e-ISSN: 0975-9506, p-ISSN: 2961-6093

Available online on www.ijpqa.com

International Journal of Pharmaceutical Quality Assurance 2026; 17(6); 225-230

Original Research Article

A Retrospective Study of Bacterial Isolates and their Antimicrobial Susceptibility Patterns in Ear Discharge from Patients with Ear Infection at Anugrah Narayan Magadh Medical College Gaya ji Bihar

Nawlesh Singh[1], Sharad Kumar[2]

[1]Associate Professor, Department of Pharmacology, Anugrah Narayan Magadh Medical College, Gaya ji, Bihar, India

[2]Associate Professor and HOD, Department of Pharmacology, Anugrah Narayan Magadh Medical College, Gaya ji, Bihar, India

Received: 22-05-2026 / Revised: 10-06-2026 / Accepted: 30-06-2026

Corresponding Author: Dr. Nawlesh Singh

Conflict of interest: Nil

Abstract:

Background: Chronic suppurative otitis media (CSOM) is a common middle ear infection associated with persistent ear discharge and hearing impairment, particularly in developing countries. Increasing antimicrobial resistance among bacterial pathogens has made the treatment of ear infection more challenging.

Aim: To determine the bacteriological profile and antimicrobial susceptibility pattern of bacterial isolates obtained from ear discharge samples of patients with ear infections.

Methodology: A retrospective observational study was conducted at Department of Pharmacology, Anugrah Narayan Magadh Medical College, Gaya ji, Bihar, India.A total of 90 ear discharge samples were analyzed using standard microbiological culture and antibiotic sensitivity testing methods. Data regarding bacterial isolates and resistance patterns were recorded and statistically analyzed.

Result: Out of 90 samples, 68 were culture positive. Female patients and children were more commonly affected. Staphylococcus aureus, Escherichia coli, and Pseudomonas species were the predominant isolates. High resistance was observed against amoxicillin, cefixime, erythromycin, and cotrimoxazole, whereas better sensitivity was noted with gentamicin, ceftriaxone, levofloxacin, and ciprofloxacin.

Conclusion: The study highlights the importance of routine culture and antibiotic sensitivity testing for effective management of CSOM and prevention of antimicrobial resistance.

Keywords: Chronic Suppurative Otitis Media, Ear Infection, Bacterial Isolates, Antimicrobial Susceptibility, Antibiotic Resistance, Ear Discharge.

DOI: 10.25258/ijpqa.17.6.37

Introduction

One of the most prevalent infectious disorders affecting children and adults globally is chronic suppurative otitis media (CSOM), especially in poorer nations where limited healthcare “facilities, poor hygiene, overcrowding, and hunger raise the risk of infection. Any inflammation of the ear is referred to as an ear infection, and it is frequently accompanied by symptoms including fever, discomfort, hearing loss, ear pain, and ear discharge. Persistent ear discharge is regarded as one of the most prevalent clinical signs of these symptoms. Global health estimates state that between 65 and 330 million people globally have ear infections, and about 60 percent of these patients experience severe hearing loss. Chronic ear infections that induce hearing loss have a significant negative influence on social interaction, academic achievement, and quality of life in addition to impairing communication [1].

Inflammation of the tympanic membrane and middle ear cleft is known as otitis media. Otitis media can be divided into three categories based on the length and intensity of the infection: acute, subacute, and chronic suppurative. The symptoms of acute otitis media typically appear quickly and can be fully resolved with the right care. However, the infection develops into chronic suppurative otitis media when it lasts for a long time and is accompanied by frequent or continuous ear discharge through a perforated tympanic membrane. Thus, persistent otorrhea that lasts longer than six weeks and chronic middle ear inflammation linked to tympanic membrane perforation are the hallmarks of CSOM. Because of its great frequency and possible repercussions, HPV continues to be a significant public health issue in developing nations [2].

Because it can result in serious intracranial and extracranial consequences if it is not identified and treated promptly, CSOM is clinically relevant. Ossicle damage, mastoiditis, facial nerve paralysis, labyrinthitis, meningitis, brain abscess, and subdural abscess are all possible outcomes of a persistent infection. These issues significantly increase morbidity and death, particularly in areas with poor access to medical treatment. Chronic middle ear infections can also result in permanent sensorineural or conductive hearing loss, which can hinder children's speech development and lower adult productivity. To avoid long-term effects, early identification and proper treatment of CSOM are crucial [3].

