

Microbiological Profile and Antibiotic Sensitivity Pattern in Untreated Otorrhea, in Western Gujarat**Purnima¹, Dhruvraj Patel², Sushil Kumar G. Jha³, Vraj Shah², Alina J.S.², Pallavi Panchal²**¹Associate Professor, Department of Otorhinolaryngology, Government Medical College, Bhavnagar, Gujarat, India²Resident, Department of Otorhinolaryngology, Government Medical College, Bhavnagar, Gujarat, India³Professor, Department of Otorhinolaryngology, Government Medical College, Bhavnagar, Gujarat, India

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Abstract:**Introduction:** Chronic suppurative otitis media (CSOM) is a chronic inflammatory disease of the middle ear characterized by persistent or recurrent ear discharge through a perforated tympanic membrane. Local bacteriological profiles and antimicrobial susceptibility patterns may vary over time and between regions, making periodic surveillance clinically relevant.**Aim:** To study the bacteriological profile and antimicrobial susceptibility pattern of ear discharge in adult patients who have not used medication.**Method:** A prospective observational cross-sectional study was conducted, including sixty patients aged more than 18 years with untreated tubo-tympanic CSOM. Ear discharge samples were collected under aseptic conditions and subjected to Gram staining and aerobic culture.**Results:** *Pseudomonas aeruginosa* was the predominant isolate in 31 cases (51.7%), showing the highest susceptibility to meropenem (100%) and imipenem (93.5%), with lower susceptibility to ciprofloxacin (45.2%) and levofloxacin (35.5%). *Staphylococcus aureus* was found in 13 cases (21.7%), showing maximum susceptibility to linezolid (100%), clindamycin (92.3%), and gentamicin (92.3%), while resistance was highest to penicillin G (69.2%) and ciprofloxacin (61.5%).**Conclusion:** Reduced susceptibility to commonly used fluoroquinolones highlights the importance of culture-directed treatment, rational antimicrobial use, periodic surveillance of local resistance patterns, and the use of adjuvant methods like regular aural toileting and acetic acid ear drops.**Keywords:** Chronic Suppurative Otitis Media; CSOM; Ear Discharge; *Pseudomonas Aeruginosa*; *Staphylococcus Aureus*; Antimicrobial Susceptibility; Antibiotic Resistance.**DOI:** 10.25258/ijcpr.18.10.41This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Chronic suppurative otitis media (CSOM) is characterized by persistent or recurrent ear discharge through a perforated tympanic membrane and remains an important cause of chronic ear disease and hearing impairment. It often occurs secondary to acute upper respiratory tract infections and can also be caused by allergy, functional and anatomical changes in the middle ear or eustachian tube.[1] The tubo-tympanic type of CSOM is characterised primarily by mucosal disease with a central tympanic membrane perforation. The microbiological profile varies according to geographical region, disease activity, and prior antimicrobial exposure. Our Sir Takhatsinhji Hospital, Bhavnagar, is a tertiary care hospital that caters to a large rural population. They have a lower

propensity to self-medicate with over-the-counter medications for ear discharge. Chronic suppurative otitis media has a polymicrobial but consistently recognizable bacteriological profile, most often involving *Pseudomonas aeruginosa* and *Staphylococcus aureus*; antimicrobial susceptibility testing reveals substantial resistance to commonly prescribed antibiotics and important local variation in sensitivity patterns. [1,2]

Aims and Objective

This study aims to evaluate the bacteriological profile and antimicrobial susceptibility patterns of ear discharge in patients with active tubo-tympanic CSOM. To achieve this, the research focuses on isolating and identifying the specific bacterial

pathogens present in ear discharge, determining the predominant causative organisms responsible for infection, and establishing their susceptibility to various antimicrobial agents. Ultimately, the study seeks to generate local evidence to guide rational empirical antibiotic therapy, particularly in clinical settings where microbiological culture and sensitivity testing facilities are unavailable.

Materials and Methods

The study used a prospective observational cross-sectional design at the tertiary care centre, Sir Takhtasinhji Hospital, Bhavnagar, located in western Gujarat. It enrolled 60 adults older than 18 years who presented with active tubo-tympanic chronic suppurative otitis media with chronic ear discharge. Patients were excluded if they had used topical antibiotic ear drops within the previous 30 days, were receiving topical or systemic antibiotics, had atticotympanic CSOM, or had ear discharge from causes other than CSOM.

