



Original Article

Bacteriological Profile and Antibiotic Susceptibility Pattern in Tubotympanic Chronic Suppurative Otitis Media at a Tertiary Care Centre in Coastal Odisha: A Prospective Observational Study

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ABSTRACT

Background: Chronic suppurative otitis media (CSOM) is a common chronic infection of the middle ear, particularly prevalent in developing countries and rural populations. Increasing antimicrobial resistance among causative organisms has made empirical treatment increasingly difficult.

Aim: To identify the bacteriological profile of tubotympanic CSOM and determine the antibiotic susceptibility pattern of the isolated organisms.

Materials and Methods: This prospective observational study was conducted over a period of two years among 150 patients with mucosal type CSOM attending the Department of Otorhinolaryngology at a tertiary care centre in Odisha. Ear discharge specimens were collected aseptically and subjected to Gram staining, culture, and antibiotic susceptibility testing using standard microbiological techniques.

Results: Among the isolates obtained, *Pseudomonas aeruginosa* was the predominant organism (38%), followed by *Escherichia coli* (14.7%) and *Staphylococcus aureus* (13%). Most isolates demonstrated sensitivity to ciprofloxacin, amikacin, piperacillin-tazobactam, and carbapenems. Emerging resistance to ciprofloxacin was observed among *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *E. coli* isolates.

Conclusion: *Pseudomonas aeruginosa* remains the most common pathogen causing tubotympanic CSOM. Continuous surveillance of antimicrobial susceptibility patterns is essential for rational antibiotic usage and formulation of effective empirical treatment protocols.

Keywords: Chronic suppurative otitis media, CSOM, *Pseudomonas aeruginosa*, Antibiotic resistance, Ciprofloxacin resistance.

INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of the middle ear and mastoid mucosa associated with recurrent or persistent ear discharge through a perforated tympanic membrane for at least two weeks [1]. The disease remains one of the major causes of preventable hearing loss worldwide, particularly in developing countries with poor socioeconomic conditions [11].

The mucosal or tubotympanic variety of CSOM is generally considered the “safe” type because it is less commonly associated with intracranial complications [3]. However, persistent infection can lead to significant morbidity, including conductive hearing loss, impaired language development in children, and reduced quality of life.

CSOM is polymicrobial in nature and may involve both aerobic and anaerobic bacteria [4,5]. The most frequently isolated organism is *Pseudomonas aeruginosa* [6], followed by *Staphylococcus aureus* [7]. *Pseudomonas aeruginosa* possesses the ability to form biofilms, thereby contributing to multidrug resistance and chronicity of infection [8]. Other commonly isolated pathogens include *Escherichia coli*, *Klebsiella* species, *Proteus* species, and *Staphylococcus epidermidis* [9,10].

The prevalence of CSOM is strongly influenced by factors such as poor hygiene, overcrowding, malnutrition, low socioeconomic status, and inappropriate antibiotic use [11,12]. Irrational antibiotic therapy and emerging antimicrobial resistance have further complicated the management of CSOM [13].

Periodic assessment of bacteriological profiles and antibiotic susceptibility patterns is therefore essential for effective empirical therapy [14]. Considering the changing microbial trends and increasing antibiotic resistance, particularly in coastal regions of India, the present study was undertaken to identify the common bacterial isolates in tubotympanic CSOM and determine their antimicrobial susceptibility patterns.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of Otorhinolaryngology at Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, over a period of two years from March 2024 to November 2025.

Ethical Approval

The study was approved by the Institutional Ethics Committee vide letter no. KIIT/KIMS/IEC/1719/2024.

Study Population

A total of 150 patients clinically diagnosed with tubotympanic CSOM were included in the study. Patients presenting with active ear discharge and tympanic membrane perforation who had not received antibiotic therapy within one week prior to enrollment were included [15].

Inclusion Criteria

- Patients with active tubotympanic CSOM
- Presence of ear discharge
- Patients not receiving antibiotic therapy

Exclusion Criteria

- Patients receiving antibiotics during sample collection

Sample Collection

A detailed clinical history was obtained from all patients. The external auditory canal was cleaned with sterile swabs, and purulent middle ear discharge was collected aseptically using sterile curved swabs introduced through the perforated tympanic membrane.

The collected samples were subjected to Gram staining and cultured on Blood agar and MacConkey agar plates at 37°C overnight [16]. Identification of bacterial isolates was performed using standard microbiological techniques.