Bacterial, viral, and fungal infections are all part of the complex etiology of CSOM. Nonetheless, bacteria are thought to be the main cause of persistent middle ear infections. Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae, and Escherichia coli are the most often isolated bacterial pathogens. These organisms enter the middle ear through a ruptured tympanic membrane and are frequently seen in the external auditory canal and surrounding skin. Pseudomonas aeruginosa is sometimes considered the most common bacterium among these diseases due to its capacity to last in damp conditions and withstand a variety of medications. Another significant pathogen that is known to cause recurring and chronic infections is Staphylococcus aureus. The polymicrobial character of CSOM makes therapy even more difficult and adds to the disease's chronicity [4].

Antimicrobial resistance in bacterial infections has made managing CSOM more difficult in recent years. The evolution of resistant bacterial strains has been greatly aided by the irrational and careless use of antibiotics, self-medication, unfinished treatment regimens, and the widespread availability of over-the-counter antimicrobial medications. Geographical location, prescription habits, socioeconomic factors, and the local incidence of resistant organisms all influence the antimicrobial susceptibility pattern of bacterial isolates. Antibiotics that were formerly effective may thus no longer produce adequate therapeutic results. The significance of routinely monitoring bacterial isolates and their antibiotic sensitivity trends at both local and national levels is underscored by the expanding issue of antimicrobial resistance [5].

Antibiotic sensitivity testing and microbiological culture are essential for the efficient treatment of CSOM. Clinicians may choose the best antimicrobial medication by identifying the pathogenic organisms and determining their susceptibility patterns, which lowers treatment failure, recurrence, and consequences. In persistent infections, when empirical treatment may not always be successful due to resistant organisms, culture-guided therapy is especially crucial. In addition to controlling infection, prompt and adequate antibiotic therapy reduces the risk of hearing loss and potentially fatal consequences. To update treatment recommendations and encourage the prudent use of antibiotics, regular research on bacteriological profiles and antimicrobial susceptibility patterns is required [6].

Even though the use of antibiotics has greatly decreased the frequency of CSOM-related complications, the illness still poses a large healthcare cost in many underdeveloped nations. The continuation of illness and the growth of resistance microorganisms are caused by a lack of knowledge, poor follow-up, delayed healthcare seeking behavior, and insufficient treatment. Chronic ear infections are also made more likely by socioeconomic factors such poverty, overcrowding, inadequate sanitation, and hunger. CSOM is a significant pediatric health problem because children are more sensitive due to anatomical and immunological reasons [7].

To ascertain the bacteriological profile of aerobic bacteria linked to chronic suppurative otitis media and to assess the antibiotic sensitivity pattern of the isolated organisms in patients visiting our hospital, the current investigation was conducted. To assist doctors, choose the best empirical treatment and enhance patient care, the research attempts to give up-to-date information on the most common bacterial infections and their trends in antibiotic resistance. Effective treatment, avoiding problems, and developing antibiotic stewardship initiatives all depend on an understanding of the local microbial pattern and resistance profile".

Methodology

Study Design: The present study was a hospital-based retrospective observational study conducted to evaluate the bacterial isolates and their antimicrobial susceptibility patterns in ear discharge samples of patients with ear infections attending Department of Pharmacology, Anugrah Narayan Magadh Medical College, Gaya ji, Bihar, India

Study Duration: The study was conducted over a period of one year.

Study Area: The study was carried out in the Department of Pharmacology, Anugrah Narayan Magadh Medical College, Gaya ji, Bihar, India

Sample Size: A total of 90 ear discharge samples from patients with ear infections were included in the study, of which 68 samples were culture positive.

Sampling Technique: A consecutive sampling technique was used, where all eligible ear discharge samples received during the study period were included in the study.

