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Bacteriological profile and their antibiotic susceptibility pattern in chronic suppurative otitis media (TTD) in a tertiary care hospital

Sriram Govindaraj*, Jinu Vadakkanethu Iype, Srinivasa V., Jayendiran S.

Department of ENT, Vinayaka Mission's Medical College and Hospital Karaikal, Pondicherry, India

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***Correspondence:**
Dr. Sriram Govindaraj,
E-mail: sri3ram3@gmail.com

ABSTRACT

Background: Chronic suppurative otitis media (CSOM) is one of the common infective conditions which can cause many complications if not treated properly. Improper use of antibiotic among the common population has led to many drug resistant organisms; therefore it is necessary to study the antimicrobial susceptibility pattern before treating the patient with CSOM. Aim of the study was to identify the bacterial isolates causing CSOM in tubo tympanic disease and to study their antimicrobial susceptibility pattern.
Methods: The study was carried out in ENT department in Vinayaka Mission Medical College, Karaikal from July 2018 till December 2018 for six months. 60 patients of CSOM (TTD) with ear discharge attending the ENT Out Patient Department were included in the study. Swabs were collected for culture and sensitivity. Bacterial isolates were identified using standard methods and antibiotic susceptibility testing were done.
Results: Pseudomonas species was the most predominant organism, which was seen in 19 patients (38%) followed by *Escherichia coli* (22%), *Staphylococcus aureus* (18%), *Klebsiella species* (10%).
Conclusions: A continuous and periodic evaluation of microbiological pattern and their antibiotic sensitivity pattern prevalent in local area, helps in prescribe proper antibiotics for successful treatment of CSOM and thus minimizing its complications and emergence of resistant strains.

Keywords: Antibiogram, Bacteriological profile, CSOM

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a chronic inflammation of the mucoperiosteal layer of the middle ear cleft which leads to chronic ear discharge and hearing impairment that may have a serious long term effect on language, auditory and cognitive development and on educational progress.[1]

It is known for its recurrence and persistent infection and is one of the common causes of deafness and permanent perforation of tympanic membrane.[2]

The disease usually occurs after upper respiratory viral infections followed by invasion by pyogenic organisms.[3]

Active chronic otitis media is a chronic inflammation of the mucoperiosteum of the middle ear cleft, with episodes of recurrent ear discharge for more than 3 to 6 weeks, through a permanent perforation of the tympanic membrane.[4] The incidence of CSOM depends on race and socio-economic factors based on poor living conditions like overcrowding, poor hygiene and nutrition. CSOM needs considerable attention, not only because of its high incidence and chronicity, but also because of issues such

as bacterial resistance and ototoxicity with empirical use of topical and systematic antibiotics.[5]

The widespread indiscriminate, haphazard use of antibiotics and poor follow up of patients has precipitated the emergence of many resistant strains of bacteria which can produce both primary and post-operative infections. Changes in the microbiological flora following the advent of sophisticated synthetic antibiotics increases the relevance of reappraisal of the modern day flora in CSOM. Antibiotic pattern in vitro is very important for the clinician to plan a general outline of treatment for a patient with a chronically discharging ear.[6]

The present study was undertaken to study the microbial flora of CSOM and the sensitivity pattern of the causative organism. This can be used as a guideline in prescribing the appropriate antibiotics, there by controlling the infection which forms the primary step in the management of chronic suppurative otitis media. The changing flora of CSOM and emergence of strains resistant to the commonly employed antibiotics is also emphasized in the study.

METHODS

The materials for the present study were collected from patients-both male and female suffering from chronic suppurative otitis media (TTD) among the age group of 20-60 years, attending ENT OPD at Vinayaka Mission's Medical College and Hospital, Karaikal, Pondicherry from July 2018 till December 2018, with history of ear discharge of more than 6 weeks duration, constitute the material for study. 60 samples were received during the study period fulfilling the following inclusion and exclusion criteria.

Inclusion criteria

- Age >20years and <60 years.
- Patients presenting with chronic ear discharge for more than 6-12 weeks.
- Patients with central perforation of tympanic membrane (safe type).
- Patients must not have received topical or systemic antibiotics (>12wks).

Exclusion criteria

- Patients who have received systemic or topical antibiotics for CSOM in last 12 weeks.
- Patients with single and first episode of ear discharge.
- Patients with serious medical conditions such as diabetes mellitus, immune-compromised states, malignancy.
- Patient with marginal or attic perforation.

