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Original Research Article

Study of Common Bacteriological Agents and Antimicrobial Sensitivity Patterns in Chronic Otitis Media

Prathvi P. Nayak[1], S. Rakshitha[2], Ima Chandra[3]

[1]Department of ENT, Assistant Professor, Haveri Institute of Medical Sciences, Haveri, Karnataka, India
[2]Department of ENT, Senior Resident, ESIC medical college and PGIMSR and Model Hospital, Rajajinagar, Bangalore, Karnataka, India
[3]Department of ENT, Assistant Professor, K.V.G. Medical College and Hospital, Sullia, Karnataka, India

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Corresponding Author: Dr. Ima Chandra
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Abstract:

Background: Chronic otitis media (COM) is a significant health concern worldwide. It is associated with perforation of the tympanic membrane and ear discharge.COM can lead to life-threatening complications if not managed properly. To solve this problem we need to do culture and sensitivity of the ear discharge and start on antibiotics looking into the sensitivity patterns.

Objective: The aim of this study isto determine common Bacteriological agents in COM and antimicrobial sensitivity in the ear discharge of patients with chronic otitis media at a tertiary health institution in southern India.

Methods: A prospective cross-sectional study was conducted with 60 patients, who had clinical features of chronic otitis media with ear discharge. Ear discharge was collected using sterile swabs. This was taken for culture and sensitivity studies and bacteriological study.

Results: The study population was predominantly male (63.3%), with 77.3% of patients aged 30 years or younger. Positive aerobic cultures were obtained in 33 cases (53%). Gram-negative aerobic bacteria were the most prevalent pathogens, with Pseudomonas aeruginosa as the commonest (37.73%), followed by Staphylococcus aureus (20.75%), Escherichia coli (20.75%), and Proteus (16.98%). Isolates showed high resistance (over 70%) to traditionally used first-line antibiotics such as Penicillin, Ampicillin, and Tetracycline. However, Ciprofloxacin demonstrated high efficacy and remains a preferred first-line treatment in the region.

Conclusion: The most common organism associated with chronic otitis media in our study was Pseudomonas aeruginosa. There have been high resistance to several antibiotics in case of COM. Ciprofloxacin is a highly effective, low-cost, and preferred first-line therapy to combat this problem. Continuous surveillance of antimicrobial resistance patterns is required for effective clinical management. This also helps in preventing of irreversible complications.

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Introduction

Chronic otitis media (COM) is a chronic inflammatory condition of the middle ear cleft involving the middle ear cavity and mastoid air cell system.1 While definitions vary among clinicians, the duration of discharge required for a COM diagnosis typically ranges from two to twelve weeks.1COM is a major cause of preventable hearing loss, which can have devastating long-term effects on language development, educational progress, and communication, especially when it begins in early childhood. [1]

The complications associated with COM include meningitis, nasopharyngitis, and mastoiditis and sinus thrombosis. [2]

Otitis media (OM) is a significant health concern worldwide, particularly in developing countries and it remains a leading cause of morbidity in those areas. [3] The most common aerobic pathogens consistently identified include Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Escherichia coli, and Klebsiella species. The specific prevalence of these organisms and their susceptibility patterns can vary significantly based on local antibiotic prescribing habits. [4]

COM commonly affects children and occurs secondary to previous acute otitis or secretory otitis media. [5] Malnutrition, overcrowding, poor hygiene, illiteracy, inadequate access to healthcare are some of the factors worsening the situation. [6]

Microbiologically, Otitis media is frequently polymicrobial, involving a lot of aerobic and anaerobic bacteria as well as fungi. [7]

The widespread and often indiscriminate use of antibiotics has led to the emergence of multiple resistant bacterial strains, which can cause both primary and postoperative infections. This misuse, combined with inadequate patient follow-up, frequently results in the persistence of low-grade infections.

Because the microbiological landscape changes with the introduction of new synthetic antibiotics, there is a critical need to re-evaluate the current flora found in Chronic Suppurative Otitis Media (CSOM). [8] Identifying the in vitro antibiotic sensitivity patterns of these microbes is essential for clinicians to develop effective treatment plans for patients suffering from chronically discharging ears. [8]

Managing Chronic Suppurative Otitis Media (CSOM) remains a subject of debate and is frequently updated, particularly in developing nations. The types of bacteria involved and their antibiotic sensitivity profiles shift according to the time period and geographical location, likely due to the overuse of antibiotics. Because of these variations, it is essential to regularly update data on the prevalence and resistance patterns of these organisms to improve patient treatment and clinical management. [9]

This study, therefore, looks forward to determine the microbial profile and drug susceptibility patterns of bacterial isolates in patients with suppurative otitis media in a tertiary care hospital in southern India. Such data is essential for ensuring prompt clinical recovery, preventing irreversible sequelae and development of antibiotic resistance.

Materials and Methods

Study Design and Setting: This prospective cross-sectional study was conducted at the Ear, Nose, and Throat (ENT) clinic of a tertiary health institution in south India. The study protocol was reviewed and approved by the Institutional Ethical Committee, and informed written consent was obtained from all adult participants or the parents/guardians of pediatric before starting the study.

