

## Original Research Article

# Study of bacteriological profile in chronic suppurative otitis media and their pattern of antibiotic sensitivity

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### ABSTRACT

**Background:** Chronic suppurative otitis media is a long-standing infection of the middle ear cleft which is characterized by recurrent and persistent ear discharge and persistent non healing perforation of tympanic membrane. It can lead to severe complications if not treated appropriately. Due to emerging antibiotic resistance, it is necessary to understand the antimicrobial pattern and their sensitivity to antibiotics which will help clinicians to select antibiotic which is sensitive to their corresponding microorganism. The aim of the study is to isolate the prevalent microorganism and study their antibiotic sensitivity pattern in patients of chronic suppurative otitis media (CSOM).

**Methods:** Total 100 patients were examined, ear swab were collected by sterile ear swab and sent for microscopy and culture sensitivity examination to microbiology department. Results were documented and analyzed.

**Results:** *Pseudomonas aeruginosa* was the most common isolate (41%) followed by *Staphylococci* (28.2%). Gram negative cocci showed high degree of sensitivity to Cotrimoxazole (100%), Amikacin (79%) and Piperacillin - tazobactam (75%). Gram positive cocci showed high degree of sensitivity to Linezolid.

**Conclusions:** Study of bacteriological profile and their sensitivity pattern helps in empirical therapy and reduces the risk of complications.

**Keywords:** CSOM, Antibiotic sensitivity, *Pseudomonas aeruginosa*

### INTRODUCTION

Chronic suppurative otitis media (CSOM) is a long-standing infection of the middle ear cleft which is characterized by recurrent and persistent ear discharge and persistent non healing perforation of tympanic membrane. The edges of perforation are covered by fibrous rim which hinders its spontaneous healing of central perforation. CSOM is multifactorial disease.<sup>1</sup>

CSOM is a major health problem in developing countries. It has caused various complications. It is common cause of hearing loss in developing countries, which can be prevented by appropriate antibacterial treatment. Incidence of CSOM is higher among people with low

socioeconomic status. Malnutrition, overcrowding, poor hygiene, inadequate health care, and recurrent upper respiratory tract infection are major predisposing factors.

Chronic otitis media is the most common cause of otorrhea. In most of the cases acute otitis media (AOM) and otitis media with effusion (OME) subside either spontaneously or after medical treatment, but inappropriate treatment leads to sequelae of AOM. This sequelae predisposes to CSOM and its complications such as: tympanic membrane atelectasis, Adhesive otitis media, Chronic persistent perforation of tympanic membrane, Chronic otomastoiditis, Cholesteatoma, Ossicular chain erosion or fixation, Sensorineural hearing loss,

tympanosclerosis, petrositis, labyrinthitis, facial palsy, intracranial complications.<sup>2</sup>

This potentially dangerous clinical condition is difficult to treat as the most common infecting organisms are often resistant to many antibiotics. Hence early accurate diagnosis and treatment of CSOM is life saving.

CSOM has received considerable importance not only because of its high incidence and chronicity but also issues such as bacterial resistance and ototoxicity with topical and systemic antibiotics.<sup>3</sup> The main stay of treatment for uncomplicated CSOM is two fold: aural toilet and specific antibiotic in form of topical or systemic. The goals of management are to achieve a Safe and dry ear. Knowledge of the local micro-organisms pattern causing CSOM and their antibiotic sensitivity is therefore essential to start an effective and cost saving treatment.<sup>4</sup>

Evaluation of the microbiological organisms and their antibiotic sensitivity pattern by ear swab is helpful in the initiation of specific antibiotic therapy and thus minimizing its complications and emergence of resistant strains.

Due to chronicity of CSOM and the repeated occurrences of otorrhea, patients are often prescribed empirical antibiotics therapy in outpatient clinics without microbiologic evaluation, which has led to emergence of resistance. Both gram positive and gram negative bacteria are responsible for infection along with fungal agents. Due to development of newer antibiotics, the microbial organisms and their resistance pattern is constantly changing.