A through complete clinical examination of ear, nose and throat was carried out. Radiological investigations of mastoids were also done.

Two swabs were collected from patients discharging ear, using sterile cotton wool swabs and ear speculum under aseptic precautions and sent for culture and sensitivity. All care was taken to avoid surface contamination with contents of external auditory canal (EAC).

The first swab was used for direct Gram stain and the second swab was inoculated in blood agar and Macconkey agar plates and incubated at 37^0C for 24hrs. The conventional methods of bacterial identification involve examination of the culture characteristics, as well as biochemical and physiologic testing on pure cultures obtained from single colonies. Organisms are identified and speciated based on the biochemical tests such as catalase test, oxidase test, coagulase test, methyl red test with reference to Koneman-color atlas of diagnostic microbiology.

Antibiotic susceptibility testing of the organisms diagnosed was done by Kirby Bauer disk diffusion method (Donald C. Sockett DVM) in Muller Hinton agar. The plates were read after overnight incubation at 37^0C by measuring the zone of inhibition around the antibiotic discs and reference tables were used to determine if the bacteria are sensitive (S), intermediate (I) or resistant (R) to the antimicrobial drugs as per CLSI (Clinical Laboratory Standards Institute) guidelines.

RESULTS

The study was carried out in a total of 60 patients comprising 24 males and 36 females (Figure 1).

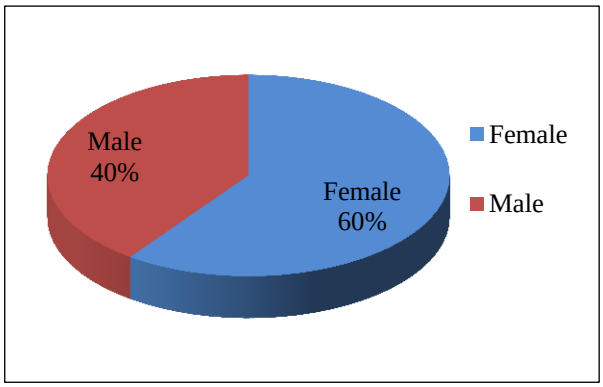

Figure 1: Sex distribution.

Microbial status

Among the 60 samples, 50 were culture positive and 10 samples were sterile. 42 samples were mono microbial and 8 samples showed polymicrobial growth (Figure 2).

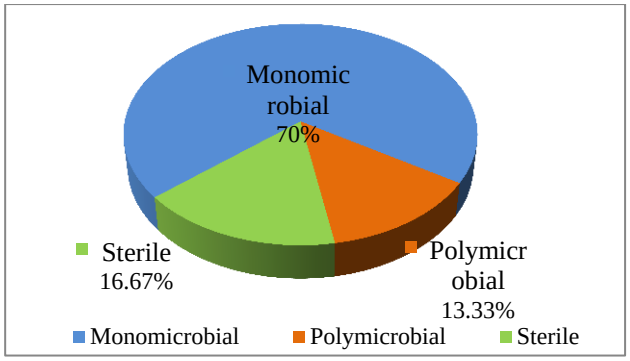

Figure 2: Microbial status.

Organisms isolated from aural discharge

In our study, *Pseudomonas* species was the most common isolated bacteria, seen in 38% (n=19) of isolates followed by the *Escherichia coli* in 22% (n=11) of isolates, followed by *Staphylococcus aureus* in 18% (n=9) (Figure 3).

Antibiotic sensitivity patterns

In Table 1, the antibiogram of CSOM cultures showed that piperacillin, tazobactam and imipenem has the highest sensitivity to all the bacterial isolates whereas ciprofloxacin, linezolid, cefixime were least sensitive.

