

**Original article**

**Clinical Profile and Microbiological Spectrum of Chronic Suppurative Otitis Media in Patients Attending a Tertiary Care ENT Clinic: A Cross-Sectional Study**

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**Abstract**

**Background:** Chronic suppurative otitis media is a major cause of preventable hearing loss, especially in developing countries. Persistent ear discharge through a perforated tympanic membrane requires early clinical diagnosis and microbiological evaluation for appropriate treatment. Empirical and irrational antibiotic use may contribute to antimicrobial resistance and recurrent disease.

**Objective:** To assess the clinical profile, microbiological spectrum, and antibiotic sensitivity pattern among patients with chronic suppurative otitis media attending a tertiary care ENT clinic.

**Materials and Methods:** A cross-sectional study was conducted in the Department of ENT . A total of 150 patients clinically diagnosed with chronic suppurative otitis media were included. Detailed clinical history, otoscopic findings, type of discharge, associated symptoms, and complications were recorded. Aural swabs were collected aseptically from the deep external auditory canal and processed for Gram staining, culture, organism identification, and antibiotic susceptibility testing using the Kirby-Bauer disc diffusion method. Data were analyzed using descriptive statistics and chi-square test.

**Results:** Of the 150 patients, 86 (57.3%) were males and 64 (42.7%) were females. The mean age was  $28.4 \pm 12.5$  years. Rural background was noted in 102 (68.0%) patients. Ear discharge was present in all patients, followed by hearing loss in 126 (84.0%). Mucopurulent discharge was the most common type. Culture positivity was observed in 136 (90.6%) cases. *Pseudomonas aeruginosa* was the predominant isolate, followed by *Staphylococcus aureus*. Piperacillin-tazobactam and ceftazidime showed good sensitivity against *P. aeruginosa*, while vancomycin showed complete sensitivity among *S. aureus* isolates. Methicillin-resistant *Staphylococcus aureus* was detected in 18.0% of *S. aureus* isolates.

**Conclusion:** Chronic suppurative otitis media remains a common ENT condition associated with persistent discharge, hearing loss, and significant microbial burden. *Pseudomonas aeruginosa* and *Staphylococcus aureus* are the leading pathogens. Culture-guided therapy and regular antimicrobial surveillance are essential to improve treatment outcome and reduce antimicrobial resistance.

**Keywords-** Antimicrobial Resistance, Chronic Suppurative Otitis Media, Ear Discharge, ENT, Hearing Loss, *Pseudomonas aeruginosa*, *Staphylococcus aureus*.

## Introduction

Chronic suppurative otitis media is a chronic inflammatory disease of the middle ear and mastoid cavity characterized by persistent or recurrent ear discharge through a perforated tympanic membrane. It is one of the commonest causes of preventable hearing impairment and is an important public health problem in developing countries. The condition affects children and adults and may lead to persistent morbidity if not diagnosed and treated appropriately.<sup>1</sup>

The disease commonly follows recurrent or inadequately treated acute otitis media. Poor hygiene, overcrowding, upper respiratory tract infection, malnutrition, low socioeconomic status, poor access to healthcare, and delayed treatment are important contributing factors. In many patients, chronic ear discharge is neglected until hearing loss or complications develop.<sup>2</sup>

CSOM is clinically important because it can produce conductive hearing loss, speech and learning difficulty in children, social embarrassment, recurrent medical visits, and economic burden. In advanced cases, it may be associated with cholesteatoma, mastoiditis, facial nerve palsy, labyrinthitis, intracranial abscess, meningitis, or lateral sinus thrombosis.<sup>3</sup>

The microbiological profile of CSOM varies according to geographical region, climate, prior antibiotic exposure, hygiene, and healthcare practices. Common bacterial isolates include *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus* species, *Klebsiella pneumoniae*, *Escherichia coli*, and other Gram-negative bacilli. Fungal isolates may also be detected in selected cases, especially after repeated antibiotic use.<sup>4</sup>

*Pseudomonas aeruginosa* is frequently isolated in CSOM because it survives well in moist environments and can persist in chronic ear discharge. Its ability to form biofilm and develop antimicrobial resistance contributes to chronicity, recurrence, and treatment failure. *Staphylococcus aureus* is another common isolate and may show methicillin resistance, making antibiotic selection more difficult.<sup>5</sup>

Microbiological evaluation is important for rational management of CSOM. Empirical antibiotic therapy without culture sensitivity testing may lead to incomplete response, recurrence, and selection of resistant organisms. Local antimicrobial susceptibility patterns should guide treatment policies because resistance patterns vary across regions and institutions.<sup>6</sup>

