibility patterns in chronic suppurative otitis media. *J Laryngol Otol*. 2018;132(1):41-5.
9. Sharma K, Aggarwal A, Khurana PMS. Comparison of bacteriology in bilaterally discharging ears in chronic suppurative otitis media. *Indian J Otolaryngol Head Neck Surg*. 2010;62(2):153-7.
10. Rangaiah ST, Dudda R, Hanumanth Prasad M, Balaji NK, Sumangala B, Gudikote MM. Bacteriological profile of chronic suppurative otitis media in a tertiary care hospital. *Int J Otorhinolaryngol Head Neck Surg*. 2017;3(3):514-8.
11. Mahajan T, Dass A, Gupta N, Chander J. Bacteriological profile in attico-antral type of chronic suppurative otitis media. *Indian J Otolaryngol Head Neck Surg*. 2019;71(Suppl 2):1412-21.
12. Varshney S, Gupta P, Kumar SK, Mohanty A, Gupta N. Chronic suppurative otitis media: a microbiological review of 20 years. *Indian J Otol*. 2020;26(2):59-67.
13. Wan Draman WN, Hashim R, Ishak A, Hanafiah M, Mohamad I. Evaluation of the current bacteriological profile and antibiotic sensitivity pattern in chronic suppurative otitis media. *Laryngoscope Invest Otolaryngol*. 2021;6(4):797-803.
14. Kawatra R, Pandey S, Agarwal A, Tholia J. Evaluation of the current bacterial pathogens and antibiogram of chronic suppurative otitis media in adults. *Indian J Otolaryngol Head Neck Surg*. 2023;75(4):3072-6.
15. Patel KN, Shrimali GP, Thakor N. Bacteriological profile isolated from cases of otitis media diagnosed at tertiary care hospital of Gujarat, India. *Int J Res Med Sci*. 2016;4(9):3891-4.