Therefore, this study was undertaken to understand the pattern of microbes and their antimicrobial susceptibility pattern which will help to provide imperial antibiotic therapy.

### ***Aims and objectives***

Isolation of organism in CSOM. To study the aerobic bacteriological profile in CSOM. To study the susceptibility pattern to commonly used antibiotics in view of emerging resistance.

### **METHODS**

The cross sectional study of patients presenting to ENT OPD of our hospital with symptoms of ear discharge with or without pain for period of 3 months or more have been included in the study.

Patients on antibiotics for the past 1 week are excluded. Ear swabs have been collected and then immediately transported to Microbiology department. They have been followed up with the reports for documentation of bacteriological profile of CSOM and their antibiotic sensitivity pattern.

### ***Inclusion criteria***

Patients of any age; both gender; discharge from unilateral or bilateral ear; ear discharge for more than 3 months duration has been included.

### ***Exclusion criteria***

Discharging ear for less than 3 months duration. Discharging ear with Intact tympanic membrane (otitis externa). Patients receiving antibiotics at the time of presentation or within a week of presentation.

A study has been conducted on patients attending tertiary health care hospital from July 2019 to June 2020 with complaints of ear discharge for more than 3 months. Detailed history, general physical examination and local systemic examination have been done for each case. Clinical and demographic data have been collected using a preformed questionnaire. In case of bilateral infection, samples have been taken from both ears.

Sterile cotton swabs have been used to collect the discharge from the ear under aseptic precautions with the aid of an aural speculum. Samples have been, then immediately transported to Microbiology department.

The first swab collected has been smeared onto a clean glass slide for direct smear examination by Gram's stain, KOH mount and Ziehl-Neelsen stain. The second swab has been further processed for isolation of aerobic bacteria by inoculating on to culture media. The swabs have been inoculated on the following culture media. MacConkey agar. Blood agar. Sabouraud dextrose agar.

Bacterial isolates have been identified by standard biochemical tests and antibiotic sensitivity test have been done by Kirby Bauer disc diffusion method. Mycelia fungal isolates have been identified on LCB mount and yeast by gram stain morphology, germ tube and sugar assimilation and fermentation tests.

The result have been interpreted according to clinical and laboratory standard institute (CLSI) guidelines.

The data was obtained and analysed using descriptive and inferential statistics using Chi-square test and analysis by Statistical package for social sciences (SPSS) with the help of statistician and  $p < 0.05$  was considered to be level of significance ( $p < 0.05$ ).

### **RESULTS**

In the present study of 'Bacteriological profile and antibiotic sensitivity pattern of CSOM patients', conducted over a period of 1 year; 100 patients fulfilling the inclusion criteria were randomly selected and analyzed. Out of 100 patients included in the study, maximum patients were in the age group of 11-20 years (30%). High prevalence of CSOM is seen in children and

young adults because, the Eustachian tube is short and wider and so are more prone to upper respiratory tract infection. Vancomycin (100%) followed by Teicoplanin (92%).

**Table 1: Distribution of culture positive patients based on age group.**

Age in years	No. of patients	Percentage
<10	6	9
11-20	20	30
21-30	19	29
31-40	10	14
41-50	6	9
>50	6	9
<b>Total</b>	<b>67</b>	<b>100</b>

