Original Research Article

Clinico-microbial profile in chronic suppurative otitis media and its management in tertiary care centre

Rashmi Ramashesh[1]*, Samira Abdul Wajid[2], Smitha Chandra[1]

[1]Department of ENT, the Oxford Medical College, Hospital and Research Centre, Karnataka, India
[2]Department of Microbiology, American University of St Vincent School of Medicine, West Indies

*Correspondence:
Dr. Rashmi Ramashesh,
E-mail: doc_rashmi@yahoo.co.in

ABSTRACT

Background: Chronic suppurative otitis media (CSOM) is an ever growing concern of preventable hearing loss and is a major health concern especially in tropical countries. Lack of cleanliness, overcrowding, poverty, malnutrition and medical ignorance are few of the contributing factors. The microbiological flora is constantly changing due to indiscriminate use of antibiotics with rapid change in the antibiotic sensitivity patterns. Hence, this study was undertaken to determine the epidemiological profile, bacteriological profile and the antibiotic sensitivity pattern which would help in establishing a protocol in management of CSOM patients in the hospital.

Methods: A total of 100 patients of CSOM attending the ENT Outpatient Department of The Oxford medical College, Hospital and Research Centre were included in the study. The samples were immediately sent to the Microbiology laboratory for further processing according to standard procedure.

Results: Out of 100 cases, 74 were active mucosal type and 26 were active squamous, with Pseudomonas species (33.6%) being the predominant organism. *Staphylococcus aureus* was the next common organism with MSSA (16.3%) and MRSA (12.5%), CONS were 6.7%. Among the 28 gram-negative bacilli, *Klebsiella pneumoniae* (7.7%), was followed by *Escherichia coli* (5.7%), and *Proteus mirabilis* (4.8%).

Conclusions: Pseudomonas species and *Staphylococcus aureus* are the commonest organisms of CSOM. Ciprofloxacin can be used as a topical agent for treating gram-negative bacilli. Among systemic antibiotics- Linezolid, Amikacin and Imepenam remains the drug of choice.

Keywords: CSOM, *Pseudomonas* spp, *Staphylococcus aureus*, Ciprofloxacin

INTRODUCTION

Chronic suppurative otitis media is defined as "inflammation of the middle ear mucosa and mastoid". CSOM is usually classified into two types, tubotympanic and attico-antral depending on whether the disease process affects the pars tensa or pars flaccida of the tympanic membrane. Tubotympanic is called as a safe type or benign type or active mucosal type as there is no serious complication whereas, attico-antral is called as the unsafe or dangerous type or active squamous type

because of associated complication and may be life threatening at times. CSOM whether safe or dangerous type is associated with mixed bacterial flora. Topical preparations containing antibiotics and steroids to reduce otorrhoea and to provide local anti-inflammatory effect are the mainstays of medical management. Antibiotic resistance has complicated the management of draining ear[1]. Knowledge of local microbiological flora in CSOM is essential for initiating empirical therapy in case of pending culture results.[1,2] Misuse and overuse of antibiotics along with increasing drug resistance among

common pathogens encountered in CSOM makes it mandatory for periodic surveillance of microbiological sensitivity profile of CSOM. In this study, we examine factors predisposing to resistance as well as role culture played in the management of patients.

Objectives

- To study the aetiological organisms for CSOM
- To analyze the susceptibility pattern of aerobic bacterial isolates at our hospital so that antibiotic policy is formulated for CSOM for better patient management.

METHODS

The study included 100 clinically suspected cases of CSOM attending the Outpatient Department of ENT at The Oxford Medical College Hospital and Research Centre, Bangalore, during a period of 1 year (February 2016 - January 2017). A detailed case history was taken which included age, sex, socio-economic status, occupation, similar complaints in family, duration of disease and treatment received previously. General physical examination and systemic examination was done. Ear discharge was obtained from the diseased ear of the patient, using two separate pre-sterilized swabs. One of the swabs was used for direct Gram stain and the second swab was plated on 5% sheep blood agar, MacConkey's agar and chocolate agar. The plates were incubated at 37°C for 48 hours. The isolates grown were identified by their cultural characteristics, morphology and biochemical reactions. Antimicrobial sensitivity testing for aerobic isolates was carried out by Kirby Bauer disc diffusion method on Muller Hinton agar. The plates were read after overnight incubation at 37^0C by measuring the zone of inhibition around the antibiotic discs as per CLSI (Clinical Laboratory Standards Institute) guidelines.[3-5]

The data was analysed on IBM SPSS version 19.

