



## Pattern of antibiotic sensitivity to microorganism isolated from patient presenting with ear discharge

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### Abstract

*Long standing ear infection is very prevalent in developing countries. Appropriate treatment of Chronic otitis media is of utmost importance to avoid various longstanding health issues, including hearing impairment and deficit in social communication.*

**Purpose of the study:** *To isolate the causative bacteria and determine the antibiotic sensitivity for the same.*

**Material and Method:** *In this study, we included 30 patients that presented to our ENT OPD with complaints of ear discharge. Swab from discharging ear were collected and sent for aerobic culture and susceptibility testing.*

**Conclusion:** *Of the total bacterial swabs the organism isolated predominantly were Pseudomonas aeruginosa, followed by Staphylococcus aureus and Proteus spp.*

*Amongst Gram Positive bacteria, highest resistance was seen for penicillin 10(76%), followed by tetracycline and ampicillin 9(69.2%). Whereas sensitivity was found to amoxicillin in 12(92%), ciprofloxacin in 10(76.9%), azithromycin in 9(69.3%) and Co-trimazole in 8(61.5%). P. aeruginosa showed highest resistance to amoxicillin 15(88.2%) followed by ampicillin 12(70.5%) and showed highest sensitivity to ciprofloxacin 12(70.5%), followed by 10(58.8%) for amikacin and gentamycin. Based on these findings, guided approach for treatment according to the antibiotic sensitivity is necessary.*

### Introduction

Otitis media is one of the leading causes affecting all age groups equally. It increases the number of OPD visits as well as economic burden over the patients and the healthcare system in developing countries<sup>(1)</sup>.

According to an estimate by WHO, people with hearing impairment resulting due to otitis media has increased from 42 million to 250 million in the last 16 years, with approximately three

quarters of the individual acquiring adult onset hearing loss<sup>(6)</sup>.

Otitis media is characterized by an inflammatory process of the middle ear cleft. Various anatomical and immunological factors along with crowded living condition and malnutrition results in a significant prevalence of patients suffering from otitis media with varying degree of severity<sup>(2)</sup>.

Adult population is equally affected by otitis media even though it is considered to be primarily affecting the younger population,<sup>(3)</sup> the disease begins in the childhood or as a sequel to inappropriate management of the acute suppurative otitis media<sup>(4)</sup>.

Undertreated or inappropriate management of the condition leads to purulent otitis media, often with perforation and further complications including recurrent acute otitis media, persistence of middle ear effusion leading to hearing impairment, it may also complicate into mastoiditis, meningitis, brain abscess and sepsis<sup>(5)</sup>.

Many studies have indicated that, Staphylococcus aureus, Pseudomonas aeruginosa, Proteus mirabilis, Klebsiella pneumonia and Escherichia coli are the commonest organisms to be isolated from ear swabs<sup>(5,7,8)</sup>

Treatment of ear infection is not always apt since drug susceptibility patterns change overtime and empirical antibiotic therapy may not be effective at times and could contribute to development of antimicrobial resistance<sup>(9,10)</sup>.

Prompt and effective treatment of ear infection will significantly reduce both short and long term complications associated with ear infection and can also improve the quality of life of patients with ear infection.

There has been an increase in antibiotic resistance noted over a period of time due to irrational use of antibiotics, however there has been limited research evidence available about the same. Hence this study has been undertaken, to determine the causative bacterial flora responsible for otitis media and its antibiotic sensitivity pattern.

**Materials and Methods**

A prospective randomized study included 30 patients presenting to the Outpatient department of our hospital with ear discharge.

**Inclusion Criteria**

- 1) Patients more than 5years of age.
- 2) Patient presenting with active tubotympanic COM

**Exclusion Criteria**

- 1) Patients who were on topical/systemic antibiotics.
- 2) Patients with suspected or diagnosed malignancy.
- 3) Patient presenting with otomycosis, atticofacial COM and otitis externa.
- 4) Acute suppurative otitis media.

The ear swab specimens of all the subjects were collected under aseptic precautions and analysed for microbial testing. Care was taken to avoid surface contamination (the pinna was pulled outward and backward to make the external auditory canal more straight to take the ear swab, then sterile cotton swabs were gently rotated in the ear discharge and taken out). All organisms grown were identified according to the standard microbiological methods by using Gram staining reaction, culture characters, colony morphology, pigment production, and type of hemolysis on blood agar.