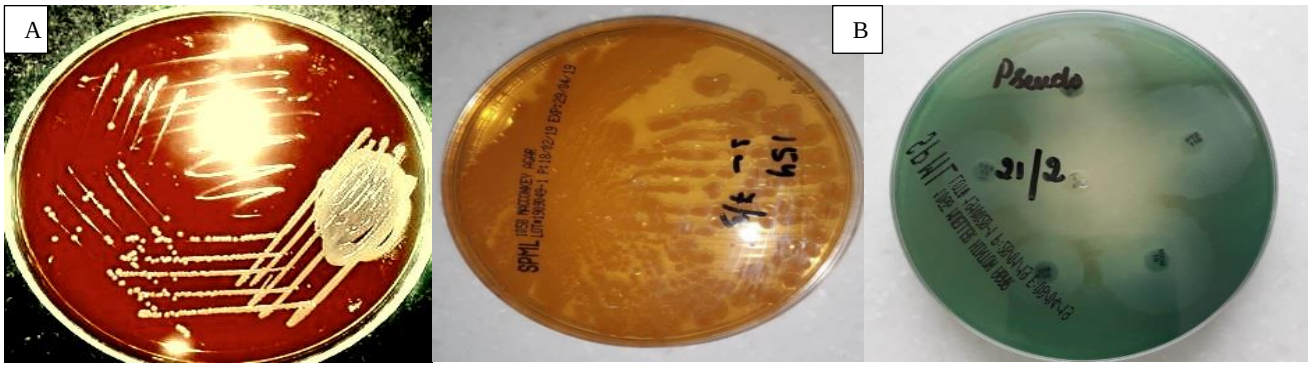

Figure 3: (A) Blood Agar culture plate showing colonies of *staphylococcal* growth. (B) Macconkey Agar culture plate showing colonies of *Klebsiella* species and *Pseudomonas*.

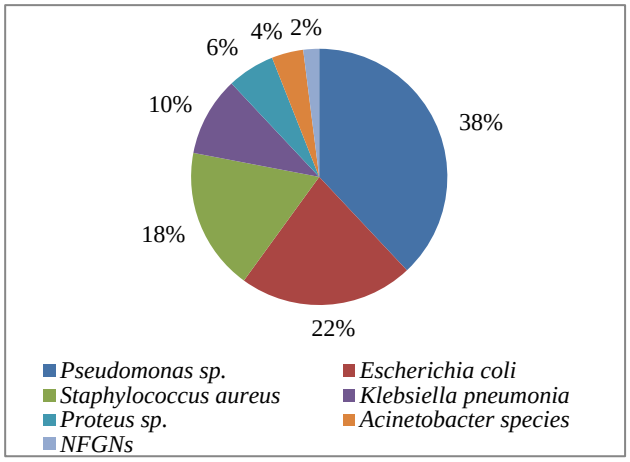

Figure 4: Organisms obtained from aural discharge.

Pseudomonas aeruginosa showed sensitivity of 100% (piperacillin and tazobactam), 63.2% (imipenem), 57.9% (gentamycin), 52.6% (pefloxacin) and 36.8% (amikacin).

E. coli showed sensitivity of 81.8% for imipenem and 72.7% for piperacillin tazobactam.

S. aureus showed a sensitivity of 88.9% to amikacin and imipenem followed by 77.8% for piperacillin tazobactam and gentamycin.

Klebsiella species showed a sensitivity of 80% to piperacillin tazobactam and gentamycin, followed by imipenem 40%.

DISCUSSION

Due to changing pattern of bacteriological profile of otitis media and sensitivity of microorganisms towards antibiotics, it has become very imperative to find out the organism causing the disease.

Our study showed that 36 (60%) patients were female and 24 (40%) were male which is in accordance with Loy et al, whose study had female (53.3 %) and male (46.7%).[7] Whereas Shyamala et al and Ahmed et al whose study showed male predominance 57% and 57.3% respectively.[8,9]

The study of Shamweel et al, showed the increased prevalence of CSOM in 30-40 years age (31.70%) which is similar to our study.[10]

Table 1: Antibiogram of isolates of aural swab culture in CSOM patients.