Inclusion criteria

Patients of all age groups who were not on any antibiotic treatment (topical or systemic) for atleast 5 preceding days were included in the study.

Exclusion criteria

Patients having ASOM, systemic disease and previous history of ear surgery were excluded from the study.

RESULTS

Out of 100 patients of CSOM, 58 were males and 42 were females. The male to female ratio was 1.3:1. The maximum age group was third decade followed by first and second decade as shown in Figure 1.
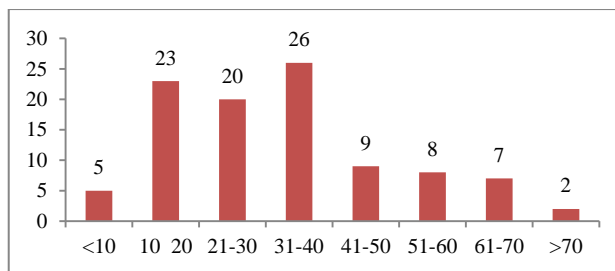

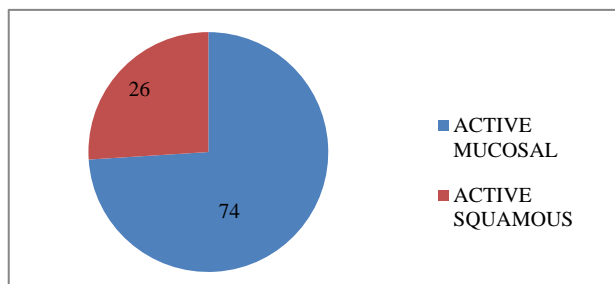**Figure 1: Age distribution of patients.**

Figure 2: Types of CSOM & its percentage.

Among the 100 cases of CSOM, 74 were active mucosal type and 26 were active squamous type as shown in Figure 2.

Among the 100 patients, 12% of them had bilateral CSOM, while the remaining 88% had unilateral CSOM.

Bacteriological profile of the CSOM showed no growth in 7 patients, 1organism in 82 patients and 2 organisms in 11 patients.
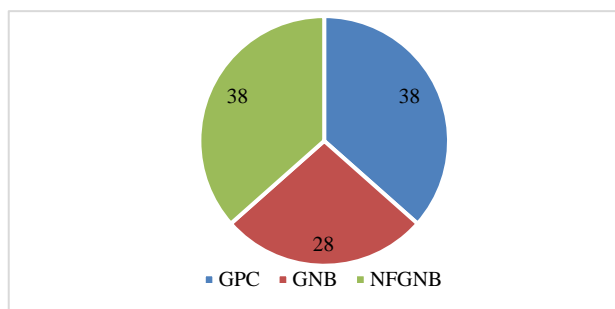

Figure 3: Percentage distribution of bacteria isolated from CSOM patients.

Out of 104 organisms isolated totally, 38 (36.5%) were gram-positive cocci, 28 (27%) were gram-negative bacilli and 38 (36.5%) were non-fermenting gram-negative bacilli as shown in Figure 3.

Out of 38 gram-positive cocci, *Staphylococcus aureus* was the predominant one- 28.9% of the total 104 organisms which were isolated. MSSA were (44.7%), followed by MRSA (34.3%) and CONS (18.4%) as shown in Table 1.

Table 1: Percentage distribution of gram-positive cocci.

Organism	Number	Percentage (%)
MSSA	17	44.7
MRSA	13	34.3
CONS	7	18.4
Enterococcus	1	2.6

Table 2: Percentage distribution of gram-negative bacilli.

Organism	Number	Percentage (%)
Klebsiella pneumoniae	8	28.6
Escherichia coli	6	21.5
Proteus mirabilis	5	17.9
Enterobacter	3	10.7
Citrobacter	2	7.1
Proteus vulgaris	2	7.1
Klebsiella oxytoca	2	7.1

Out of the 28 gram negative bacilli, the most common organism isolated was *Klebsiella pneumonia* (28.5%), followed by *Escherichia coli* (21.4%), and *Proteus mirabilis* (17.8%) as shown in Table 2.

Table 3: Percentage distribution of non-fermenter gram-negative bacilli.