Antibiotic Susceptibility Testing

Antibiotic susceptibility testing was carried out using the microdilution method. Minimum inhibitory concentration (MIC) values were determined for various antibiotics including fluoroquinolones, aminoglycosides, carbapenems, cephalosporins, polymyxins, and beta-lactam combinations.

RESULTS

A total of 150 patients were included in the study. Of these, 85 (56.7%) were males and 65 (43.3%) were females. Right ear involvement was observed in 78 patients (52%), left ear involvement in 69 patients (46%), and bilateral disease in 3 patients (2%).

The most common bacterial isolate was *Pseudomonas aeruginosa* accounting for 57 isolates (38%), followed by *Escherichia coli* with 22 isolates (14.7%) and *Staphylococcus aureus* with 20 isolates (13%). Other organisms isolated included *Acinetobacter* species (6%), *Klebsiella* species (2%), *Klebsiella oxytoca* (1.3%), *Serratia* species (1.3%), and *Staphylococcus epidermidis* (1.3%). Mixed infections involving *Klebsiella*, *Proteus*, *E. coli*, and *Pseudomonas* species were also identified.

No microbial growth was observed in a small proportion of cases despite appropriate incubation.

Antibiotic Susceptibility Pattern

Pseudomonas aeruginosa

The isolates demonstrated sensitivity to amikacin (56.1%), piperacillin–tazobactam (52.6%), meropenem (44%), ciprofloxacin (26.3%), imipenem (21%), ceftazidime (15%), and ceftipime (14%).

Staphylococcus aureus

The isolates were sensitive to amikacin (70%), gentamicin (60%), tigecycline (55%), erythromycin (50%), ciprofloxacin (40%), linezolid (40%), vancomycin (35%), teicoplanin (35%), and daptomycin (30%).

Escherichia coli

The isolates showed maximum sensitivity to tigecycline (91%), amikacin (73%), meropenem (68%), azithromycin (68%), colistin (64%), piperacillin–tazobactam (54.5%), and ceftazidime (54%).

Other Organisms

Acinetobacter species showed good sensitivity to cefoperazone, polymyxin B, cotrimoxazole, imipenem, and amikacin. *Klebsiella* isolates demonstrated sensitivity to colistin, tigecycline, piperacillin–tazobactam, and carbapenems.

Emerging ciprofloxacin resistance was noted particularly among *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *E. coli* isolates.

DISCUSSION

CSOM continues to be a significant health burden in developing countries, especially among individuals belonging to lower socioeconomic groups [11]. In the present study, a slight male predominance was observed, comparable to studies conducted by Deb et al. [19], Sharma et al. [20], and Hiremath et al. [21]. Unilateral disease was more common than bilateral involvement, similar to findings reported in previous studies [22].

The predominant isolation of *Pseudomonas aeruginosa* observed in the present study is consistent with reports from several studies worldwide [6,13,19]. The ability of *Pseudomonas aeruginosa* to form biofilms and survive in moist environments contributes to its persistence and multidrug resistance [8].

An important finding of the present study was the emergence of ciprofloxacin-resistant isolates. Ciprofloxacin remains one of the most commonly prescribed topical antibiotics in CSOM because of its broad-spectrum activity and affordability. However, increasing resistance among *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *E. coli* poses a serious therapeutic challenge [17].

Alternative antibiotics such as piperacillin–tazobactam, imipenem, meropenem, and amikacin demonstrated better sensitivity patterns in resistant isolates. These findings emphasize the importance of culture-guided therapy in persistent and recurrent CSOM cases.

The emergence of mixed infections involving Gram-negative organisms such as *Klebsiella*, *Proteus*, and *E. coli* also highlights the polymicrobial nature of CSOM. Similar observations have been documented in previous studies [4,5].

Quinolones, particularly ciprofloxacin, continue to demonstrate good efficacy against many Gram-negative isolates. Nevertheless, the increasing emergence of resistant strains necessitates periodic regional surveillance and rational antibiotic use [18].

CONCLUSION

Pseudomonas aeruginosa was the most common bacterial isolate in tubotympanic CSOM followed by *Escherichia coli* and *Staphylococcus aureus*. Most isolates remained sensitive to aminoglycosides, carbapenems, and beta-lactam combinations. However, emerging resistance to ciprofloxacin among common pathogens is a growing concern.

Regular monitoring of bacteriological profiles and antibiotic susceptibility patterns is essential for selecting appropriate empirical therapy and preventing further antimicrobial resistance.

Limitations

- Single-centre study
- Limited sample size
- Anaerobic cultures were not extensively evaluated

- Long-term follow-up of resistant isolates was not performed

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Nil.

Conflicts of Interest

None declared.

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