Microorganism	No of cases	Pip-Tz (%)	Imi (%)	Gen (%)	Ami (%)	Pef (%)	Ceft. S (%)	Cipr (%)	Lin (%)	Cefx (%)	Cefp. S (%)
Pseudomonas sp.	19	19 (100)	12 (63.2)	11 (57.9)	7 (36.8)	10 (52.6)	5 (26.3)	7 (38.8)	0 (0)	0 (0)	4 (21.5)
Escherichia coli	11	8 (72.7)	9 (81.8)	7 (63.6)	2 (18.2)	6 (54.5)	1 (9.1)	6 (54.5)	2 (18.2)	1 (9.1)	1 (9.1)
Staphylococcus aureus	9	7 (77.8)	8 (88.9)	7 (77.8)	8 (88.9)	5 (55.6)	1 (11.1)	2 (22.2)	0 (0)	0 (0)	3 (33.3)
Klebsiella Sp.	5	4 (80)	2 (40)	4 (80)	2 (40)	3 (60)	2 (40)	2 (40)	1 (20)	0 (0)	1 (20)
Proteus sp.	3	2 (66.6)	1 (33.3)	2 (66.6)	2 (66.6)	1 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (33.3)
Acinetobacter species	2	1 (50)	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Nonfermenting *Gram negative bacilli (NFGNs)*	1	1 (100)	1 (100)	1 (100)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*****Pip-Tz- Piperacillin Tazobactam, Imi- Imipenem, Gen- Gentamycin, Ami- Amikacin, Pef- Pefloxacin, Ceft.S- Ceftriaxone Sulbactam, Cipr- Ciprofloxacin, Lin- Linezolid, Cefx- Cefixime, Cefp.S- Cefoperazone Sulbactam

Monomicrobial growth was seen in 42 samples (70%), which is similar to the previous study by Agarwal et al.[11] In our study, polymicrobial growth was seen in 8 samples (13.33%) and 10 samples (16.67%) showed no growth. In studies of Vijaya et al and Fatma et al it shows higher number of sterile sample; this may be due to prior antibiotic therapy.[12,13]

The predominant organism isolated in our study was Pseudomonas species (38%) followed by *Escherichia coli* (22%) and *Staphylococcus aureus* (18%). Study of Malkappa et al, found that commonest organism was *Pseudomonas aeruginosa* (45.24%) followed by *Staphylococcus aureus* (22.22%).[14] This observation is in line with the finding from study of Sharma S et al and Harshika et al.[15,16] But in contrast, Singh et al who have found *Staphylococcus* species as the predominant organism causing CSOM.[17]

In the present study, piperacillin tazobactam showed a high rate of activity against *Pseudomonas aeruginosa*, *Klebsiella*, and *Proteus* with a sensitivity index of 100%, 80% and 66.6% respectively followed by imipenem which showed a high rate of activity against *Escherichia coli* and *Staphylococcus aureus* with a sensitivity index of 81.8% and 89% respectively. In Rathi et al, study showed sensitivity to clindamycin (87.67%), followed by cotrimoxazole (56.16%) and cloxacillin (39.7%) and also showed multiple drug resistance to amoxicillin clavulinic acid and cefixime (5.3%).[18]

In contrast, Chandersekhar et al reported that in case of *Pseudomonas* sensitivity to ceftazidime (100%), ciprofloxacin (98.8%) and amikacin (97%).[19] In Vishwanath et al study reported that the tobramycin was the most effective (83.8%), followed by gentamicin (78.1%), ciprofloxacin (75.6%) and neomycin (3.5%).[20]

Empirical misuse and self-medication of antibiotics have induced changes in microbial flora and their susceptibility to antibiotics, making it more difficult in managing CSOM. It is nowadays common for an otologist to see discharging ears, whose bacterial flora have already been modified by prior antibiotic therapy often leading to cultures that are sensitive only to higher antibiotics which may result in expensive and unaffordable treatment to common man. Hence treatment becomes a problem. This may be because of microbial resistance to basic antibiotics. This suggests their failure leading to continuation of purulent discharge in the discharging ear when they are again prescribed without obtaining a culture. It is hence important to know what type of bacteria is taking part in event of suppuration so that appropriate antibiotics may be instituted early and effectively to prevent complications. Chronic otitis media is generally of long duration with repeated active inflammation. Thus, repeat empirical prescription of antibiotics over a long period of time can induce multidrug-resistant strains.[18]

In conclusion, *Pseudomonas* species and *Escherichia coli* were found to be the common cause of CSOM in our study. These organisms are found to be more susceptible to higher antibiotics like piperacillin/tazobactam and imipenem and they were less susceptible to the routinely used drugs like ciprofloxacin and cephalosporins. Also, the resistance pattern of the microorganisms usually keeps changing. Hence, routine use of topical antibiotics

for any case of CSOM as empirical therapy must be reviewed and judicial use of antibiotics is recommended. Appropriate antimicrobial drugs should be prescribed after proper diagnosis of the causative organism and its antimicrobial susceptibility pattern. The patients should also be advised to take the drugs for the complete prescribed duration. This will not only help in minimising the complications, but also help in preventing the emergence of resistant strains.

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