Organism	Number	Percentage (%)
Pseudomonas species	20	52.6
Pseudomonas aeruginosa	15	39.5
Acinetobacter	3	7.9

Out of the 38 nonfermenting gram negative bacilli, *Pseudomonas* species (52.6%) was the highest followed by *Pseudomonas aeruginosa* (39.5%) and *Acinetobacter* (7.9%) as shown in Table 3.
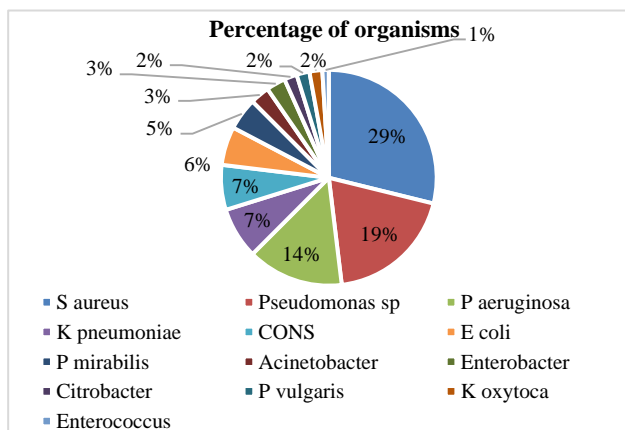

Figure 4: Percentage distribution of all the organisms isolated from CSOM.

Among the total 104 organism which were isolated, *Pseudomonas* species (33.6%) were the highest among which *Pseudomonas aeruginosa* was 14.4%. It was followed by *Staphylococcus aureus*- 28.8%; MSSA were (16.3%), followed by MRSA (12.5%), and CONS (6.7%). Among the 28 gram-negative bacilli, *Klebsiella pneumoniae* (7.7%), was followed by *Escherichia coli* (5.7%), and *Proteus mirabilis* (4.8%). *Acinetobacter* were 2.8% as shown in Figure 4.

Table 4: Antibiotic sensitivity pattern of *Staphylococcus aureus* (total=30).

Antibiotics	Sensitive	Percentage (%)
P	0	0
AMC	6	20
AK	16	53.3
CX	13	43.3
COT	12	27.9
CIP	7	23.3
CD	17	56.7
C	18	60
E	12	40
GEN	8	26.7
TE	23	76.7
V	26	86.7
LZ	30	100

AK- Amikacin, AMC- Amoxyclav, C- Chloramphenicol, CD-Clindamycin, CIP- Ciprofloxacin, CX- Cefoxitin, COT-Cotrimoxazole, E-Erythromycin, GEN-Gentamicin, LZ-Linezolid, P-Penicillin, TE-Telithromycin, V-Vancomycin.

Table 5: Antibiotic sensitivity pattern of GNB (total=28).

	Sensitive	Percentage (%)
AMP	3	10.7
AMC	12	42.9
AK	17	60.7
CTX	16	57.1
CTR	15	53.6
CPM	17	60.7
CIP	22	78.6
COT	16	57.1
IMP	22	78.6
MRP	16	57.1
TE	9	32.1

AK- Amikacin, AMC- Amoxyclav, AMP-Ampicillin, CIP- Ciprofloxacin, CTX- Cefotaxime, CTR- Ceftriaxone, CPM-Cefipime, COT- Cotrimoxazole, IMP-Imipenem, MRP-Meropenem, TE-Telithromycin.

Antibiotic sensitivity of *Staphylococcus aureus* (30) showed MSSA (56.7%) and MRSA (43.3%). The most sensitive antibiotic was Linezolid (100%), followed by Vancomycin (86.7%) followed by Telithromycin (76.7%) and Chloramphenicol (60%). *Staphylococcus aureus* was 100% resistant to Penicillin, followed by Amoxyclav (60%) and Gentamicin (60%) as shown in Table 4.

Among the gram-negative bacteria, the most sensitive antibiotic was Ciprofloxacin (78.6%) and Imipenem (78.6%), followed by Amikacin (60.7%), and Cefepime (60.7%). The most resistant antibiotic was Ampicillin (97%), followed by Telithromycin (67.9%) (Table 5).

Table 6: Antibiotic sensitivity pattern of NF GNB patients studied (total=38).

