

## Research Article

# Bacteriological study of discharging ear in patients attending a tertiary care hospital

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### ABSTRACT

Ear infections occur in all age groups. Chronic Suppurative Otitis Media (CSOM) is the most common illness in ENT practice. It may even cause hearing impairment especially sensory – neural deafness if not treated properly and with caution. The study was undertaken to know the aerobic microbiological/bacteriological profile of ear discharge and variations in sensitivity pattern to treat the patients efficiently. A total of 71 patients who had discharging ear infection were included in this study. The most common microorganisms isolated were *Pseudomonas aeruginosa* and *Staphylococcus aureus* followed by Coagulase-Negative Staphylococci (CoNS), *Klebsiella* spp, *Proteus* spp and *Escherichia coli*. Among the commonly used topical antibiotics, Ciprofloxacin appear to be first line antibiotic (91.52% sensitive) to treat CSOM followed by Gentamycin (89.6% sensitive). However, the action of Chloramphenicol was low (59.53% sensitive). Ofloxacin can be used to treat CSOM due to *Staphylococcus aureus* other than Ciprofloxacin and Gentamycin.

**Keywords:** Bacteriology, Ear infection, *Pseudomonas aeruginosa*, Culture & sensitivity

### INTRODUCTION

Ear is an important sensory organ. It is worthy to note that ear infections are a very common problem worldwide. Ear infection is an inflammation of the ear and ear discharge is one of the commonest symptoms of ear infection.<sup>1</sup> About 65-330 million people suffer from ear infection worldwide and 60% of them had significant hearing impairment.<sup>2</sup> The discharging ear is a common problem in the tropics. It is seen in all age groups but is more prevalent in infants and children.<sup>3</sup> It's decreasing incidence during and after adolescent stage is the result of the growth and development of the pharynx. But still it remains one of the major problems of adults attending the Ear, Nose and Throat (ENT) clinics (department).

Ear discharge may arise from external auditory meatus in otitis externa or middle ear cavity in otitis media. Chronic suppurative otitis media (CSOM) is one of the most common chronic diseases of childhood. It is one of the major causes of deafness in India. Ear infection is a common problem for both children and adults but the magnitude is different in different countries. Anatomically the children's Eustachian tube is shorter, more horizontal with a more flaccid cartilage which can easily impair its opening and hence ear infection is a major health problem of them especially in those with poor socioeconomic status.<sup>4</sup> Inadequate antibiotic treatment and poor hygienic conditions are related to the development of CSOM. Most of the studies on the microbiology of CSOM have revealed that the most common bacteria associated with CSOM are *Pseudomonas*, *Staphylococcus*, *Proteus* spp., and

Klebsiella.<sup>5</sup> A few other studies showed *Staphylococcus aureus* as the most common bacteria, especially if cholesteatoma was present.<sup>6</sup> Bacterial predominance and their antibiotic sensitivity pattern change over time. So, knowledge of the local pattern of infection is essential to enable efficacious treatment of this disorder. As topical antibiotic treatment is often effective and seldom harmful, most experts would start with a wide-spectrum antibiotic on an empiric basis and make a request for cultures if drug resistance is suspected.

### Aim

To determine the frequency of bacterial isolates associated with CSOM and their drug susceptibility patterns against commonly used topical antibiotics as well as other antibiotics from patients who gave ear discharge samples at tertiary care teaching hospital, ELURU.

### METHODS

The study was undertaken in a tertiary care teaching hospital of West Godavari district, Coastal Andhra Pradesh, with an aim to study the bacterial flora and their sensitivities to a series of antibiotics in patients with ear infections. Samples of patients with unilateral or bilateral discharging ear sent to microbiology lab for microbiological studies in the department of microbiology were recruited in this study. The following criteria were taken into consideration in selecting the patients in this study.

- Patients with active purulent discharge at the time of examination.
- Patients who did not have any antibiotic treatment recently.