**Results and Observations**

In the present study, individuals ranged from the age group of 10 to 73 years. The highest percentage 10(33.3%) of ear infection was found among subjects ranging from 10-20 years.

AGE	EAR INFECTION (n=30)	PERCENTAGE
10-20	10	33.3%
21-30	9	30%
31-40	3	10%
41-50	2	6.6%
51-60	3	10%
61-70	2	6.6%
Above 70 years	1	3.33%

The proportion of ear infection was higher in males 22(73%) as compared to females who were 8(26.6%).

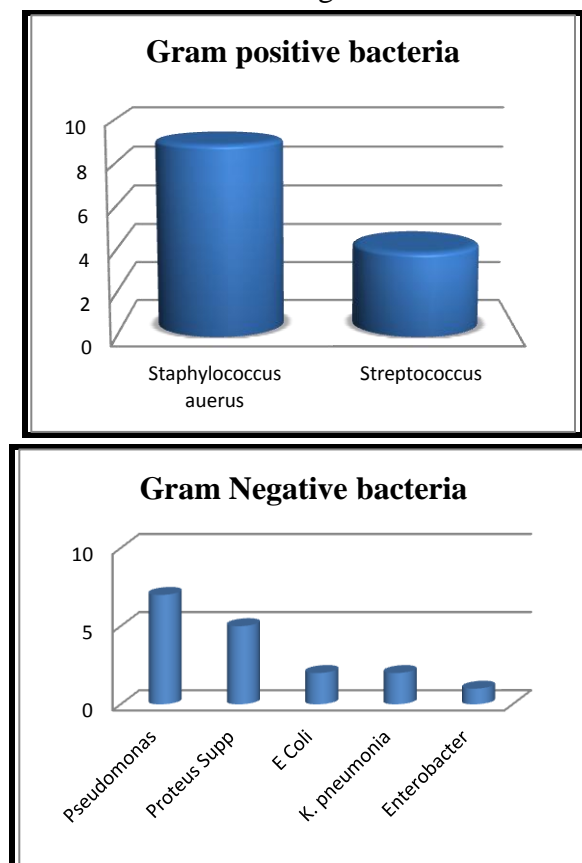
**Table 1:** Sex Distribution amongst subjects presenting with ear discharge

SEX	EAR INFECTION (n=30)	PERCENTAGE
MALE	22	73%
FEMALE	8	26.6%

Out of all the positive swabs, 21(70%) demonstrated single organism and 9(30%) were positive for 2 organisms.

Amongst the individuals, Gram Negative bacteria were 17(56.4%) and 13(43.6%) were Gram Positive.

**Graph 1:** Distribution of subjects according to Gram Positive and Gram Negative isolates.



In our study Gram Positive bacteria (Staph aureus, strep) showed highest resistance to penicillin 10(76%), followed by tetracycline and ampicillin 9(69.2%). Sensitivity was found to amoxicillin in 12(92%), ciprofloxacin in 10(76.9%), azithromycin in 9(69.3%) and Co-trimazole in 8(61.5%)(Tab 1).

**Table 1:** Antimicrobial resistance patterns of Gram Positive bacterial isolates (n=13) from ear swab taken from study subjects.

ANTIBIOTICS	Gram Positive Bacteria (n=13)	
	Resistant (%)	Sensitive (%)
P	10 (76%)	3(23%)
TE	9 (69.2%)	4(30.7%)
AMC	1 (7.6%)	12(92%)

CF	3 (23%)	10(76.9%)
AZM	4 (30.7%)	9(69.3%)
AMP	9 (69.2%)	4(30.7%)
COT	5 (38.4%)	8(61.5%)

**KEY:** (P)penicillin, (TE)tetracycline, (AMC) amoxicillin/clavulanic acid, (CF)ciprofloxacin, (AZM) azithromycin, (AMP)ampicillin, (COT)co trimazole.

