



## Original Research Article

# Bacteriological profile and antibiogram of chronic Suppurative otitis media in a tertiary care centre, ballari–A cross sectional study

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## ABSTRACT

**Introduction:** Chronic suppurative otitis media (CSOM) is a condition of middle ear characterized by recurrent or persistent discharge through a chronic perforation of tympanic membrane. CSOM causes mild to moderate conductive hearing loss in more than 50% of cases. As there is mild to moderate conductive deafness, this in turn in children is likely to affect language and cognitive development. CSOM produces chronic mastoiditis by contiguous spread. If untreated it can lead to irreversible local destruction of middle ear structures and various intracranial and extra cranial complications. The organisms causing CSOM and their susceptibility pattern to antibiotics varies in different regions and also changes over time. Therefore it is important to study the organisms causing CSOM and their susceptibility pattern at regular intervals to see the pattern of organisms prevalent in patients with CSOM in that particular region and their antibiotic susceptibility to start empirical treatment for patients with CSOM by clinicians.

**Objectives:** To determine the bacteriological profile and antimicrobial sensitivity pattern of organisms causing chronic suppurative otitis media.

**Materials and Methods:** Ear swabs collected from patients of suspected CSOM during the period of 1 year from January 2018 to December 2018 were included in the study. Samples were processed for routine microscopy and culture and the organisms were identified by standard methods and antimicrobial susceptibility testing was done as per CLSI (Clinical and laboratory Standards Institute) guidelines. The isolates were identified by colony morphology, Gram's stain and biochemical reactions and antibiotic susceptibility tests performed by CLSI recommended by Kirby-Bauer disc diffusion method.

**Results:** Out of the 132 ear swab samples, 114 yielded growth. 18 samples showed no growth. Most common organism isolated was *Staphylococcus aureus* 43(37.7%) followed by *Pseudomonas aeruginosa* 32(28.1%). Other organisms isolated include *Klebsiella* spp 12(10.6%), Coagulase negative *staphylococci* 11(9.6%), *Proteus* spp 8(7%), *E. coli* 5(4.4%) and *Citrobacter* spp 3(2.6%). Amikacin, Gentamycin and Ciprofloxacin were found to be effective against most of Gram positive and negative organisms.

**Conclusion:** CSOM is a disease of middle ear which if not given timely treatment can lead to irreversible ear damage and intracranial and extracranial complications. Identification of organisms causing CSOM and appropriate antibiotic sensitivity pattern is helpful in the treatment of CSOM and reduce complications. Hence in the era of increasing antimicrobial resistance, the knowledge of bacterial organisms causing CSOM and their antimicrobial pattern in that particular area help clinicians in choosing appropriate antibiotics for the empirical treatment of CSOM.

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## 1. Introduction

Chronic suppurative otitis media (CSOM) is a long-standing infection of a part or whole of the middle

ear cleft characterized by discharging ear and permanent perforation.<sup>1</sup> It is defined as a condition of the middle ear that is characterized by persistent or recurrent discharge for three months or more through a perforation of the tympanic membrane.<sup>1,2</sup> The incidence of CSOM is increasing in the

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developing countries due to poor nutrition, poor hygienic practices and lack of health education.<sup>3</sup> If timely treatment is not given, it leads to considerable morbidity by causing many complications like hearing loss and even causing life threatening complications. Hence it is necessary to treat the persistent ear discharge in CSOM by using appropriate antibiotics according to antibiotic susceptibility of the organisms isolated. Various risk factors are involved in the development of CSOM such as frequent upper respiratory tract infections, nasal disease, inadequate antibiotic treatment, poor living conditions with poor nutrition and hygiene. These risk factors may lead to the development of CSOM by weakening the immunological defenses, and encouraging early infection.<sup>4</sup> The organisms causing CSOM and their susceptibility pattern to antibiotics varies in different regions and also changes over time. Therefore it is important to study the organisms causing CSOM and their susceptibility pattern at regular intervals to see the pattern of organisms prevalent in patients with CSOM in that particular region and their antibiotic susceptibility to start empirical treatment for patients with CSOM by clinicians and also helps to establish antibiotic policy and prevent irrational use of antibiotics which would otherwise lead to development of antibiotic resistance by the organisms.