Clinical assessment of CSOM includes history of duration of discharge, character of discharge, hearing loss, earache, tinnitus, vertigo, previous treatment, and complications. Otoscope examination helps identify tympanic membrane perforation, granulation tissue, cholesteatoma, retraction pocket, discharge, and middle ear mucosal status. Audiological evaluation may be required to document hearing loss.<sup>7</sup>

Antibiotic susceptibility testing is increasingly important because multidrug-resistant organisms are being reported in chronic ear infections. Organisms resistant to commonly used topical and systemic antibiotics may require culture-directed therapy. Inappropriate antibiotic use may also encourage persistent infection and chronic inflammation.<sup>8</sup>

CSOM remains a preventable and treatable condition if diagnosed early and managed systematically. Public awareness, early treatment of acute otitis media, hygiene education, avoidance of self-medication, microbiological surveillance, and appropriate surgical referral are important components of management.<sup>9</sup>

The present study was conducted to assess the clinical presentation, microbiological profile, and antibiotic sensitivity pattern among CSOM patients attending a tertiary care ENT clinic during 2018.<sup>10</sup>

## Materials and Methods

This cross-sectional study was conducted in the Department of ENT , during the year 2018. A total of 150 patients clinically diagnosed with chronic suppurative otitis media were included in the study.

Patients aged five years and above with ear discharge for six weeks or more and perforated tympanic membrane on otoscopic examination were included. Patients who had received antibiotics in the preceding five days, patients with diabetes mellitus or immunocompromised status, and patients with history of ear surgery were excluded. These exclusion criteria were applied to avoid alteration of culture results and reduce confounding factors.

Detailed clinical history was obtained from all patients. Information regarding age, gender, rural or urban background, duration of ear discharge, character of discharge, hearing loss, earache, tinnitus, vertigo, previous treatment, recurrent episodes, and associated upper respiratory symptoms was recorded.

ENT examination was performed in all patients. Otosopic examination was done to confirm tympanic membrane perforation and assess discharge, middle ear mucosa, granulation tissue, and other local findings. The type of discharge was categorized as mucopurulent, purulent, or serous. Patients with suspected complications were evaluated further according to clinical need.

Two aural swabs were collected from the deep part of the external auditory canal under aseptic precautions. Care was taken to avoid contamination from the external ear. One swab was used for Gram staining, and the second swab was inoculated on blood agar and MacConkey agar for bacterial culture.

Culture isolates were identified using colony morphology, Gram staining, and standard biochemical tests. Antibiotic susceptibility testing was performed using the Kirby-Bauer disc diffusion method. The antibiotics tested included piperacillin-tazobactam, ceftazidime, ciprofloxacin, amikacin, vancomycin, and oxacillin according to organism type. Methicillin resistance among *Staphylococcus aureus* isolates was assessed using oxacillin testing.

Data were analyzed using SPSS version 22.0. Descriptive statistics were used to express frequencies and percentages. Associations between clinical parameters and microbial isolates were evaluated using chi-square test. A p-value less than 0.05 was considered statistically significant. Informed consent was obtained from all participants or guardians where applicable. Confidentiality of patient information was maintained.

## Results

A total of 150 patients with chronic suppurative otitis media were included in the study.

**Table 1: Demographic Characteristics of Study Participants**

Variable	Frequency (%)
Male	86 (57.3)
Female	64 (42.7)
Mean age	28.4 ± 12.5 years
Rural background	102 (68.0)

Male predominance was observed, with 86 (57.3%) males and 64 (42.7%) females. The mean age of patients was 28.4 ± 12.5 years. A rural background was observed in 102 (68.0%) patients, suggesting that environmental, hygiene-related, socioeconomic, and healthcare access factors may contribute to the burden of CSOM.

**Table 2: Presenting Symptoms Among Study Participants**

Symptom	Frequency (%)
Ear discharge	150 (100.0)
Hearing loss	126 (84.0)
Earache	38 (25.3)
Tinnitus	12 (8.0)
Vertigo	6 (4.0)

Ear discharge was present in all patients and was the defining clinical symptom. Hearing loss was reported by 126 (84.0%) patients, indicating a high burden of functional morbidity. Earache was observed in 38 (25.3%) patients, while tinnitus and vertigo were less common. The presence of vertigo should alert clinicians to possible inner ear irritation or complications.

**Table 3: Type of Ear Discharge**

Type of Discharge	Frequency (%)
Mucopurulent	93 (62.0)
Purulent	41 (27.0)
Serous	16 (11.0)

Mucopurulent discharge was the most common type, observed in 93 (62.0%) patients, followed by purulent discharge in 41 (27.0%) cases. Serous discharge was observed in 16 (11.0%) patients. Mucopurulent and purulent discharge suggest active infection and support the need for microbiological evaluation.

