ORIGINAL ARTICLE

BACTERIAL PROFILE AND ANTIBIOTIC SENSITIVITY PATTERNS IN CHRONIC SUPPURATIVE OTITIS MEDIA: A STUDY FROM LOW- AND MIDDLE-SOCIOECONOMIC COMMUNITIES IN ISLAMABAD

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Background: Chronic Suppurative Otitis Media (CSOM) is a significant cause of preventable hearing loss, particularly in children from resource-limited settings. This study aimed to identify the causative microorganisms and their antibiotic sensitivity patterns through ear discharge cultures in affected patients. **Methods:** This cross-sectional study was conducted at a tertiary care hospital in Islamabad, targeting patients from low- and middle-socioeconomic communities. A total of 106 patients diagnosed with CSOM were enrolled using a structured questionnaire. Ear discharge samples were collected and subjected to bacterial culture and antibiotic sensitivity testing to identify causative organisms and guide appropriate antimicrobial therapy. **Results:** Mucosal CSOM was more common (76.4%) than the epithelial type (23.6%). Among 102 patients, males (56) were slightly more affected than females (50), with 31.1% of cases occurring in children and young adults. Culture-positive samples identified *Enterobacter* as the common pathogen. Culture/sensitivity testing showed Imipenem to be the most effective agent, with 100% sensitivity across all isolates. **Conclusion:** CSOM was predominantly mucosal and commonly associated with upper respiratory tract infections, persistent ear discharge, and tympanic membrane perforation. *Enterobacter* was the most frequent isolate, while imipenem showed the highest sensitivity.

Keywords: Antibiotics, Cell culture, Chronic Suppurative Otitis Media, Enterobacter, Tinnitus

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INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a persistent and long-standing infection that affects the middle ear and its structures. Abbreviated as CSOM, this disease is characterised by recurrence and can lead to many intra- and extra-cranial complications. CSOM is typically seen in areas with low hygiene standards, water quality problems and overcrowded living conditions. Among children globally, CSOM has been recognized to be a common cause of avoidable hearing loss.[1] According to a report by the World Health Organisation (WHO), 65–330 million people are suffering from ear discharge worldwide.[2] Patients with CSOM typically present with painless otorrhoea persisting for 2–6 weeks and conductive hearing loss due to tympanic membrane perforation.[3]

The disease is classified into two types: Safe Type (without Cholesteatoma) and Unsafe Type (with Cholesteatoma). It is also classified based on whether it affects the pars flaccida or the pars tensa of the tympanic membrane, known as Atticoantral and Tubotympanic CSOM, respectively. CSOM causes inflammation in the middle ear cavity and the mastoid, sometimes persisting for more than 2 months. As the disease progresses, it perforates the eardrum. CSOM usually arises from recurrent or persistent acute otitis media. It should be distinguished from tympanostomy tube otorrhoea, a post-procedure complication. It is also linked to congenital anomalies and allergies that often cause Eustachian tube dysfunction, impairing middle ear function.[4,5]

Despite its high frequency, there is limited local data from Islamabad linking CSOM types with demographic factors, complications, and antibiotic resistance. In foresight, we hope that this information will help doctors and researchers by providing epidemiological data to guide appropriate antibiotic selection and improve prognosis. Misuse of antibiotics has also contributed to these changes. Many medical practitioners also resort to using these antibiotics indiscriminately, which has resulted into a chronic effect on the bacterial flora. The emergence of many resistant bacterial strains has also become a concern. We aim to provide localised data from a tertiary care hospital dealing with these communities regarding the incidence, type of pathogens, and specific antibiotics used.

The objectives of this study were to identify the specific aetiological agents responsible for CSOM among patients from low- and middle-socioeconomic communities in Islamabad, and to evaluate ear discharge culture findings for antibiotic sensitivity.

METHODOLOGY

This cross-sectional study was conducted in a low socioeconomic population to assess the clinical and demographic features of Chronic Suppurative Otitis

Media. The study targeted a population from a remote village in Islamabad, ensuring representation across diverse age groups. The study duration was 6 months. The study was approved by the Institutional Review Board of HBS Medical and Dental College (IRB letter-SUB/24/25). Informed consent was obtained from all participants or guardians of minors. The study was conducted in accordance with Declaration of Helsinki.

Convenience sampling was used to summarise the clinical and demographic data. Participants who presented with symptoms of CSOM were included in this study. Non-willing patients, who did not have a complete medical record, or had symptoms of Acute Suppurative Otitis Media or other diseases were excluded from the study.

The data from the patients were collected using a specially designed proforma, and clinical examination was performed using an otoscope to identify the abnormality in the ear canal. Age, gender, area of residence, and occupation were recorded. Duration of disease, causes, other associated diseases, symptoms, findings, diagnosis and means of diagnosis were also recorded. Ear discharge samples were collected from selected male CSOM patients for culture and antibiotic sensitivity testing. The female patients were not willing to provide samples.