Inclusion criteria

- Patients of all age groups and both sexes with ear infections

- Patients presenting with ear discharge suggestive of CSOM
- Patients whose ear discharge samples were sent for culture and sensitivity testing
- Patients with complete microbiological and laboratory records available

Exclusion criteria

- Patients with incomplete laboratory or clinical records
- Contaminated or improperly collected ear discharge samples
- Duplicate samples from the same patient
- Samples showing only fungal growth
- Patients already receiving prolonged antibiotic therapy before sample collection

Data Collection: Data were collected retrospectively from microbiology laboratory registers, culture reports, and antibiotic sensitivity records maintained in the hospital. Demographic information such as age and sex of the patients, along with microbiological findings including bacterial isolates and antimicrobial susceptibility patterns, were recorded in a structured data collection sheet. Ear discharge specimens had been collected under aseptic precautions by trained healthcare personnel and processed according to standard microbiological procedures.

Procedure: Ear discharge samples collected from patients with suspected ear infections were transported to the microbiology laboratory under sterile conditions and processed immediately. The specimens were inoculated onto appropriate culture media such as blood agar and MacConkey agar and incubated aerobically at suitable temperatures for bacterial growth. Identification of bacterial isolates was performed using colony morphology, Gram staining characteristics, and standard biochemical tests. Following isolation and identification, antimicrobial susceptibility testing was carried out by the Kirby–Bauer disc diffusion method on Mueller–Hinton agar according to standard clinical laboratory guidelines.

Ethical Consideration: Ethical approval for the study was obtained from the Institutional Ethics Committee prior to commencement of data collection. Since the study was retrospective in nature and based on previously recorded laboratory data, direct patient intervention was not involved. Confidentiality and privacy of patient information were maintained throughout the study by excluding personal identifiers from the data collection sheets. All procedures were conducted in accordance with ethical principles for biomedical research involving human participants.

Statistical Analysis: The data collected were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to summarize demographic characteristics, bacterial isolates, and antimicrobial resistance patterns. Results were presented in the form of tables and charts for better interpretation. Categorical variables were expressed as proportions and percentages. The distribution of bacterial isolates according to age group and sex was analyzed systematically".

Result

Table 1 displays the sex-specific distribution of culture-positive and culture-negative cases. Of the 90 patients, 32 (35.56%) were men and 58 (64.44%) were women. Of the culture-positive cases, 25 (36.76%) were male and 43 (63.24%) were female. The results show that female patients were more likely than male patients to have ear infections with positive bacterial growth.

Table 1: Distribution of Culture Positive Cases According to Sex (n = 90)

Sex	Culture Positive n (%)	Culture Negative n (%)	Total n (%)
Female	43 (63.24)	15 (68.18)	58 (64.44)
Male	25 (36.76)	7 (31.82)	32 (35.56)
Total	**68 (100)**	**22 (100)**	**90 (100)**

Table 2 shows how different bacterial isolates are distributed across different age groups. With 15 (22.06%) cases, the age group of 0–5 years old had the most bacterial isolates, followed by the age group of 6–10 years old with 13 (19.12%) cases. The most often isolated organism was Staphylococcus aureus, which was followed by Pseudomonas species and E. coli. The findings imply that children, especially those in the lower age groups, had a higher prevalence of ear infections.

Table 2: Distribution of Bacterial Isolates According to Age Group (n = 68)

Age Group (Years)	S. aureus	E. coli	Pseudomonas spp.	Klebsiella spp.	Proteus spp.	CoNS*	Total n (%)
0–5	7	7	5	0	0	1	15 (22.06)
6–10	2	2	2	1	1	5	13 (19.12)
11–15	2	2	1	1	1	1	8 (11.76)
16–20	2	2	2	2	2	2	12 (17.65)
21–30	1	1	0	1	1	2	6 (8.82)
31–40	1	1	1	0	1	1	5 (7.35)
>40	2	1	5	1	1	0	9 (13.24)
Total	17	16	16	6	7	12	68 (100)

In Table 3, the antimicrobial resistance pattern of a variety of bacterial isolates against antibiotics that are frequently employed is illustrated. Pseudomonas species were shown to be highly resistant to amoxicillin, cefixime, erythromycin, and cotrimoxazole. While gentamicin, ceftriaxone, and levofloxacin exhibited less resistance, Staphylococcus aureus showed significant resistance to erythromycin and cotrimoxazole. Overall, the study showed that bacterial isolates were becoming more resistant to antibiotics, underscoring the need of culture-guided antibiotic therapy for the successful treatment of ear infections.