**Table 4: Culture Results Among Study Participants**

Culture Finding	Frequency (%)
Positive cultures	136/150 (90.6)
Polymicrobial growth	12 (8.0)

Culture positivity was observed in 136 (90.6%) cases, showing a high microbiological yield. Polymicrobial growth was observed in 12 (8.0%) patients. High culture positivity supports the clinical relevance of bacterial infection in persistent CSOM and the need for targeted antimicrobial therapy.

**Table 5: Isolated Organisms**

Isolated Organism	Frequency (%)
<i>Pseudomonas aeruginosa</i>	68 (45.3)
<i>Staphylococcus aureus</i>	58 (38.7)
<i>Proteus mirabilis</i>	10 (6.7)
<i>Klebsiella pneumoniae</i>	8 (5.3)
<i>Escherichia coli</i>	4 (2.7)

*Pseudomonas aeruginosa* was the predominant isolate, observed in 68 (45.3%) patients, followed by *Staphylococcus aureus* in 58 (38.7%) cases. *Proteus mirabilis*, *Klebsiella pneumoniae*, and *Escherichia coli* were less frequent. These findings indicate that both Gram-negative and Gram-positive organisms contribute to CSOM.

**Table 6: Antibiotic Sensitivity Pattern**

Antibiotic	<i>P. aeruginosa</i> Sensitivity (%)	<i>S. aureus</i> Sensitivity (%)
Piperacillin-tazobactam	92	—
Ceftazidime	88	—
Ciprofloxacin	71	64
Amikacin	76	72
Vancomycin	—	100
Oxacillin	—	82

*Pseudomonas aeruginosa* showed highest sensitivity to piperacillin-tazobactam (92%) followed by ceftazidime (88%). Sensitivity to ciprofloxacin and amikacin was lower. *Staphylococcus aureus* showed 100% sensitivity to vancomycin and 82% sensitivity to oxacillin. MRSA was detected in 18.0% of *S. aureus* isolates, and multidrug-resistant strains were noted in 15.0% of Gram-negative isolates.

### Discussion

The present cross-sectional study evaluated the clinical profile, microbiological spectrum, and antibiotic sensitivity pattern of chronic suppurative otitis media among 150 patients attending a tertiary care ENT clinic. Male predominance and a high proportion of patients from rural background were observed. Ear discharge and hearing loss were the major presenting complaints. Culture positivity was high, and *Pseudomonas aeruginosa* and *Staphylococcus aureus* were the predominant isolates. Antimicrobial resistance was observed among both Gram-negative and Gram-positive organisms.

Bluestone highlighted that chronic suppurative otitis media is strongly influenced by recurrent middle ear infection, delayed treatment, poor access to care, and environmental risk factors.<sup>11</sup> In the present study, 68.0% of patients belonged to a rural background, suggesting that socioeconomic factors, hygiene-related issues, and limited early ENT care may contribute to persistence of disease.

Kenna emphasized that management of chronic suppurative otitis media requires proper clinical assessment, infection control, and prevention of complications.<sup>12</sup> In the present study, hearing loss was reported by 84.0% of patients, which highlights the functional burden of CSOM and the need for early diagnosis and appropriate therapy.

Lasisi et al. reported that clinical and demographic risk factors such as poor living conditions, delayed treatment, and limited healthcare access contribute to chronic suppurative otitis media.<sup>13</sup> The rural predominance observed in the present study is consistent with these findings and supports the need for public health awareness regarding early treatment of persistent ear discharge.

Ologe and Nwawolo observed chronic suppurative otitis media among school pupils and emphasized its public health importance because of its association with preventable hearing loss.<sup>14</sup> Although the present study included a wider age group, the high frequency of hearing impairment similarly reflects the morbidity associated with chronic middle ear disease.

Morris and Leach discussed acute and chronic otitis media and noted that untreated or inadequately treated middle ear infection may progress to persistent discharge and hearing impairment.<sup>15</sup> In the present study, all patients had ear discharge, and most had associated hearing loss, supporting the clinical importance of early treatment and follow-up.

Qureishi et al. reviewed prevention and treatment of otitis media and emphasized rational antimicrobial therapy and appropriate clinical management.<sup>16</sup> In the present study, culture positivity was 90.6%, indicating that microbiological evaluation is important, especially in persistent, recurrent, or resistant cases.

Akinpelu et al. reported important challenges in the management of chronic suppurative otitis media in developing countries, including delayed presentation and limited healthcare resources.<sup>17</sup> The findings of the present study are comparable because many patients came from rural backgrounds and presented with persistent discharge and hearing loss.