Patient of any age, both genders having discharging ear were included. Aural swabs were collected from each patient (after cleaning external auditory canal with spirit swab) before starting medical treatment. Pus swabs were cultured on blood agar, Mac Conkey agar and chocolate agar. Swabs were processed for the isolation of aerobic bacteria using standard bacteriological procedures, and the organisms grown were identified according to the standard bacteriological methods.<sup>7</sup>

All cases showing growth on culture media after 72 hours of inoculation were subjected antibiotic sensitivity testing by modified Kirby - Bauer disk diffusion method, and the interpretation of results was done by using standard guidelines.<sup>8</sup>

Testing was specifically done for ciprofloxacin, gentamicin, and chloramphenicol, which are available locally as topical ear drops.

### RESULTS

A total of 71 patients were included in this study. There were total 39 females and 32 males with ratio of 1.21:1. The distribution of sex is shown in Table 1.

**Table 1: Sex distribution in 71 patients.**

Sex	No. of patients
Females	39
Males	32
Total	71

Majority of the patients who had ear discharge were between 16-25 years. This was followed by the age group between 6-15 years. Fifty six patients had unilateral disease, while fifteen patients had bilateral disease. The side of ear discharge is 50.7%, 28.16% and 21.12% had right, left and bilateral respectively. The distribution of age and side of discharging ear are over shown in Table 2.

**Table 2: Age distribution.**

Age (Years)	Male	Female	Right ear	Left ear	Both ears	Total
< 5	5	7	5	3	3	11
6-15	5	6	6	4	2	12
16-25	10	13	13	6	4	23
26-35	2	7	4	2	3	9
36-45	3	3	4	1	1	6
>45	3	7	4	4	2	10
Total	28	43	36	20	15	71

Of the 71 patients, 65 yielded positive culture from the ear swab. Fifty - four patients (83.07%) had a single organism isolated from middle ear culture, while eleven patients (16.92%) had two organisms isolated. Six patients had a sterile culture with no organisms isolated.

**Table 3: Number of isolates.**

No. of isolates	No. of patients
0	6
1	54
2	11

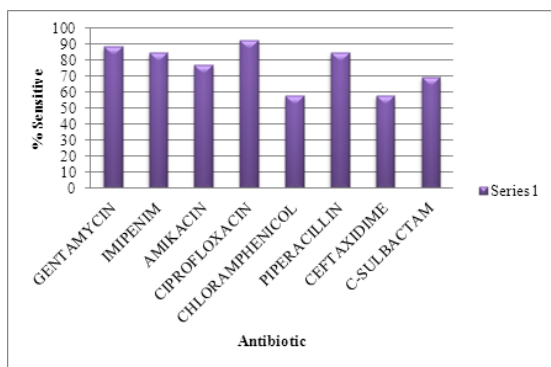
The most common microorganisms isolated were *Pseudomonas aeruginosa* and *Staphylococcus aureus* followed by CoNS, *Klebsiella* spp, *Proteus* spp and *Escherichia coli*.

We took into consideration only bacteriological profiles. Nevertheless to say, we also isolated *Candida albicans* from five patients and *Aspergillus* spp from three patients. *Staphylococci* and *Pseudomonas* co- existed

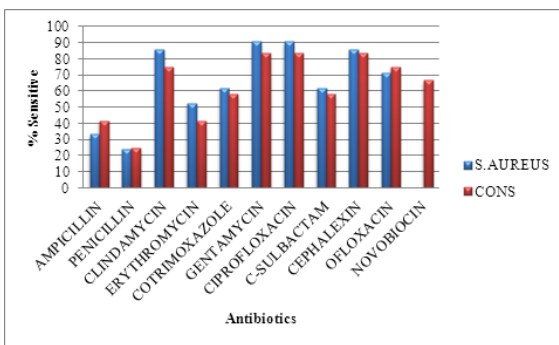
with the fungi *Candida albicans*. The antibiotic sensitivities of the pathogens were tested (Figures 1 - 3).