The data collected was analysed on SPSS-25. Data were presented as frequencies and percentage, and sensitive (S), resistant (R), and increased exposure (I).

RESULTS

Chronic Suppurative Otitis Media (CSOM) appears to be most common in two age groups: males aged 13–25 years (21.7%) and females aged 6 months–5 years (18.87%), highlighting that both young adults and young children are particularly vulnerable. The 25–60 years age group also showed a substantial proportion of cases, especially among females (17.9%), indicating that the condition significantly affects the adult population as well. In contrast, CSOM is relatively uncommon among 6–12-year-olds (1.89% in males, almost negligible in females) and in those aged 60 years and above (5.7% in males, 0.9% in females). Overall, CSOM is slightly more prevalent in males (52.8%) than in females (47.2%), suggesting a marginally higher susceptibility in males. (Table-1).

From the total of 106 patients with CSOM, 22 were specifically selected for ear discharge culture testing. All of these patients were male, either children or young adults, and had experienced recurrent episodes of CSOM. At the time of sample collection, none of these patients were taking any antibiotics. Antibiotic sensitivity testing showed Imipenem to be the most effective agent, with 100% sensitivity across all isolated organisms. High sensitivity was also observed with Amikacin and Cefoperazone-Sulbactam (~81%), while Cefixime, Ceftriaxone, and Ciprofloxacin demonstrated high resistance rates, particularly among *Enterobacter*, *E. coli*, and *Klebsiella* species. Fluoroquinolone sensitivity was variable, with notable resistance observed for levofloxacin.

Table-1: Age and gender distribution [n (%)]

Age Group (Years)	Male	Female	Total
6 months–5 Years	13 (12.26)	20 (18.87)	33 (31.1)
6–12 Years	2 (1.89)	0 (0.0)	2 (1.89)
13–25 Years	23 (21.7)	10 (9.43)	33 (31.1)
25–60 Years	12 (11.32)	19 (17.92)	31 (29.2)
≥60 Years	6 (5.66)	1 (0.94)	7 (6.6)

Table-2: Sensitivity patterns of cultured bacteria against various antibiotics

Antibiotics	*Enterobacter Spp.* n=8	*Escherichia coli* n=4	*Klebsiella Spp.* n=6	*Proteus Spp.* n=2	*Pseudomonas aeruginosa* n=2	NR
Amikacin	S=8, R=0, I=0	S=2, R=2, I=0	S=6, R=0, I=0	S=2, R=0, I=0	S=0, R=2, I=0	0
Amoxicillin Clavulanic Acid	S=6, R=2, I=0	S=2, R=2, I=0	S=2, R=2, I=2	S=2, R=0, I=0	S=0, R=0, I=0	2
Cefixime	S=0, R=6, I=2	S=0, R=4, I=0	S=0, R=6, I=0	S=2, R=0, I=0	S=0, R=0, I=0	2
Cefoperazone + Sulbactam	S=6, R=2, I=0	S=4, R=0, I=0	S=6, R=0, I=0	S=2, R=0, I=0	S=0, R=0, I=0	2
Ceftriaxone	S=2, R=6, I=0	S=0, R=4, I=0	S=0, R=6, I=0	S=2, R=0, I=0	S=0, R=0, I=0	2
Imipenem	S=8, R=0, I=0	S=4, R=0, I=0	S=6, R=0, I=0	S=2, R=0, I=0	S=2, R=0, I=0	0
Levofloxacin	S=4, R=4, I=0	S=0, R=4, I=0	S=4, R=2, I=0	S=0, R=0, I=0	S=2, R=0, I=0	2
Tobramycin	S=6, R=0, I=2	S=2, R=2, I=0	S=6, R=0, I=0	S=0, R=2, I=0	S=0, R=0, I=0	2
Ciprofloxacin	S=2, R=6, I=0	S=0, R=4, I=0	S=2, R=4, I=0	S=0, R=2, I=0	S=0, R=2, I=0	2

S= Sensitive, R= Resistance, I= Increased Exposure, NR= Not Reported

DISCUSSION

Our study analyzed demographics and bacteriological characteristics of a total of 106 CSOM patients, a population not previously investigated. The most affected age groups were children (6 months to 5 years) and young adults (13–25 years). In a previous study conducted in a population from Karachi, the most affected group was 19–35 years[5], while a Malaysian study reported peaks in 1–10 years and >41 years[6]. Gender distribution in our study showed a slight male predominance, whereas the Karachi study reported more females (145 *vs* 55 males)[5], and an Indonesian study also showed female predominance (67 *vs* 55 males)[7]. These findings highlight demographic variations locally and internationally.

Cultures were obtained from 22 CSOM patients, all male children or young adults who had experienced recurrent episodes of CSOM and were not receiving any antibiotics at the time of sampling. Gram-negative organisms predominated, with *Enterobacter* species being the most frequently isolated pathogens. In

contrast, a study from Ethiopia[8] reported only 4 *Enterobacter* isolates among 50 Gram-negative organisms. In the current study, most of the patients had received ciprofloxacin during their initial episode of CSOM, ear discharge was collected for culture before starting any antibiotics in the recurrent episode. The results showed that the isolates were not sensitive to ciprofloxacin but were sensitive to imipenem. Co-amoxiclav showed sensitivity in 12 of the 22 isolates. Combined antibiotic therapy along with aural toilet has been reported as effective in other studies[9,10].