Study Population and Selection Criteria: The study population consisted of patients presenting with clinical evidence of chronic otitis media, characterized by persistent or intermittent ear discharge through a perforated tympanic membrane for a duration of at least 8 to 12 weeks. [3,5]

Exclusion Criteria:

- Patients who had took antibiotic therapy within the preceding one to two weeks.(systemic or topical)
- Patients with otitis externa
- Anatomical abnormalities such as cleft palate.
- Patients who didn't give consent for the study.

Specimen Collection and Transport [1,3]: Under vision using headlight, ear discharge samples were collected in sterile cotton swabs and transported to microbiology laboratory.

Laboratory Procedures

Microscopic Examination: The ear discharge was subjected to gram staining.

Culture and Identification [1,5]: Blood agar, MacConkey agar, and Chocolate agar used for inoculation. Sabouraud Dextrose Agar (SDA) supplemented with chloramphenicol used for fungal culture. Colony morphology, pigment production, and biochemical tests such as catalase, coagulase, oxidase, and urease tests were used for bacterial isolate identification.

Antimicrobial Susceptibility Testing (AST) [4-7]: The modified Kirby-Bauer disc diffusion method was employed on Mueller-Hinton agar. After 1 day of incubation, the zones of inhibition were measured and interpreted as Sensitive (S), Intermediate (I), or Resistant (R) in accordance with the latest Clinical and Laboratory Standards Institute (CLSI) guidelines.

Statistical Analysis: Statistical Package for Social Sciences (SPSS) used. A p-value of less than 0.05 was considered statistically significant for all analyses.

Results

Study Overview and Demographics

- Total Patients: 60.
- Gender: 38 males (63.3%) and 22 females (36.6%).
- 62 aural swabs (accounting for patients with bilateral discharge).
- Age Profile: approximately 46 of patients fell into the 0–30 age range.(77.3%)

Bacteriological Profile

- Positive Aerobic Cultures: 33 cases (53%).
- Culture Negative: 29 cases (47%).

Among the 33 isolated bacteria, the distribution based on the findings would be:

- Pseudomonas aeruginosa: 12 cases (37.73%).
- Staphylococcus aureus: 7 cases (20.75%).
- Escherichia coli: 7 cases (20.75%).
- Proteus: 6 cases (16.98%).
- Klebsiella: 1 case (3.77%).

Antimicrobial Susceptibility Patterns

- High Resistance: More than 70% of isolates across several studies showed resistance to Penicillin, Ampicillin, and Tetracycline.
- High Sensitivity: Quinolones—specifically Ciprofloxacin

Ciprofloxacin Sensitivity: Ciprofloxacin sensitivity in 66% of its isolates.

- Sensitive: 16 isolates.
- Intermediately sensitive: 3 isolates.
- Resistant: 3 isolates.

Discussion

COM is a major public health concern worldwide, particularly in developing countries. The high prevalence of the disease in the developing countries is due to low socioeconomic status, lack of education, overcrowding, poor hygiene, and inadequate access to healthcare. [1,3] Afolabi OA et al in his study stated that Chronic otitis media (COM) is primarily a childhood disease and thisis often attributed to the anatomical structure of the Eustachian tube in a child, which is shorter, wider, and more horizontal, facilitating the passage of pathogens from the nasopharynx to the middle ear. [3] Regarding gender, a male predominance was observed. The microbiological profile identified in this study confirms that suppurative OM is typically polymicrobial, involving a wide array of aerobic and anaerobic bacteria as well as fungi. [7,9] Gram-negative organisms were consistently found to be more prevalent than Gram-positive strains. Pseudomonas aeruginosa is frequently the leading isolate due to its ability to thrive in the warm, damp environment of the middle ear .These results were consistent with study done by Alhaik WM et al. [4] S. aureus, while sometimes considered a contaminant from the skin, remains a major primary pathogen. Other frequently isolated Gram-negative bacteria included Proteus species, Klebsiella pneumoniae, and Escherichia coli. [2]

Antimicrobial Susceptibility and Resistance Trends: Afolabi OA et al in his study found that Fluoroquinolones—specifically Ciprofloxacin—demonstrated excellent activity. Ciprofloxacin is particularly favored for its low cost, lack of ototoxicity, and availability in topical forms. Khatun MR et al in his study identified Moderate to high level of multidrug-resistance especially to 3rd generation cephalosporins, Ciprofloxacin and Amoxicillin/Clavulanate. [7]

Conclusion

The most common organisms associated with COM in our study was Pseudomonas. The study also found ciprofloxacin as a highly effective, low-cost, and preferred first-line treatment due to its sensitivity profile and lack of ototoxicity. There have been changing pattern of antimicrobial resistance and there is need of continuous studies to learn the changes in resistance to antibiotics. Proper Clinical examination of the ear is needed. Culture and sensitivity study of the ear discharge also needed to start on particular antibiotics. This helps in preventing irreversible complications.

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