	Sensitive	Percentage (%)
AK	30	79
CAZ	22	57.9
CPM	25	65.8
COT	4	10.5
CIP	22	57.9
GEN	25	65.8
IMP	32	84.2
MRP	25	65.8
PI	21	56.8
PIT	26	68.4
TE	5	13.2
TOB	20	52.6

AK- Amikacin, CIP- Ciprofloxacin, CPM-Cefipime, CAZ-Ceftazidime, COT- Cotrimoxazole, GEN-Gentamicin, IMP-Imipenem, MRP-Meropenem, PI- Piperacillin, PIT-Piperacillin/Tazobactam, TE-Telithromycin, TOB- Tobramycin.

Among the non-fermenting gram negative bacteria, the most sensitive antibiotic was Imipenem (84.2%), followed by Amikacin (79%) and Piperacillin-Tazobactam (68.4%). Maximum antibiotic resistance was noted to Cotrimoxazole (89.5%) followed by Telithromycin (86.8%) (Table 6).

DISCUSSION

In our study, the maximum no of cases were in the age group 30 -40 yrs. This is in contrast to the study done in Sri Lanka where in the most common age group was 15 - 25 yrs. Males outnumbered females in the ratio of 1.3:1. This is in accordance with the study done in Sri Lanka.[6]

Out of 104 organisms' isolated in our study, the gram-negative bacilli (63.5%) were more than gram *positive cocci* (36.5%). This is in accordance with study done by Poorey and Madana et al which showed gram negative organisms outnumbered gram positive organisms. This can be attributed to contaminated water.[2,7]

Out of the 66 gram negative bacilli, the most common organism was Pseudomonas species (33.6%), followed by *Klebsiella pneumonia* (7.7%), *Escherichia coli* (5.7%) and *Proteus mirabilis* (4.8%). More frequent isolation of fecal bacteria like *Escherichia coli* and *Klebsiella pneumoniae* indicates that individuals are at high risk of infection from poor hygiene and sanitary conditions.[8]

Among the gram positive cocci, *MSSA* (16.3%), were followed by MRSA (12.5%), then by coagulase negative staphylococci- CONS (6.7%). This is in accordance with the study in a tertiary care set up conducted by Vishwanath et al where in most common isolate was *Pseudomonas aeruginosa*, followed by *Staphylococcus aureus*, coagulase negative *staphylococci* and *Klebsiella pneumonia*.[1]

Antibiotic sensitivity testing carried out for gram-positive cocci showed maximum sensitivity to Linezolid (100%) and Vancomycin (86.7%). This is in contrast with the study done by Vishwanath et al where Tobramycin was the most effective antibiotic followed by Gentamicin and Ciprofloxacin against both gram-positive cocci and *gram negative* bacteria.[1]

The antibiotic sensitivity testing done for gram-negative bacilli, showed maximum susceptibility to Ciprofloxacin (78.6%) and Imepenem (78.6%), followed by Amikacin (60.7%).

Antibiotic sensitivity for non-fermenting gram-negative bacilli showed highest sensitivity to Imipenem (84.2%), followed by Amikacin (79%) and Piperacillin-Tazobactam (68.4%). This is in accordance with another study done by Indhuran et al where in Pseudomonas aeruginosa was highly susceptible to Imipenem, Piperacillin-Tazobactum, Ceftazidime and Amikacin.[9]

In a study done by Poorey et al Amikacin was most effective drug followed by Ciprofloxacin, Cefoperazone, and Gentamicin.[2] In another study done in Uttarakhand, Amikacin was most effective drug followed by Ceftazidime, Gentamicin and Ciprofloxacin.[10]

The most common organism in both tubotympanic and atticoantral disease was Pseudomonas species which is in accordance with the study in Sri Lanka, where in *Pseudomonas* species was the most common followed by *Staphylococci* and *Coliforms*.[6]

In active mucosal type, there was a significant number of MRSA, which can be attributed to growing resistance amongst the common organisms in CSOM.

CONCLUSION

Pseudomonas species is the common organism in both tubotympanic and atticoantral types of CSOM. Ciprofloxacin can be used as a topical agent for treating gram-negative bacilli. Among systemic antibiotics-Linezolid, Vancomycin, Amikacin and Imepenem remain the drug of choice. In the era of increasing drug resistance, periodic monitoring of microbiological profile of CSOM along with clinical correlation is essential.

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