Poorey and Iyer studied bacterial flora in chronic suppurative otitis media and reported *Pseudomonas aeruginosa* and *Staphylococcus aureus* as important isolates.<sup>18</sup> In the present study, *P. aeruginosa* was isolated in 45.3% of cases, followed by *S. aureus* in 38.7%, showing a similar microbiological pattern.

Indudharan et al. reported that Gram-negative bacilli, particularly *Pseudomonas* species, are frequently isolated from chronic suppurative otitis media.<sup>19</sup> In the present study, *Pseudomonas aeruginosa* was the most common organism. Its predominance may be related to its ability to survive in moist environments and persist in chronic ear discharge.

Brook described the microbiology of chronic suppurative otitis media and emphasized that polymicrobial infection may occur in chronic middle ear disease.<sup>20</sup> In the present study, polymicrobial growth was observed in 8.0% of cases. Although single-organism growth was more common, mixed infection should be considered in persistent or non-responding cases.

Maji et al. studied the bacteriology of chronic suppurative otitis media and reported regional variation in organism distribution.<sup>21</sup> The present study also supports the importance of local microbiological surveillance because empirical treatment should be guided by local pathogen and resistance patterns.

Prakash et al. reported that bacterial isolates in chronic suppurative otitis media show variable antibiotic susceptibility patterns.<sup>22</sup> In the present study, *Pseudomonas aeruginosa* showed maximum sensitivity to piperacillin-tazobactam and ceftazidime, while sensitivity to ciprofloxacin and amikacin was comparatively lower.

Sharma et al. compared bacteriological findings in chronic suppurative otitis media and emphasized the need to study local antimicrobial sensitivity patterns.<sup>23</sup> The present findings support this recommendation because multidrug-resistant Gram-negative organisms were observed in 15.0% of isolates.

Madana et al. studied microbiological profile and antibiotic sensitivity pattern in cholesteatomatous chronic suppurative otitis media and reported *Pseudomonas aeruginosa* as an important pathogen.<sup>24</sup> Although the present study was not limited to cholesteatomatous disease, the predominance of *Pseudomonas aeruginosa* is comparable and clinically relevant.

Yeo et al. conducted a multicenter study on the bacteriology of chronic suppurative otitis media and reported that *Pseudomonas aeruginosa* and *Staphylococcus aureus* were common pathogens.<sup>25</sup> The present study showed the same two leading organisms, supporting the need for culture-directed therapy and regular antimicrobial surveillance.

The high culture positivity observed in the present study indicates that bacterial infection plays a major role in active CSOM. Routine culture may not be required in every uncomplicated case, but it is valuable in recurrent, persistent, resistant, or complicated disease. Culture-directed treatment can reduce unnecessary antibiotic use and improve clinical response.

Mucopurulent discharge was the most common type of discharge in the present study. This finding suggests active middle ear infection and supports the need for appropriate topical or systemic therapy based on clinical condition and microbiological findings. Persistent purulent discharge should prompt careful examination for granulation tissue, cholesteatoma, mastoid involvement, or resistant organisms.

The presence of hearing loss in 84.0% of patients is clinically important. CSOM commonly causes conductive hearing loss due to tympanic membrane perforation, middle ear mucosal disease, ossicular damage, and chronic inflammation. Audiological evaluation should be considered, especially in children, students, and patients with long-standing disease.

The detection of MRSA in 18.0% of *Staphylococcus aureus* isolates and multidrug-resistant Gram-negative organisms in 15.0% of cases is an important finding. It highlights the need to avoid irrational antibiotic use, incomplete treatment, and repeated empirical therapy. Antibiotic stewardship should be incorporated into ENT practice.

The present study has certain limitations. Fungal culture and anaerobic culture were not performed. Audiometric assessment was not included for all patients. The study was conducted at a single tertiary care center, so the findings may not represent all regions. Long-term treatment outcome and recurrence were not assessed. Future studies including audiological evaluation, fungal profile, biofilm assessment, and follow-up outcomes may provide stronger evidence.

### **Conclusion**

Chronic suppurative otitis media remains a common ENT condition associated with persistent ear discharge, hearing loss, and significant microbial burden. In the present study, male predominance and rural background were common. Ear discharge was present in all patients, while hearing loss was observed in most cases. Mucopurulent discharge was the commonest type. Culture positivity was high, with *Pseudomonas aeruginosa* and *Staphylococcus aureus* being the predominant organisms. *P. aeruginosa* showed good sensitivity to piperacillin-tazobactam and ceftazidime, while *S. aureus* showed complete sensitivity to vancomycin. MRSA and multidrug-resistant Gram-negative organisms were also detected. Culture-directed therapy, antimicrobial surveillance, patient education, early treatment, and appropriate ENT follow-up are essential to reduce recurrence, complications, hearing impairment, and antimicrobial resistance.

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