## 2. Objectives

1. To determine the bacteriological profile
2. To determine the antimicrobial resistance pattern of organisms causing chronic suppurative otitis media

## 3. Materials and Methods

Ear swabs collected from patients of suspected CSOM during the period of 1 year from January 2018 to December 2018 were included in the study. Samples were processed for routine microscopy and inoculation was done on Nutrient agar, MacConkey agar and blood agar. The inoculated plates were incubated at 37°C overnight. The next day the isolates were identified by colony morphology, Gram's stain and various biochemical tests by standard methods as per CLSI guidelines. Antibiotic susceptibility tests were performed by Kirby-Bauer disc diffusion method as recommended by CLSI guidelines. The antibiotics used were Penicillin (10IU), Ampicillin (10µg), Cotrimoxazole (25µg), Augmentin (30µg), Piperacillin (100µg), Chloramphenicol (30µg), Ciprofloxacin (5µg), Amikacin (30µg),

## 4. Results

Out of the 132 ear swab samples received in the microbiology laboratory from the suspected cases of CSOM for a duration of 1 year, 114 yielded growth. The growth was monobacterial growth. 18 samples showed

no growth. Most common organism isolated was *Staphylococcus aureus* 43(37.7%) followed by *Pseudomonas aeruginosa* 32(28.1%). Other organisms isolated include *Klebsiella* spp 12(10.6%), *coagulase negative staphylococci* 11(9.6%), *Proteus* spp 8(7%), *Escherichia coli* 5(4.4%) and *Citrobacter* spp 3(2.6%). Amikacin, Gentamycin and Ciprofloxacin were found to be effective against most of Gram positive and negative organisms.

## 5. Discussion

In the present study, Out of 132 swabs, 114 yielded growth. Monobacterial growth was seen in 100% of cases, unlike in studies done by Poorey VK, Lyer A<sup>5</sup> and Shyamla R, Reddy SP<sup>6</sup> which showed polymicrobial growth. *Staphylococcus aureus* (37.7%) was the most common organism isolated followed by *Pseudomonas aeruginosa*, *Klebsiella* spp, Coagulase negative Staphylococci, *Proteus* spp, *Escherichia coli*, *Citrobacter* species (2.6%) was the least common organism isolated. *Staphylococcus aureus* which was the most common organism isolated in our study showed 82.5% sensitivity to Gentamicin followed by 78.4% sensitive to Amikacin. Most of the other organisms isolated were also sensitive to Amikacin, Gentamicin followed by Ciprofloxacin.

This is in accordance with the study done by Sharma A et al<sup>7</sup> in which most common organism causing CSOM was *Staphylococcus aureus*, followed by *Pseudomonas aeruginosa*, most patients with *Staphylococcus* infection being sensitive to Vancomycin followed by Linezolid and Gentamycin and patients with *Pseudomonas aeruginosa* sensitive to Amikacin and Ciprofloxacin.

In a study done by Raakhee T, Sreenivasa Rao Unguturu,<sup>8</sup> out of 71 patients the most common microorganisms isolated were *Pseudomonas aeruginosa* and *Staphylococcus aureus* followed by Coagulase-Negative Staphylococci (CONS), *Klebsiella* spp, *Proteus* spp and *Escherichia coli*, with increased sensitivity to Ciprofloxacin followed by Gentamycin and relatively less sensitive to Chloramphenicol.

