

A STUDY OF AEROBIC BACTERIOLOGICAL PROFILE OF EAR DISCHARGE AND THEIR ANTIBIOTIC SENSITIVITY AT TERTIARY CARE CENTRE

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Abstract

Background: Chronic otitis media (COM) is a widely prevalent disease in developing countries. Microbiological findings in COM vary between studies. However, the bacterial spectrum most often identified in the COM-affected middle ear is dominated by *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Enterobacteriaceae* such as *Proteus* spp. and *Klebsiella pneumoniae*. This study was conducted to isolate and study the aerobic bacterial profile and antibiotic sensitivity in patients presenting with ear discharge to the ENT OPD of Northern railway central hospital, New Delhi. **Materials and Methods:** Total 112 swabs were cultured on Blood Agar (BA), MacConkey Agar (MA), and Chocolate Agar (CA), and then antibiotic susceptibility tests were done for all bacterial isolates by the Kirby-Bauer disc diffusion method. **Result:** Bacterial growth was obtained from 106 out of the 112 samples, of which 36.7% of the isolates were *Pseudomonas aeruginosa*, 16.9% were *Staphylococcus aureus*, 14.1% were *Staphylococcus epidermidis*, and 6.6% were *Klebsiella*. The maximum number of organisms were found sensitive to Gentamicin (45.2%), followed by Piperacillin-Tazobactam (38.6%), Linezolid (31.1%), Cotrimoxazole (28.3%). The maximum number of organisms were found resistant to Ciprofloxacin (58.5%), followed by Levofloxacin (37.7%), and ampicillin (33.9%). **Conclusion:** *Pseudomonas* was the most commonly isolated organism, followed by *Staphylococcus aureus* in our study. The maximum number of organisms were found sensitive to Gentamicin antibiotic, followed by the Piperacillin-Tazobactam.

INTRODUCTION

Otorrhea or aural discharge occurs as a consequence of the diseases of the ear. Otitis media in all its forms is one of the most common diseases worldwide. While acute suppurative otitis is a fairly common infection among the younger age group, chronic suppurative infection spares no age group. The aetiology of these conditions is diverse. Microbiological findings in COM vary between studies. However, the bacterial spectrum most often identified in the COM-affected middle ear is dominated by *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Enterobacteriaceae* such as *Proteus* spp. and *Klebsiella pneumoniae*. Anaerobic bacteria are commonly detected in studies of COM by applying suitable anaerobic methods for isolation. Infections are often polymicrobial and a

synergistic relationship between aerobes and anaerobes has been suggested. *Mycobacterium tuberculosis* is a rare cause of chronic infection of the middle ear, but tuberculous otomastoiditis has to be considered in a patient presenting with chronic ear discharge.^[1]

Neomycin is effective against *Staphylococcus aureus* and *Proteus* spp., but has little effect against *Streptococci*, *Pseudomonas aeruginosa*, or anaerobes, while polymyxin B is effective against *Pseudomonas*, *S. aureus* and *Proteus* spp. Chloramphenicol is effective against a wide range of organisms but is ineffective against *P. aeruginosa*. The fluoroquinolones (ciprofloxacin and ofloxacin) are effective against *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, *Staphylococci*, and *P. aeruginosa*. Otological antiseptics such as acetic acid, boric acid, and Burrow

's solution (13% aluminium acetate), have bacteriostatic and antifungal properties because of their acidic pH. They are effective against *P. aeruginosa*, *S. aureus*, *Proteus* spp. and *Candida*. The aminoglycosides, polymyxin B, chloramphenicol, and acetic acid are potentially ototoxic, the greatest risk of ototoxicity being associated with use for more than 7 days and use in a dry middle ear space. The quinolones have no known ototoxicity. With the availability of these drugs, the use of ototoxic preparations in patients with a tympanic membrane perforation should be reserved for cases with culture of an organism resistant to quinolones. Ototoxicity associated with topical use of antifungal agents has not been reported.^[2]

The aim of this study mainly, is to detect the bacterial isolates in patients with otitis media infections and also, apply their antibiotic susceptibility pattern against bacterial pathogens among patients who visited ENT Clinics in our tertiary health centre.

Aims and Objectives:

To study aerobic bacterial profile, antibiotic susceptibility and resistance pattern of patients presenting with ear discharge in ENT OPD at our institute. This study will also study the correlation between specific ear pathology and microorganisms frequently isolated.

MATERIALS AND METHODS

Study Design: Cross-Sectional Study.

Study setting: This study was conducted in the department of ENT of a tertiary care hospital in North India in collaboration with Department of Microbiology.