**Table 2: Distribution of culture positive patients based on sex.**

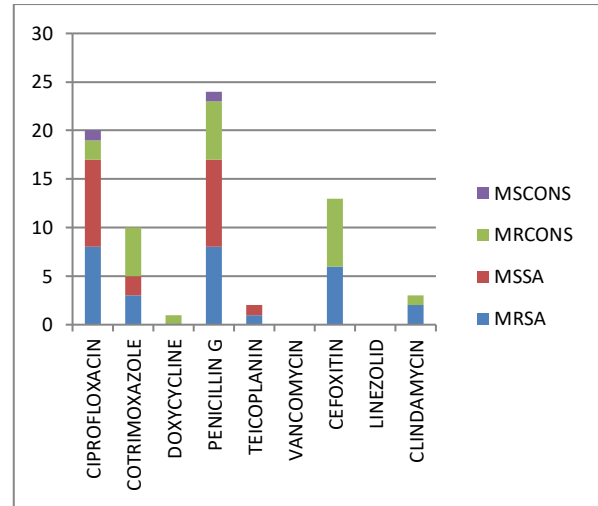
Gender distribution	Frequency	Percentage
<b>Male</b>	32	47
<b>Female</b>	35	52
<b>Total</b>	<b>67</b>	<b>100</b>

**Table 3: Distribution of culture result of all the patients.**

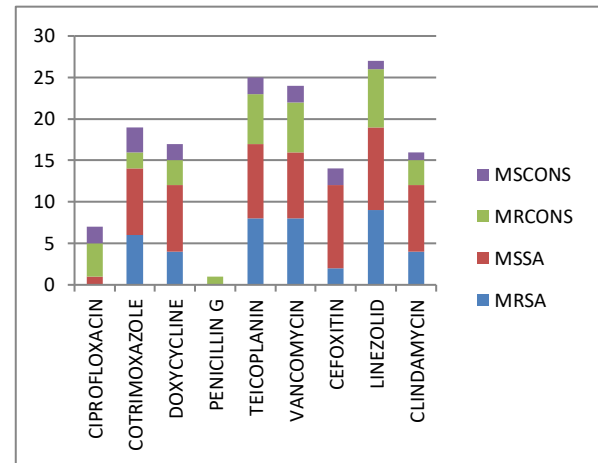
	Frequency	Percentage
<b>Monobacterial growth</b>	61	61
<b>Polybacterial growth</b>	06	6
<b>No organism</b>	33	33
<b>Total</b>	<b>100</b>	<b>100</b>

**Table 4: Distribution of growth based on type of organism.**

Organisms	No. of isolates	Percentage
<b>Gram negative</b>		
Pseudomonas aeruginosa	30	41.09
Klebsiella pneumonia	02	2.7
Escherichia coli	05	6.8
Proteus mirabilis	03	4.1
Citrobacter koseri	01	1.3
Acinobacter	02	2.7
<b>Gram positive</b>		
Staphylococcus aureus	29	39.7
Streptococcus	01	1.3
<b>Total</b>	<b>73</b>	<b>100</b>



**Figure 1: Distribution of resistance pattern of staphylococcus aureus.**



**Figure 2: Distribution of sensitivity pattern of staphylococcus aureus.**

**Table 5: Distribution of antibiotic sensitivity in percentage.**

Antibiotics	Sensitivity (%)
<b>Amikacin</b>	79
<b>Ceftazidime</b>	20
<b>Ciprofloxacin</b>	45
<b>Cotrimoxazole</b>	100
<b>Imipenem</b>	64
<b>Meropenem</b>	73
<b>Piperacillin</b>	32
<b>Piptaz</b>	76
<b>Gentamycin</b>	73

Male to female ratio is 1: 1.1 with major predominance in females. Out of 100 patients studied, 67 patients ear swab culture were positive and 33 were negative. Of 67 culture positive samples, 61 yielded monobacterial growth and 6 yielded polybacterial growths. Most common organism isolated in our study are gram negative bacilli

*Pseudomonas aeruginosa* (41.09%) followed by gram positive *Staphylococcus aureus* (39.7%). Antibiotic sensitivity pattern of *Pseudomonas aeruginosa* showed that Cotrimoxazole was active against 100% isolates of *Pseudomonas aeruginosa* followed by Amikacin (79%) and Piperacillin/Tazobactam (75%). *Staphylococci* showed a high degree of sensitivity to Linezolid (100%) and Vancomycin (100%) followed by Teicoplanin (92%).