A study by Sunilkumar Biradar, C. Roopa<sup>9</sup> revealed that out of 211 isolates identified

including polymicrobial samples, Predominant aerobic bacteria causing CSOM were identified as *Pseudomonas aeruginosa* 48.5% followed by *Staphylococcus aureus* 36.8%, *Klebsiella* 8%, *E. coli* 5.5% and *Proteus mirabilis* 1%. *Pseudomonas aeruginosa*, which was predominant organism isolated unlike our study, meropenem was the most sensitive antibiotic (100%) followed by amikacin, ceftriaxone, cefuroxime, gentamicin and amox-clav. Among *S. aureus*, which was the most common organism isolated in our study, vancomycin was the most susceptible antibiotic (100%), followed by amox-clav and amikacin.

Out of total 204 ear swabs processed in a study done by Rajat Prakash et al,<sup>10</sup> microbial growth was seen in 91.18%

**Table 1:** Microorganisms isolated in positive cultures.

Organism	Number	Percentage (%)
Staph. aureus	43	37.7
Pseudomonas aeruginosa	32	28.1
Klebsiella spp	12	10.6
Coagulase negative Staphylococci	11	9.6
Proteus spp	8	7
E. coli	5	4.4
Citrobacter Spp.	3	2.6
Total	114	100

**Table 2:** Antibiotic resistant pattern of common Isolates (%)

Organism	P	AMP	COT	AMC	CAZ	PIP	C	CIP	AK	GM
Staphylococcus aureus	52.7	50	31	35.1	-	-	20.3	20.3	21.6	17.5
Pseudomonas	-	-	-	-	0	21.9	21.9	15.6	21.9	9.4
Klebsiella spp	-	-	26.3	35.6	29.5	20.3	15.5	9.5	23	10.2
Cons	56.5	45.5	54.5	44.5	-	-	35.5	21.5	22.5	13.5
Proteus spp	-	35	35.5	15	31.3	15.4	33.2	15.5	30	15.5
Escherichia coli	-	25	35.6	38.9	42.5	25	24.6	0	25	0
Citrobacter spp	-	35.6	28.5	32.3	28.3	31.2	22.4	29.4	23.1	19.4

rest showing no growth in 57.84% samples had mono-microbial growth in which both aerobic flora and anaerobic flora and fungal isolates were recovered. Antimicrobial sensitivity on 181 isolates done revealed Amikacin as the most susceptible antibiotic followed by ceftriaxone and gentamicin.

A study by Samiullah, Mohd Rashid<sup>11</sup> The most organism isolated was Pseudomonas spp. 31.25% followed by Staphylococcus aureus 20% and Coagulase negative staphylococcus 11.25% with most of the Gram negative bacteria showing sensitivity to Ceftazidime, Ciprofloxacin, Lomefloxacin, Gentamicin and Netilline and gram positive bacteria showing increased sensitivity to Cephalexin, Linezolid and Gentamicin.

## 6. Conclusion

CSOM is a disease of middle ear which if timely treatment not given can lead to irreversible ear damage and intracranial and extracranial complications. It is a major cause of concern in developing countries as it leads to considerable morbidity if untreated. In our study 114 showed growth out of 132 ear swabs. Among which most of the organisms were sensitive to Amikacin, Gentamicin followed by Ciprofloxacin. Identification of organisms causing CSOM and appropriate antibiotic sensitivity pattern is helpful in the treatment of CSOM and reduce complications. Organisms causing CSOM and their susceptibility pattern varies geographically. Hence in the era of increasing antimicrobial resistance due to irrational use of antibiotics, the knowledge of bacterial organisms causing CSOM and their antimicrobial pattern in that particular

area help clinicians in choosing appropriate antibiotics for the empirical treatment of CSOM and thus reduce the development of antibiotic resistance by the organisms due to irrational use of antibiotics.

## 7. Recommendations

ESBL (Extended spectrum beta lactamases) and Vancomycin resistance detection could yield a better antibiotic resistance pattern.

## 8. Source of Funding

None.

## 9. Conflicts of interest

None.

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