Study Period: 1 year

Sample size: The sample size was 110.

Inclusion criteria

Patients attending in ENT OPD with ear discharge

Exclusion criteria

1. Patients who had taken antibiotics 15 days prior to sampling
2. Malignancies

Methodology

Sample collection

The study was conducted on patients presenting with ear discharge in the outpatient department of the Department of Otorhinolaryngology, Northern Railway Central Hospital, New Delhi, in collaboration with Dept of Microbiology. Written and informed consent of patient / parent of a minor patient in a language understood by them, was taken before collection of samples of ear discharge and also regarding their participation in our study. Patient's detailed history consisting of present complaints, treatment history, and history of investigations was taken. Consent guidelines were followed. The External auditory canal of discharging ear was cleaned with sterile cotton. Under all aseptic precautions, discharge was collected with two sterile cotton swabs (one for microscopic examination and the other for bacteriological culture) with help of

sterile ear speculum, taking care not to touch External ear canal. Swabs collected were labelled with patient's name, age, sex, registration number, and laterality of ear and transported in sterile tubes to the microbiology laboratory immediately without delay.

Microscopy

Primary smear was made from one of the swabs. Gram staining was done and observed under microscope. Presence of organisms, pus cells was noted.

Bacteriological culture

Second swab was cultured on Blood Agar (BA), MacConkey agar (MA) and Chocolate agar (CA) and incubated aerobically at 37°C for 24 hours. Agar plates were observed for growth of microorganisms. If growth was present, identification of the organism was done based on microscopic morphology, staining characteristics, cultural and biochemical properties using standard laboratory procedures manually /on automated bacterial identification system (VITEK-2 COMPACT, MAKE-BIOMERIEUX). The organism was then tested for antibiotic susceptibility.

If no growth was present, plates were further incubated for next 24 hours. If still there was no growth, then it was reported as sterile and plates were discarded.

Antibiotic susceptibility test- It was done for all bacterial isolates by Kirby-Bauer disc diffusion method/on automated antibiotic testing system (VITEK-2 COMPACT, MAKEBIOMERIEUX) as per Clinical Laboratory Standards Institute (CLSI) guidelines.

RESULTS

Data was collected from 110 patients presenting with ear discharge in the ENT OPD at the hospital. There were two patients having bilateral infection, hence a total of 112 swabs (108 unilateral cases giving 108 swabs and 02 bilateral cases giving 4 swabs) were 40years (19.1%)age range, while the least number of patients were seen in 81-90 years (2%) age group. Gender distribution showed 66 (60.0%) males and 44 females patients in our study.

[Table 1] shows: Swabs collected from 112 discharging ears of the 110 patients was studied, growth was seen in 106(94.64%) cultures, while no growth was seen in the remaining 6(5.36%) cultures.

[Table 2] Organism isolated -Out of the culture positive cases, *Pseudomonas* was the most commonly found organism in 39 cases (36.7%), followed by *Staphylococcus Aureus* in 18 cases (16.9%) and *Staphylococcus Epidermidis* in 15(14.1%) cases. Other organisms found in our study were *Klebsiella* (6.6%), *E. coli*(6.6%), *MRSA*(5.6%).

[Table 3] Gram staining - Growth obtained on culture from samples collected were gram stained. Out of the 106 organisms isolated, 48(45%) cases were Gram positive organisms in (55%) cases.

Antibiotic sensitivity was carried out for the 106 isolates by Kirby-Bauer disc diffusion method by

using antibiotic discs. In the current study, maximum number of organisms were found sensitive to Gentamicin (45.2%), followed by Piperacillin-Tazobactam (38.6%), Linezolid (31.1%), Cotrimoxazole (28.3%), Meropenem (27.3%).

Antibiotic resistance - In the present study, maximum number of organisms were found resistant to Ciprofloxacin (58.5%) followed by Levofloxacin (37.7%) and Ampicillin (33.9%).

Table 1: Distribution of patients according to growth of organism.

Growth on culture	Number (percentage)
Growth present	106(94.64%)
Growth absent	6(5.36%)
Total	112(100%)

Table 2: Distribution of patients according to the organism obtained on culture.