A Pakistani study[9] showed gram-negative bacteria were resistant to Ciprofloxacin, while a study conducted in Egypt[10], *Pseudomonas aeruginosa* (in 84.4% cases) was sensitive to ciprofloxacin. In contrast to these findings in the current study, sensitivity for imipenem was seen in 100%, for amikacin 81.2%, and for Cefoperazone+Sulbactam it was seen in 81.4%. The safest route for the treatment of CSOM should begin with the conduction of culture tests before prescribing antibiotic medications. With culture results, an appropriate line of treatment can be selected regarding causative agent and its sensitivity towards antibiotics.[11,12] Use of ciprofloxacin should only be preferred in case of *Pseudomonas aeruginosa* and should be avoided in cases with *Enterobacter spp*; the latter being the leading causative agent in the low socioeconomic settings of Islamabad. Despite better efficacy results, drugs like imipenem should be used cautiously to combat rising incidence of antibiotic resistance in gram negative bacteria, including *Pseudomonas aeruginosa* which poses a serious threat to future of treatment for bacterial diseases. Such antibiotic may be reserved for complicated cases only.[13]

The findings demonstrate considerable demographic and bacteriological variability in CSOM with *Enterobacter* as the predominant pathogen. The observed mismatch between empirical antibiotic use and culture sensitivity highlights the need for routine microbiological testing to guide drug therapy. Adopting culture-based treatment strategies may improve clinical outcomes while helping to curb inappropriate antibiotic use and emerging resistance.

CONCLUSION

Enterobacter emerged as the leading pathogen, and routine empirical use of ciprofloxacin was not consistently supported by culture findings. These results emphasize the need for early diagnosis and culture-guided, rational antibiotic therapy to reduce complications. Imipenem demonstrated the highest *in vitro* sensitivity among the isolates.

REFERENCES

1. Onifade A, Katolo HW, Mookerjee S, Bhutta MF. Epidemiology of chronic suppurative otitis media: systematic review to estimate global prevalence. J Epidemiol Glob Health 2025;15(1):55.
2. Sidam S, Sahoo AK, Mishra UP, Gupta V, Kushwah A, Sahoo PK, *et al*. Impact of chronic suppurative otitis media on quality of life and psychological well-being: A cross-sectional study. Cureus 2024;16(2).e54150. DOI:10.7759/cureus.54150
3. Rosario DC, Mendez MD. Chronic suppurative otitis. InStatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
4. Khairkar M, Deshmukh P, Maity H, Deotale V. Chronic Suppurative Otitis Media: a comprehensive review of epidemiology, pathogenesis, microbiology, and complications. Cureus 2023;15(8):e43729.
5. Anwar Z, Afaque SA, Bhatti MI, Dogar MR, Mahmood M, Anwar A. Demographical variations of sensory neural hearing loss (SNHL) in chronic suppurative otitis media (CSOM) patients at JPMC Karachi. Pakistan J Med Health Sci 2023;17(5):294–6.
6. 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;6(6):1300–6.
7. Darussalam AA, Abdullah A, Munandar As D. The relationship of age and gender on the incident of chronic supurative otitis media. Ahmad Dahlan Med J 2025;6(1):94–100.
8. Molla R, Tiruneh M, Abebe W, Moges F. Bacterial profile and antimicrobial susceptibility patterns in chronic suppurative otitis media at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. BMC Res Notes 2019;12(1):414.
9. Mittal R, Lisi CV, Gerring R, Mittal J, Mathee K, Narasimhan G, *et al*. Current concepts in the pathogenesis and treatment of chronic suppurative otitis media. J Med Microbiol 2015;64(10):1103–16.
10. Mondal T, Guha R, Chowdhary MSD, Ray S. Comparison of the effectiveness and safety of Clarithromycin and Co-Amoxyclav in acute exacerbation of chronic otitis media: a randomized, open-labeled, phase iv clinical trial. Int J Health Clin Res 2020;3(8):179–83.
11. Khan I, Osama M, Ullah I, Haq IU. Microbiological spectrum and antibiotics sensitivity pattern of chronic suppurative otitis media (CSOM) patients: a prospective study from a tertiary care hospital in Peshawar. Pak J Med Sci 2025;41(1):194–9.
12. Ahmad S. Antibiotics in chronic suppurative otitis media: A bacteriologic study. Egypt J Ear Nose Throat Allied Sci 2013;14(3):191–4.
13. Abda EM, Adugna Z, Assefa A. Elevated level of imipenem-resistant gram-negative bacteria isolated from patients attending health centers in North Gondar, Ethiopia. Infect Drug Resist 2020;13:4509–17.

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SIR: Critical review and Final approval

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