## DISCUSSION

CSOM is characterized by intermittent or persistent, chronic discharge through a perforated tympanic membrane and can be associated with cholesteatoma.<sup>5</sup>

Infection can spread from middle ear to vital structures such as mastoid, facial nerve, labyrinth, lateral sinus, meninges and brain leading to mastoid abscess, facial nerve paralysis, deafness, lateral sinus thrombosis, meningitis and intra cranial abscess. Of all the complications, hearing loss associated with chronic ear discharge is nearly always significant reported in 50% of cases and tending to be more severe than those reported in other types of otitis media.<sup>6</sup>

Iqbal et al in 2011 enrolled 190 patients at CMH D.I. Khan, Pakistan and showed that there were 87.9% bacterial isolates and 3.7% fungi. *Pseudomonas aeruginosa* (45.9%) was the dominant isolate followed by *Staphylococcus aureus* (26.4%) including 10 isolates of methicillin resistant *Staphylococcus aureus* (MRSA). Antibiotic sensitivity pattern of *Pseudomonas aeruginosa* showed that Piperacillin/Tazobactam was active against 100% isolates of *Pseudomonas* and *Staphylococcus aureus* except MRSA.<sup>7</sup>

Kumar et al in 2011, conducted a study on 100 patients diagnosed with CSOM at Agroha, Hisar which showed the predominance of gram negative bacilli (59.74%) and the highest incidence (45.5%) was that of *Pseudomonas aeruginosa* followed by *Staphylococcus aureus* (37.7%). Amikacin was found to be the drug of choice. Of the 15 fungal isolates 9 (60%) were *Candida* species (*Candida albicans*), *Aspergillus* was isolated in 6 (40%) with maximum 3 (20%) strains of *Aspergillus fumigatus*.<sup>8</sup>

Ayson et al in 2006, carried out a study enrolling 32 patients with CSOM at Quirino Memorial Medical Centre, Philippine, in which the most common pathogen isolated was *Staphylococcus aureus* (50%) followed by *Pseudomonas aeruginosa* (33%). Majority of isolates of *Staphylococcus aureus* (61%) were resistant to penicillin while more than 90% were sensitive to Aminoglycosides and Clindamycin. *Pseudomonas aeruginosa* was resistant to penicillin in 64.3% of cases and Ciprofloxacin was active against *Pseudomonas* in 85.7%.<sup>9</sup>

The most common bacterial isolate was *Pseudomonas* n=30 (41%) which correlated with study of Arvind et al, Moorty et al *Pseudomonas* is the most prevalent organism

in tropical region like ours. It does not usually inhabit upper respiratory tract. Its presence in middle ear cannot be ascribed to an invasion through eustachian tube but should be considered as secondary invader gaining access to middle ear via defect in tympanic Membrane.<sup>6</sup> *Staphylococcus aureus* was the next common isolate in our study. This difference in results of various authors could have been due to the difference in the patient population studied and geographical variations.

## Limitations

Antibiotic sensitivity pattern of bilateral ear diseases was not compared. Fungal study was not included. Type of CSOM and its correlation with antibiotic sensitivity pattern was not included.

## CONCLUSION

The present study showed that *Pseudomonas aeruginosa* was the most common aerobic bacterial isolate causing CSOM followed by *Staphylococcus aureus*. Antibiotic susceptibility test showed that cotrimoxazole was most effective drug, followed by amikacin and piperacillin/tazobactam for most of the gram negative bacilli including *Pseudomonas aeruginosa*. Cotrimoxazole is combination of trimethoprim and sulfamethoxazole and Amikacin belong to aminoglycoside both are cost effective as compare to other class of drugs sensitive in earlier studies. Continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity of isolates is necessary to initiate effective treatment protocols for the study population. It also decreases the potential risk of complications by early institution of appropriate treatment. Untreated cases of CSOM can result in a broad range of complications like persistent otorrhea, mastoiditis, labyrinthitis, meningitis and facial nerve palsy. Some patients may develop life threatening complications like lateral sinus thrombosis or brain abscess also. Hence treatment has to be initiated early and effectively.

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