Organisms Isolated On Culture	Number (Percentage)
Pseudomonas Aeruginosa	39(36.77)
Staphylococcus Aureus	18(16.99%)
Staphylococcus Epidermidis	15(14.1%)
E. Coli	7(6.6%)
Klbesiella Pneumoniae	7(6.6%)
Mrsa	6(5.6%)
Enterobacter Cloacae Complex	3(2.8%)
Enterococcus Species	3(2.8%)
Morganella Morganii	2(1.8%)
Micrococci	1 (0.9%)
Acinetobacter Baumanii Complex	1 (0.9%)
Citrobacter Koseri	1 (0.9%)
Staphylococcus Haemolyticus	1 (0.9%)
Staphylococcus Haemolyticus	1 (0.9%)
Serratia Marcescens	1 (0.9%)
Total	106(100%)

Table 3: Distribution of patients according to gram staining of organisms isolated.

Gram Staining	Number (Percentage)
Gram negative	58(55%)
Gram positive	48 (45%)
Total	106(100%)

Table 4: Common organisms isolated in culture in different studies in comparison with the present study.

Study	Growth on culture	Most common organism isolated in culture	Second most common organism isolated in culture.
Present study	106	Pseudomonas Aeruginosa (36.7%)	Staphylococcus Aureus (16.9%)
Gadekar et al, ^[3]	155	Pseudomonas Aeruginosa (54.43%)	Staphylococcus Aureus (15.19%)
Aishwarya et al, ^[4]	100	Pseudomonas Aeruginosa (37%)	Staphylococcus Aureus (21.5%)
Kumar et al, ^[5]	79	Pseudomonas Aeruginosa (43.43%)	Staphylococcus Aureus (17.5%)

DISCUSSION

COM is one of the most common diseases worldwide. It is defined as infection of the middle ear cleft that lasts more than 3 months, accompanied by frequent discharge, ear perforation and sometimes hearing loss. The entry of bacterial pathogen occurs through perforation in the ear drum. Microbiological spectrum in COM is dominated by Pseudomonas, Staphylococcus, Enterobacteriaceae sp. Etc. Neomycin is effective against Staphylococcus and Proteus sp. With little effect against Pseudomonas, Streptococci or anaerobes. Polymyxin is effective against Pseudomonas, Staph aureus and Proteus. Fluoroquinolones are effective against Streptococcus, Hemophilus etc. As the pathogenesis and varying microbiology of COM is not fully understood, it is important to investigate prevalence of various pathogens in different areas. There was no common consensus between various available published

studies on the age group pattern. Our study showed a male predominance in patients presenting with COM. Similar predominance was also seen in Gadekar et al,^[3] and Kumar et al,^[5] study.

With respect to the growth culture, in our study, out of the 112 discharging ears or in the 110 patients studied, growth was seen in 106 cultures (92.17%), while no growth was seen in the remaining 9 cultures (7.83%). All samples in the present study yielded single type of organism. In the study conducted by Gadekar et al (2020),^[3] on 169 swabs collected from 157 patients, 155(91.7%) patients showed microbial growth while 14(8.3%) patients yielded no growth. In the study by Aishwarya et al,(2019),^[4] in a Tertiary Care Centre in Kerala "on (135 patients, bacterial growth was obtained in 100(74.1%) samples out of 135 sample.

Pseudomonas was the most commonly isolated organism in 39 patients (36.7%), followed by Staphylococcus aureus in 18 patients (16.9%) and Staphylococcus epidermidis in 15 (14.1%) cases. In

the study conducted by Gadekar et al. (2020),^[3] the most common bacteria found was *P. aeruginosa* in 43 (54.43%) of samples, followed by *S. aureus* in 12 (15.19%), and Coagulase-negative Staphylococci in 9 (11.39%) cases.

We observed that the maximum number of organisms were found sensitive to Gentamicin (45.2%), followed by Piperacillin-Tazobactam (38.6%), Linezolid (31.1%), Cotrimoxazole (28.3%), Meropenem (27.3%), Nitrofurantoin, and Vancomycin (20.7%) in their study. They also observed that all of them were sensitive to Linezolid and Vancomycin (100%), followed by Clindamycin and Gentamicin (71.42%), further by Co-trimoxazole and Tetracycline (42.5%). Organisms showed lower sensitivity to Erythromycin (28.57%). All the strains were resistant to ampicillin and ceftioxin

CONCLUSION

1. *Pseudomonas* is one of the most commonly isolated organisms in COM patients followed by *Staphylococcus aureus*.
2. Most of the organisms, isolated in COM were found to be sensitive to Gentamicin, followed by Piperacillin-Tazobactam.

3. Most of the organisms were found to be resistant to Ciprofloxacin, followed by Levofloxacin.
4. *Pseudomonas* was found most sensitive to Piperacillin-Tazobactam and Gentamicin.
5. *Staphylococcus aureus* was found most sensitive to Linezolid, followed by Cotrimoxazole.

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