Table 3: Antimicrobial Resistance Pattern of Bacterial Isolates (n = 68)

Antibiotics	S. aureus n=17 (%)	E. coli n=10 (%)	Pseudomonas spp. n=16 (%)	Klebsiella spp. n=6 (%)	Proteus spp. n=7 (%)	CoNS n=12 (%)
AMX	6 (35.29)	7 (70.00)	12 (75.00)	4 (66.67)	5 (71.43)	2 (16.67)
CFM	7 (41.18)	5 (50.00)	13 (81.25)	4 (66.67)	3 (42.86)	10 (83.33)
CN	2 (11.76)	3 (30.00)	6 (37.50)	1 (16.67)	2 (28.57)	2 (16.67)
CRO	2 (11.76)	2 (20.00)	4 (25.00)	1 (16.67)	1 (14.29)	1 (8.33)
CIP	5 (29.41)	2 (20.00)	4 (25.00)	1 (16.67)	2 (28.57)	3 (25.00)
CE	5 (29.41)	8 (80.00)	12 (75.00)	3 (50.00)	3 (42.86)	5 (41.67)
C	3 (17.65)	2 (20.00)	13 (81.25)	2 (33.33)	3 (42.86)	4 (33.33)
CXM	4 (23.53)	3 (30.00)	11 (68.75)	4 (66.67)	3 (42.86)	3 (25.00)
DO	2 (11.76)	5 (50.00)	12 (75.00)	3 (50.00)	3 (42.86)	5 (41.67)
E	12 (70.59)	4 (40.00)	13 (81.25)	2 (33.33)	5 (71.43)	8 (66.67)
SXT	8 (47.06)	4 (40.00)	14 (87.50)	2 (33.33)	3 (42.86)	6 (50.00)
LEV	2 (11.76)	3 (30.00)	2 (12.50)	1 (16.67)	1 (14.29)	1 (8.33)

Discussion

One of the most prevalent chronic infections affecting the middle ear is still chronic suppurative otitis media (CSOM), especially in poorer nations where poor hygiene, overcrowding, starvation, and a lack of healthcare facilities greatly increase the disease's incidence. The goal of the current retrospective study was to assess the antibiotic susceptibility pattern and bacteriological profile of bacterial isolates from ear discharge samples of Darbhanga Medical College patients. The current study's conclusions offer crucial details on the prevalent microorganisms linked to ear infections and the changes in their resistance, which may aid medical professionals in choosing the best antibiotic treatment [8]."

There were 90 samples of ear fluid that were looked at in this study. Of those, 68 showed positive bacterial growth and 22 were culture negative. The study's culture positive rate suggests that bacterial pathogens are a significant contributor to persistent ear infections. Similar results have been documented in earlier research, when patients with CSOM had culture positive rates ranging from 60% to 80%. The current study's culture-negative instances might be the result of previous antibiotic usage, insufficient sample collection, the presence of anaerobic organisms, or viral and fungal infections that are not picked up by standard aerobic culture techniques [9].

According to the study, females were more likely than males to have culture-positive instances. In both the culture-positive and culture-negative groups, the majority of patients were female. While a number of academics have confirmed a male majority, certain regional studies have revealed similar findings. Variations in healthcare-seeking behavior, environmental exposure, socioeconomic conditions, and demographic characteristics of the research region may all have an impact on the variance in gender distribution. Nonetheless, the current research indicates that women in this area could be more susceptible to persistent ear infections or more inclined to seek medical care [10].

The age distribution of the bacterial isolates showed that children were more frequently impacted, especially those in the 0–5 and 6–10 age groups. This result is in line with other research showing a high incidence of CSOM in kids. Anatomical and physiological variables, including shorter and more horizontal Eustachian tubes, immature immune responses, repeated upper respiratory tract infections, malnutrition, and poor personal cleanliness, may be responsible for children's increased vulnerability. Childhood chronic ear infections are clinically relevant because, if left untreated, they can cause hearing loss, delayed speech development, poor academic performance, and social problems [11].