In our study, P. aeruginosa, Proteus supp, K. pneumonia, E.coli and Enterbacter were resistant to amoxicillin 15(88.2%) and ampicillin12 (70.5%), whereas ceftriaxone 9 (52.9%), gentamycin10(58.8%), amikacin10(58.8%), and ciprofloxacin 12(70.5%) were effective against Gram Negative bacteria (Tab 2).

**Table 2:** Antimicrobial resistance patterns of Gram Negative bacterial isolates (n=17) from ear swab taken from study subjects

ANTIBIOTICS	Gram Negative Bacteria (n=17)	
	Resistant (%)	Sensitive (%)
AMC	15 (88.2%)	2 (11.7%)
CF	5 (29.4%)	12 (70.5%)
G	7 (41.1%)	10 (58.8%)
AMP	12 (70.5%)	5(29.4%)
AK	7 (41.1%)	10(58.8%)
CTR	8 (47%)	9 (52.9%)

**Key:** (AMC) amoxicillin/clavulanic acid, (CF)ciprofloxacin, (G) gentamycin, (AMP)ampicillin, (AK)amikacin, (CTR) ceftriaxone.

**Discussion**

Otologist all around the world are observing a high rise in antibiotic resistance amongst people presenting with ear discharge. This rise has been attributed to excessive consumption of untargeted antibiotics, as well as Biofilm formation which is emerging as a factor for persistence of the infection. Early ear swab bacteriological diagnosis helps prescription of appropriate antibiotics, assessment of bacterial resistance, safety, risk of toxicity of the prescribed antibiotics.

- In our study the maximum number of subjects who presented with ear discharge was amongst the age group of 10-20 years. Hailu D et al.<sup>(11)</sup> in their study found the highest proportion of ear infection among patients in the age group of 1- 20 years.

- In the present study, a higher preponderance of ear infection was found in males as compared to females. These findings were similar to Muluye et al.<sup>(12)</sup>.
- In our study, Gram Negative bacteria were 17(56.4%) of which *P. aeruginosa* was the commonest isolate 7(41.1%), followed by *Proteus* spp. 4(23.5%). Whereas *Staph aureus* 9(69.2%) found to be the commonest isolate amongst Gram Positive bacteria 13(43.3%), followed by *Streptococcus* 4(30.7%). Gaur RS et al.<sup>(13)</sup> had similar findings in their study which revealed that *P. aeruginosa* (30.96%) was the most common isolate in COM followed by *S. aureus* (29.65%). The prevalence of *P. aeruginosa* could be due to the organisms ability to produce enzymes like proteases to stop the normal defense mechanism of body required to fight infections<sup>(14)</sup>.
- In the present study, Gram Positive bacteria (*Staph aureus*, *strep*) showed highest resistance to penicillin 10(76%), followed by tetracycline 9(69%) and ampicillin 9(69.2%). This was supported by findings in the study by Abera et al.<sup>(15)</sup>. Whereas they exhibit sensitivity to amoxicillin in 12(92%), ciprofloxacin in 10(76.9%), azithromycin in 9(69.3%) and Co-trimazole in 8(61.5%).
- In our study, *P. aeruginosa* showed highest resistance to amoxicillin 15(88.2%) followed by ampicillin 12(70.5%), which were similar to the findings in the study conducted by Abera et al.<sup>(15)</sup>. However *P. aeruginosa* showed highest sensitivity to ciprofloxacin 12(70.5%), and 10(58.8%) for amikacin and gentamycin. Gaur RS et al.<sup>(13)</sup> in their study noted 62.5% of isolates to be susceptible to Ciprofloxacin. Whereas Jang CH et al.<sup>(16)</sup> carried out a study in 2004 in which Ciprofloxacin resistance was noted in 100% of the isolates.

### Conclusion

According to the findings of our study, *P. aeruginosa* was the most common isolate followed by *S. aureus*, and *Proteus* spp. *P. aeruginosa* showed highest susceptibility to ciprofloxacin 70.5%, followed by amikacin and gentamycin 58.8%. *S. aureus* showed highest sensitivity to amoxicillin 92% followed by ciprofloxacin 76.9%. Hence based on the results of our study, treatment of otitis media through a guided approach according to antibiotic susceptibility of bacterial isolates is recommended.

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