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# A Study of Csom Tubotympanic Type and Its Microbial Flora in Central India

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**Abstract:** To study the microbial flora and sensitivity pattern from the culture of ear swabs of patients with chronic suppurative otitis media (CSOM) tubotympanic type attending ENT OPD at Index Medical College, Hospital & Research Centre from January 2016 to December 2016. Patients with ear discharge who were eligible for the study were counseled about their condition and an informed written consent was obtained for the study. At the ENT OPD visit of each patient with tubotympanic type CSOM(central perforation), a pretested proforma was used to record the relevant information of each individual included in the study. The ear discharge was collected with two sterile swabs preventing contact with the external auditory canal from middle ear using a sterilized aural speculum. The specimens were immediately taken to the microbiology test laboratory for culture and sensitivity test. Staphylococcus aureus and Pseudomonas spp. were initiate to be the common cause of CSOM in our investigation, these organisms are found to be less vulnerable to the drugs like ciprofloxacin and cephalosporins. With the improvement and extensive use of antibiotics, the types of pathogenic micro-organisms and their resistance to antibiotics have changed. Hence, Routine use of topical antibiotics for any case of CSOM as pragmatic therapy must be reviewed and judicial use of antibiotics is suggested & advised to acquire the drugs for the complete prescribed interval without stopping in the middle. This will not only facilitate in minimizing the complications, but also help in preventing the emergence of resistant strains.
**Keywords:** CSOM, tubotympanic.

## INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as the chronic inflammation of middle ear and mastoid cavity that may present with recurrent ear discharges or otorrhoea through a tympanic perforation [1]. Incidence of the disease is higher in developing countries especially among low socio-economic society because of malnutrition, overcrowding, poor hygiene, inadequate health care and recurrent upper respiratory tract infection [2]. The urban to rural ratio of the disease is 1:2 and the poorer rural communities have highest prevalence [2, 3].

CSOM is 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 (TM) [2]. Tubotympanic is called as a safe type or benign type as there is no serious complication whereas, attico-antral is called as the unsafe or dangerous type because of associated complication and may be life threatening at times [4].

Various previous studies showed that most common organisms found in CSOM are Staphylococcus aureus, Pseudomonas aeruginosa, Proteus mirabilis, Klebsiella, pneumonia, E.coli, Aspergillus species and Candida [5, 6].

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 intracranial abscess [7, 8]. 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 [9].

Treatment options include dry mopping, ear wicking, gentle syringing, or suctioning; systemic

antibiotics; and topical treatment with either antiseptics or antibiotics, sometimes with steroids [10, 11].

Complications associated with CSOM were frequent in pre-antibiotic era, however, the introduction of antibiotics gave clinicians a tool to be used even without the precise etiological diagnosis and the irrational use of antibiotics led to the emergence of multi-drug resistant bacterial strains and disease complication in return [12, 13, 17]. Changes in bacterial flora in CSOM in the last decade have been confirmed and described by various authors [2,17-19].

The treatment of CSOM is controversial and subject to change particularly in the developing countries, the prevalence and antibiogram of these organisms has been reported to vary with time and geographical area as well as continent to continent, probably due to indiscriminate use of the antibiotics [14, 17]. Hence, the periodic update of prevalence and antibiogram of the etiological agents for CSOM would be helpful in therapy and management of patients [15].

The present research was thus planned to study the microbial flora and sensitivity pattern from the culture of ear swabs of these patients [16].

**Overview**

Chronic suppurative otitis media (CSOM) is defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges or otorrhoea through a tympanic perforation. The disease usually begins in childhood as a spontaneous tympanic perforation due to an acute infection of the middle ear, known as acute otitis media (AOM), or as a sequel of less severe forms of otitis media (e.g. secretory OM). The infection may occur during the first 6 years of a child's life, with a peak around 2 years. The point in time when AOM becomes CSOM is still controversial. Generally, patients with tympanic perforations which continue to discharge mucoid material for periods of from 6 weeks to 3 months, despite medical treatment, are recognized as CSOM cases.

The ultimate fate of the tympanic perforation is still largely undocumented. Thus, both the start and the end of the disease process are difficult to define. Although healing is often observed over prolonged periods, there are more patients who develop either recurrent bouts of otorrhoea (active CSOM) or a dry but permanent tympanic perforation (inactive CSOM).

Inactive otitis media refers to a previously discharging ear that has apparently ceased (discharging) without probability of resumption in the near future. Often, the perforation heals imperfectly with areas of retraction and scarring in the eardrum which do not vibrate in response to sound, as well as normal areas. The episodes of otorrhoea are often provoked by upper respiratory infections. A decidedly smaller group of patients, particularly those who have not been treated, develop life-threatening complications.

## MATERIALS & METHODS

The patients were selected from ENT OPD Index Medical College Hospital & Research Centre, INDORE presented with tubotympanic type of CSOM (central perforation) from age group 7-70 years. According to the inclusion criteria during their outpatient visit patients with ear discharge from one or both ears, who were eligible for the study were counseled about their condition and an informed written consent was obtained for the study.

A pretested proforma was used to record the relevant information of each individual included in the study. The ear discharge was collected with two sterile swabs preventing contact with the external auditory canal from middle ear using a sterilized aural speculum. The specimens were immediately taken to the microbiology test laboratory for culture and sensitivity test.

**Sample Size Calculation**

We included all clinically diagnosed cases of chronic suppurative otitis media and satisfying inclusion criteria attending ENT OPD at Index Medical College Hospital & Research Centre from January 2016 to December 2016. Thus final sample size came as 100 and culture & sensitivity study was conducted.