The most prevalent bacterial pathogen among the isolated organisms was discovered to be Staphylococcus aureus, which was followed by Escherichia coli and Pseudomonas species. These results are consistent with research done in a number of tertiary care facilities where Pseudomonas aeruginosa and Staphylococcus aureus were shown to be the most common infections in CSOM. Because they can form biofilms, endure in damp conditions, and become resistant to several medications, Pseudomonas species are very significant. The polymicrobial character of persistent ear infections is further demonstrated by the presence of Gram-negative organisms including Proteus and Klebsiella species [12].

The current study's antimicrobial susceptibility testing revealed significant resistance among the bacterial isolates to frequently administered medications. Amoxicillin, cefixime, erythromycin, and cotrimoxazole were shown to be highly resistant, especially in Pseudomonas species and Gram-negative isolates. Numerous researchers in India and other developing nations have identified similar resistance patterns. The inappropriate use of antibiotics, self-medication, unfinished treatment regimens, the availability of antimicrobial medications over the counter, and the absence of antibiotic stewardship programs are all potential causes of the rising resistance trend. These results demonstrate the increasing worry about antibiotic resistance throughout the world [13].

Additionally, the current investigation revealed that a number of bacterial isolates had comparatively reduced resistance to gentamicin, ceftriaxone, levofloxacin, and ciprofloxacin. For the treatment of persistent ear infections in the study area, these antibiotics may thus continue to be effective therapeutic alternatives. However, as resistance trends differ between geographical areas and healthcare settings, local antimicrobial susceptibility data should always serve as the basis for empirical antibiotic therapy. In order to track evolving bacterial profiles and resistance trends, periodic surveillance studies are crucial [14].

The current study's conclusions have significant therapeutic ramifications. In patients with CSOM, early detection of causative organisms and suitable culture-guided antibiotic therapy can minimize morbidity, avoid recurrence, lower treatment failure, and enhance hearing outcomes. Since untreated chronic ear infections can negatively impact language development and quality of life, prompt therapy is particularly crucial for youngsters. The burden of persistent ear infections may also be lessened by bolstering public health initiatives including better sanitation, raising knowledge of sensible antibiotic usage, encouraging early healthcare seeking, and expanding access to healthcare facilities [15].

The current study has certain limitations despite its useful findings. Because it was retrospective research, it mostly relied on previously documented laboratory data, and certain clinical data could not have been fully available. The absence of anaerobic bacterial culture and fungal research may have hampered the discovery of all potential pathogens. Additionally, because the study was limited to a single tertiary care facility, the results could not be representative of the total community. However, the study offers valuable baseline information about local bacterial isolates and patterns of antibiotic resistance in individuals with persistent ear infections [16].

Overall, the current study highlights the significance of antibiotic sensitivity testing and microbiological assessment in the efficient treatment of CSOM. Effective antibiotic stewardship techniques and the development of suitable treatment guidelines depend on going monitoring of bacterial infections and their resistance profiles.

Conclusion

The present retrospective study highlighted the bacteriological profile and antimicrobial susceptibility pattern of bacterial isolates obtained from ear discharge samples of patients with ear infections attending Darbhanga Medical College. The study demonstrated that chronic ear infections were more common among children and female patients, with Staphylococcus aureus, Escherichia coli, and Pseudomonas species being the predominant bacterial isolates. A significant level of antimicrobial resistance was observed against commonly used antibiotics such as amoxicillin, cefixime, erythromycin, and cotrimoxazole, indicating the growing problem of antibiotic resistance among pathogens associated with chronic suppurative otitis media. However, relatively better sensitivity was observed with antibiotics like gentamicin, ceftriaxone, levofloxacin, and ciprofloxacin. The findings emphasize the importance of routine microbiological culture and antibiotic sensitivity testing for appropriate selection of antimicrobial therapy. Early diagnosis, rational use of antibiotics, and continuous surveillance of re-

sistance patterns are essential for effective management of ear infections, prevention of complications, and reduction of hearing impairment associated with chronic suppurative otitis media.