Ear discharge specimens were collected aseptically with sterile swabs before any topical medication was administered, then processed by Gram staining and aerobic culture on Blood Agar and MacConkey Agar. Bacterial isolates were identified using standard microbiological methods based on colony morphology, Gram-staining characteristics, and relevant biochemical tests, while antimicrobial susceptibility was assessed by the Kirby-Bauer disc diffusion method and interpreted according to CLSI criteria. The resulting data were analyzed descriptively, with categorical variables reported as frequencies and percentages.

Result

Among 60 patients, 36 (60%) were male, and 24 (40%) were female. More than 50% of patients were from age group of 25 to 55 years (Table 1). 94% of patients in study were from Lower and Middle socioeconomic status (Figure 1). *Pseudomonas aeruginosa* was the predominant isolate in 31 cases (51.7%), followed by *Staphylococcus aureus* in 13 (21.7%). (Table 2)

Table 1: Age Distribution

Age group (years)	Number	Percentage
18-25	11	18.3
>25-40	16	26.7
>40-55	15	25.0
>55-70	13	21.7
>70	5	8.3
Total	60	100.0

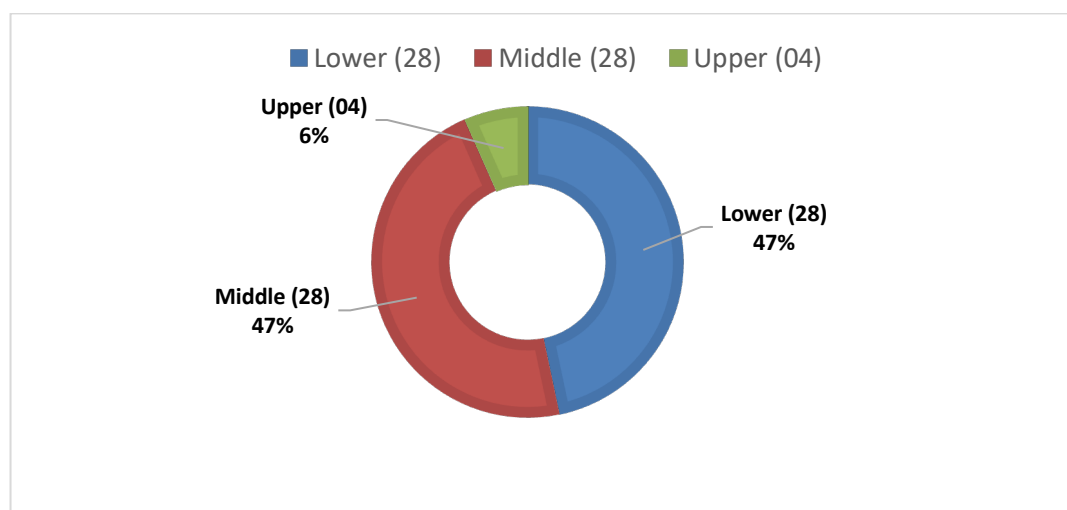


Figure 1: Socioeconomic status

Table 2: Organisms Isolated from Middle Ear Discharge

Organism	Number	Percentage
<i>Pseudomonas aeruginosa</i>	31	51.7
<i>Staphylococcus aureus</i>	13	21.7
<i>Escherichia coli</i>	8	13.3
<i>Klebsiella pneumoniae</i>	4	6.7
No growth	4	6.7
Total	60	100.0

Pseudomonas aeruginosa exhibited the highest susceptibility to meropenem (100%) and imipenem (93.5%). Susceptibility to ciprofloxacin (45.2%) and levofloxacin (35.5%) was comparatively low. *Staphylococcus aureus* demonstrated maximum susceptibility to linezolid (100%), followed by clindamycin (92.3%) and gentamicin (92.3%). Resistance was highest to penicillin G (69.2%) and ciprofloxacin (61.5%). The study found favourable activity of aminoglycosides and carbapenems against *Escherichia coli*, with reduced susceptibility to fluoroquinolones. *Klebsiella pneumoniae* showed susceptibility to the majority of antibiotics.