**Table 4: Aerobic bacteria isolated from discharging ear.**

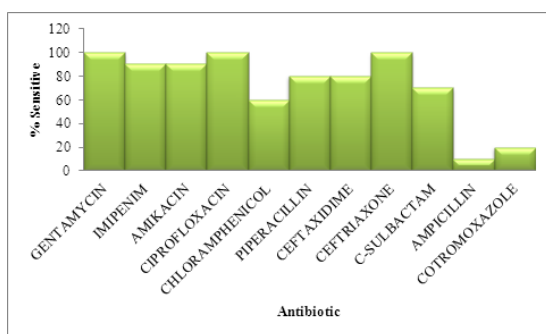
Type of organism	No. of isolates	No. of patients infected
<i>Pseudomonas aeruginosa</i>	26	26
<i>Staphylococcus aureus</i>	21	16
Coagulase negative <i>Staphylococcus</i>	12	9
<i>Klebsiella</i> spp	10	7
<i>Proteus</i> spp	5	5
<i>Escherichia coli</i>	2	2
Total	76	65



**Figure 1: Antibiogram of *Pseudomonas aeruginosa*.**

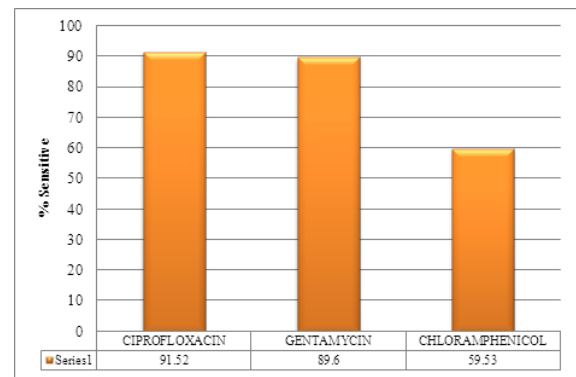


**Figure 2: Antibiogram of *Staphylococcus aureus* & CONS.**



**Figure 3: Antibiogram of *Klebsiella* spp.**

Among the three commonly prescribed topical antibiotics tested, ciprofloxacin showed the highest susceptibility rate (91.52%), followed by gentamicin (89.6%) and chloramphenicol (59.53%), (Figure 4). From the given data it is clearly evident that ciprofloxacin and gentamicin were better than chloramphenicol. And also sensitivity of ciprofloxacin was slightly better than gentamicin. Another topical antibiotic prescribed ofloxacin showed 69.04% susceptibility rate for gram positive cocci infections.



**Figure 4: Comparison of common topical antibiotics.**

**DISCUSSION**

Ear infections occur in all age groups. Among the various ear infections, CSOM is a very common infection. Chronic suppurative otitis media is a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges through a tympanic perforation. Through the perforation bacteria gain entry into the middle ear. Infection of the middle ear mucosa subsequently results in ear discharge. Untreated cases of CSOM can result in a broad range of complications like persistent otorrhea through a tympanic perforation, with conductive hearing loss of varying severity, mastoiditis, labyrinthitis, meningitis, and facial nerve paralysis. This disease is notorious for causing irreversible destruction of middle ear structures and also very serious intracranial complications. Hence, treatment needs to be instituted early and effectively to avoid such complications. CSOM was most prevalent in the age group of children and young adults between 6 - 25 years similar to the study.<sup>9</sup> This may be so because in children the Eustachian tube is short and wider. Since India is a developing country and majority are still living under poverty level activities such as swimming, washing clothes etc. in contaminated water supply, pouring oil in the ear due to traditional beliefs also attribute to ear infections.