References

1. Man J, Chen H, Zhang T, Yin X, Yang X, Lu M. Global, regional, and national burden of age-related hearing loss from 1990 to 2019. Aging (Albany NY). 2021 Dec 15;13(24):25944.
2. Jamal A, Alsabea A, Tarakmeh M, Safar A. Etiology, diagnosis, complications, and management of acute otitis media in children. Cureus. 2022 Aug 15;14(8).
3. Jain A, Arora N, Meher R, Passey JC, Bansal R. Intracranial complications of CSOM in pediatric patients: a persisting problem in developing countries. International Journal of Pediatric Otorhinolaryngology. 2017 Sep 1;100:128-31.
4. Khairkar M, Deshmukh P, Maity H, Deotale V. Chronic suppurative otitis media: a comprehensive review of epidemiology, pathogenesis, microbiology, and complications. Cureus. 2023 Aug 18;15(8).
5. Kumwenda P, Adukwu EC, Tabe ES, Ujor VC, Kamudumuli PS, Ngwira M, Wu JT, Chisale MR. Prevalence, distribution and antimicrobial susceptibility pattern of bacterial isolates from a tertiary Hospital in Malawi. BMC Infectious Diseases. 2021 Jan 7;21(1):34.
6. Dhingra S, Vir D, Bakshi J, Rishi P. Mapping of audiometric analysis with microbiological findings in patients with chronic suppurative otitis media (CSOM): a neglected clinical manifestation. Critical reviews in clinical laboratory sciences. 2023 Apr 3;60(3):212-32.
7. Ayisi JG, van't Hoog AH, Agaya JA, Mchembere W, Nyamthimba PO, Muhenje O, Marston BJ. Care seeking and attitudes towards treatment compliance by newly enrolled tuberculosis patients in the district treatment programme in rural western Kenya: a qualitative study. BMC public health. 2011 Jun 29;11(1):515.
8. Baquero F, Cantón R, Baquero-Artigao F. Current patterns and evolution of antibiotic resistance among bacterial pathogens involved in acute otitis media. Clinical Microbiology and Infection. 1997 Jan 1;3:3S26-33.
9. Xu F, Kong W, Peng J, Gu H, Zheng H. Analysis of main pathogenic bacteria and drug sensitivity in patients with chronic suppurative otitis media and middle ear cholesteatoma in China. Biotechnology letters. 2020 Aug;42(8):1559-66.
10. Quinn E, Najjar Z, Huhtinen E, Jegasothy E, Gupta L. Culture-positive shigellosis cases are epidemiologically different to culture-negative/PCR-positive cases. Australian and New Zealand Journal of Public Health. 2019 Feb 1;43(1):41-5.
11. Theunissen SC, Rieffe C, Kouwenberg M, De Raeve LJ, Soede W, Briaire JJ, Frijns JH. Behavioral problems in school-aged hearing-impaired children: the influence of sociodemographic, linguistic, and medical factors. European child & adolescent psychiatry. 2014 Apr;23(4):187-96.
12. Kim HJ, Na SW, Alodaini HA, Al-Dosary MA, Nandhakumari P, Dyona L. Prevalence of multidrug-resistant bacteria associated with polymicrobial infections. Journal of Infection and Public Health. 2021 Dec 1;14(12):1864-9.
13. Goldstein FW, Multicentre Study Group. Antibiotic susceptibility of bacterial strains isolated from patients with community-acquired urinary tract infections in France. European journal of clinical microbiology and infectious diseases. 2000 Mar;19(2):112-7.
14. Kanafani ZA, Sleiman A, Frem JA, Doumat G, Gharamti A, El Hafi B, Doumith M, AlGhoribi MF, Kanj SS, Araj GF, Matar GM. Molecular characterization and differential effects of levofloxacin and ciprofloxacin on the potential for developing quinolone resistance among clinical Pseudomonas aeruginosa isolates. Frontiers in microbiology. 2023 Sep 8;14:1209224.
15. Swain SK. Psychosocial impact of chronic otitis media on quality of life–A review. Journal of Indira Gandhi Institute of Medical Science. 2023 Jul 1;9(2):106-10.
16. Mohan A, Tiwari P, Bhatnagar S, Patel A, Maurya A, Dar L, Pahuja S, Garg R, Gupta N, Sahoo B, Gupta R. Clinico-demographic profile & hospital outcomes of COVID-19 patients admitted at a tertiary care centre in north India. Indian Journal of Medical Research. 2020 Jul 1;152(1-2):61-9.