Discussion

Most of the patients our tertiary care centre caters, are from predominantly rural backgrounds, who do not give due consideration to symptoms, that do not affect daily activities, like ear discharge. This negligent behaviour makes them less likely to seek medical attention even in the form of over-the-counter medications. The probability of these patients for regular follow up is also low, due to lack of public transportation and connectivity issues. The predominance of lower and middle socioeconomic groups (95%) in our study is consistent with the recognised association of chronic ear disease with overcrowding, poor hygiene, recurrent respiratory infection, nutritional disadvantage, and delayed access to health care.[3]

The two most common organisms which were reported in this study are *P. aeruginosa* (51.7%) and *S. Aureus* (21.7%), which is substantiated by previous studies conducted in India and also in other Asian and Sub-Saharan countries.[1,4,5] A meta-analysis of 33 sub-Saharan African studies identified *P. aeruginosa* in 23-25% and *S. aureus* in 18-27% of otitis media isolates.[1] In contrast, a similar study conducted in Nepal found *S. aureus* to be the most common organism (43.3%) and *P. aeruginosa* in only 7.2%, highlighting substantial geographical variation.[4] In India, multiple studies conducted between 2010 to 2023 in various regions of Rajasthan, Karnataka, Pondicherry and Uttarakhand also produced results implicating these two organisms.[3,5-7]

In our institution, a study conducted in 2014 reported *P. aeruginosa* (40.95%) and *S. aureus* (24.76%) as the predominant isolates[8] another study conducted in 2016 reported *P. aeruginosa* in 31% and *S. aureus* in 35% of cases[9] and now, ten years later, our study found *P. aeruginosa* (51.7%) and *S. Aureus* (21.7%). This change in microbial pattern suggests periodic evaluation is needed even in the same geographical region. The higher proportion in the present study may be due to including only untreated patients and the persistence of biofilm-producing *Pseudomonas* in chronically discharging ears. Such variation supports the value

of institution-specific surveillance and cautions against adopting an empiric regimen solely based on data from other regions.

In this study, *P. aeruginosa* demonstrated complete susceptibility to meropenem and 93.5% susceptibility to imipenem, but substantially lower susceptibility to ciprofloxacin (45.2%) and levofloxacin (35.5%). Similar activity of reserve antipseudomonal drugs has been reported from Western Rajasthan, where *P. aeruginosa* showed high susceptibility to colistin, piperacillin-tazobactam and ceftazidime.[5] In Karnataka, ciprofloxacin susceptibility of *P. aeruginosa* was only 47.3%, closely matching our findings. [3]

Staphylococcus aureus was most susceptible to linezolid (100%), clindamycin and gentamicin (92.3% each), while resistance to penicillin G and ciprofloxacin was high. This pattern broadly agrees with the earlier Samanth et al. 2017 study, in which Gram-negative isolates retained susceptibility to meropenem, aztreonam and piperacillin, while Gram-positive isolates were susceptible to vancomycin and gentamicin.[9] In Karnataka and Western Rajasthan, *S. aureus* showed 100% susceptibility to linezolid and vancomycin.[3] [5]

A study conducted in Odisha, showed marked resistance of *S. aureus* to penicillin and cephalosporins and substantial beta-lactam resistance in *P. aeruginosa*, supporting the need for culture-guided therapy.[10] By contrast, the study conducted in Pondicherry found high overall sensitivity to amikacin, and the study in Uttarakhand also reported maximum sensitivity to amikacin (95.5%), ceftriaxone (83.4%) and gentamicin (82.7%).[6] [7] The study in Rajasthan, additionally reported high resistance to ampicillin, amoxicillin-clavulanate and cotrimoxazole, with emerging multidrug resistance among *Pseudomonas* isolates.[11] *E. coli* and *Klebsiella* showed sensitivity to Gentamicin(100%), Levofloxacin(100%) and Ciprofloxacin(75%) in our study.

The excellent in-vitro activity of carbapenems against *P. aeruginosa* should not lead to routine empiric carbapenem use. These agents are systemic reserve antibiotics and should be preserved for severe infection, complications, or culture-proven resistant disease when other options are ineffective. Multiple studies support adjuvant methods like aural toileting and instilling acetic acid ear drops, along with topical antibiotic ear drops to reduce bacterial load.[12,13] This is clinically relevant because, even with lower susceptibility, fluoroquinolones are commonly used in chronic ear infections, so adjuvant methods can be added with routinely prescribed ear drops to increase effectiveness. Studies have demonstrated fungal isolates and *Mycobacterium tuberculosis*, illustrating that non-

bacterial causes should also be considered when standard antibacterial treatment fails.[14] Hence, all patients with chronic ear discharge should preferably undergo culture and sensitivity testing.

Conclusion

Collectively, these Indian studies support the present finding that antimicrobial susceptibility in CSOM is geographically variable, hence reserve antibiotics should not be used empirically without consideration of regional microbial pattern. Periodic microbial surveillance and culture-guided antimicrobial use, are therefore essential to improve treatment success and avoid indiscriminate use of reserve antibiotics resulting in their resistance. Adjuvant methods like regular ear toileting, acetic acid ear drops etc. should be used along with the routinely prescribed ear drops, to increase efficacy.

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