In our study, females were most commonly affected than males. Various bacteriological studies on CSOM have shown that the most frequently isolated bacteria were *P. aeruginosa*, *S. aureus*, Coagulase-negative *Staphylococcus*, *Proteus* species, and *Klebsiella* species.<sup>10-13</sup>

The bacterial agents of discharging ear in our study were polymicrobial in 16.92% cases and monomicrobial in 83.07% cases. *Pseudomonas aeruginosa* (34.21%) was the most common aerobic isolate in ear discharge which was very closely followed by *Staphylococcus aureus* (27.63%). Sharma et al.<sup>14</sup> reported that aural swabs collected from patients of CSOM showed *Pseudomonas* in 36% cases, followed by *S. aureus* in 30% of cases. Similar conclusion was drawn by another study<sup>15</sup> who found *Pseudomonas* as the most common organism in CSOM. *Pseudomonas aeruginosa* is a non-fermenting gram negative bacillus which is a water bacteria and isolation of coagulase negative *Staphylococci* is insignificant. The frequent isolation of water bacteria *Pseudomonas aeruginosa* indicates that individuals are at high risk of infection due to poor hygiene conditions.<sup>16</sup> *Pseudomonas aeruginosa* and *Staphylococcus aureus* account for 61.84% of total bacterial isolates in cases of CSOM.

*Pseudomonas* showed high sensitivity to ciprofloxacin (92.3%), gentamicin (84.61%), imipenem (84.61%), piperacillin (88.46%). High fluoroquinolones antibacterial activity against *Pseudomonas* isolates was reported by others, although resistant strains of *Pseudomonas* isolates to fluoroquinolones were detected in other studies.<sup>17,18</sup>

*Staphylococcus aureus* was sensitive to gentamicin (90.47%), ciprofloxacin (90.47%), clindamycin (85.7%), cephalexin (85.7%) and ofloxacin (71.42%). Majority of COPS were resistant to ampicillin (66.66%) and penicillin (76.19%). Clinical resistance of *Staphylococci* spp. to penicillin and other antimicrobial agents is now a problem throughout the world.<sup>19,20</sup> *Staphylococci* spp. sensitivity to ciprofloxacin is in agreement with other reports and most of the investigators reported high sensitivity rate for *Staphylococci* spp. to fluoroquinolones such as ofloxacin and ciprofloxacin.<sup>21</sup>

CONS is a normal skin flora so it might be a contaminant. However majority of them were sensitive to almost all the antibiotics used. Highest sensitivity was shown towards ciprofloxacin followed by gentamicin, clindamycin, c-sulbactam, cefotaxime.

In this study special interest was taken into account of the common antibiotics prescribed by the ENT physicians in treating ear discharge namely chloramphenicol, gentamicin and ciprofloxacin. Sensitivity to ciprofloxacin was high (91.52%) followed by gentamicin (89.6%). Most of the isolates were resistant to chloramphenicol. However the clinicians were concerned about the real danger of sensory - neural hearing loss from otitis media than the possibility of ototoxicity due to topical antibiotic use. As a result we considered only those antibiotics which were safer without side effects. Since ciprofloxacin was quite effective without possible damage and also the best sensitive drug for the most commonly isolated organisms, this quinolone was the best to be prescribed in

treating CSOM. Our study also correlates with other studies which show that the quinolone, ciprofloxacin to be safe and effective particularly against *P. aeruginosa* and *S. aureus*.<sup>22,23</sup>

## CONCLUSION

Our present study, in the light of other various studies, indicates that there can be a variation in the organisms infecting and their susceptibility pattern. In our study water bacillus *Pseudomonas aeruginosa* and *Staphylococcus aureus* were the most important organisms associated with ear discharge-CSOM. Appropriate antimicrobial drugs should be prescribed after proper diagnosis of the causative organism and its antimicrobial susceptibility pattern. Ciprofloxacin appear to be first line antibiotic to treat CSOM. Ciprofloxacin is also much safer without side effects. Gentamycin was also found to be effective. The patients should also be advised to take the drugs for the complete prescribed duration without stopping in the middle. This will not only help in minimizing the complications, but also help in preventing the emergence of resistant strains. The antibiotic susceptibility patterns must be continuously and periodically evaluated to decrease the risk of resistant strains. Continuous and periodic evaluation of microbial pattern and antibiotic sensitivity of CSOM helps to decrease the potential risk of complications.

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