## DISCUSSION

CSOM is a major public-health problem, and India is one of the countries with high-prevalence where urgent attention is needed [22]. It's a persistent disease with great risk of irreversible complications. CSOM is an important cause of preventable hearing loss particularly in the developing world [20] and a reason of serious concern, particularly in children, because it may have long-term effects on early communication, language development, auditory processing, educational process, and physiological and cognitive development [22].

In present study, we found that the CSOM was more prevalent in first and second decade of life and accounted for 52% of the cases. The male is to female ratio was found to be 1:1.2. Cases of CSOM were more common in females (55) than in males (45). As this study involved, a random selection of cases the predominance of female patients over male may be only an incidental finding. Moreover, no knowledge of anatomical differences in the ear structures of male and female has been reported.

Analysis of the total 93 positive cases revealed that mono-microbial growth was obtained in 76 (81.7%) samples while 17 (18.3%) samples yielded polymicrobial growth. Predominant bacterial etiology

(aerobic) of CSOM in this region is Staphylococcus aureus (28.2%) In our study, Pseudomonas was the 2nd most common organism isolated (26.4%). The only anaerobe isolated in all cases was Bacteroids fragilis.

Antimicrobial susceptibility test (AST) was carried out for all the isolates. Imipenem and Amikacin were found to be most effective drug while maximum resistance was seen against cephalosporins and fluoroquinolones. The most effective antibiotics against P. Aeruginosa were Imipenem (96.6%) and amikacin (93.1%). Maximum resistance was seen against fluoroquinolones and cephalosporins. The most effective antibiotics against Staph aureus were Vancomycin (100%), Piperacillin/ tazobactum (95.2%) and aminoglycosides (90.5%). Maximum resistance was seen against Ampicillin and ofloxacin. In case of E.coli, Proteus and Klebsiella sp, Imipenam was found to be the most effective drug followed by Amikacin and piperacillin plus tazobactam.

## RESULTS

**Table-1: Gender distribution of study subjects**

| Gender | N | % |
|---|---|---|
| **Male** | 45 | 45.0% |
| **Female** | 55 | 55.0% |
| **Total** | 100 | 100.0% |

Female predominance was observed among CSOM cases with female to male ratio of 1.2:1.

**Table-2: Age distribution of study subjects**

| Age group(yrs) | N | % |
|---|---|---|
| **0-10** | 25 | 25.0% |
| **11 - 20** | 27 | 27.0% |
| **21-30** | 17 | 17.0% |
| **31-40** | 12 | 12.0% |
| **41-50** | 8 | 8.0% |
| **51-60** | 5 | 5.0% |
| **> 60** | 6 | 6.0% |
| **Total** | 100 | 100.0% |
| **Mean age - 21.7 +/- 7.2 years** | | |

Mean age of cases with CSOM was 21.7 years with over half of them were less than 20 years of age (52%). Only 6% subjects were above 60 years of age.

**Table-3: Distribution of study subjects based on presence of Microbial Growth**

| Microbial Growth | N | % |
|---|---|---|
| **Present** | 93 | 93.0% |
| **Absent** | 7 | 7.0% |
| **Total** | 100 | 100.0% |

Microbiological growth was present in 93% isolates.

**Table-4: Distribution of study subjects based on pattern of Microbial Growth**

| Microbial Growth (n-93) | N | % |
|---|---|---|
| **Mono-microbial** | 76 | 81.7% |
| **Polymicrobial** | 17 | 18.3% |

Out of total 93% positive samples, mono-microbial growth was present in 76 samples (81.7%) while poly-microbial growth was present in 17 samples (18.3%).

**Table-5: Distribution of study subjects based on isolated organisms**

| Isolates (n-110) | N | Percentage (%) |
|---|---|---|
| **Aerobic** | | |
| **Pseudomonas Aeruginosa** | 29 | 26.4% |
| **Proteus spp** | 15 | 13.6% |
| **Staph. Aureus** | 31 | 28.2% |
| **Klebsiella pneumoniae** | 15 | 13.6% |
| **MRSA** | 10 | 9.1% |
| **E.Coli** | 5 | 4.5% |
| **Anaerobic** | | |
| **Bacteroidsfragilis** | 5 | 4.5% |
| **Total** | 110 | 100.0% |

Most common isolated organism was Staph. Aureus (28.2%) followed by P. Aeruginosa (26.4%), proteus spp. (13.6%), K. pneumoniae (13.6%) and E.coli (4.5%). Most common isolated anaerobic organism was Bacteroids fragilis (4.5%).

**Table-6: Sensitivity Pattern of Staph. Aureus**

| Staph. Aureus (n-21) | Sensitive strains (n) | % |
|---|---|---|
| **Amikacin** | 19 | 90.5% |
| **Ampicillin** | 6 | 28.6% |
| **Augmentin** | 18 | 85.7% |
| **Ceftriaxone** | 14 | 66.7% |
| **Cefoperazone** | 15 | 71.4% |
| **Piperacillin/ Tazobactum** | 20 | 95.2% |
| **Ofloxacin** | 12 | 57.1% |
| **Levofloxacin** | 13 | 61.9% |
| **Vancomycin** | 21 | 100.0% |

The most effective antibiotics against Staph aureus were Vancomycin (100%), Piperacillin/ tazobactum (95.2%) and aminoglycosides (90.5%). Maximum resistance was seen against Ampicillin and ofloxacin.

**Table-7: Sensitivity Pattern of P.Aeruginosa**

| P.Aeruginosa (n-29) | Sensitive strains (n) | % |
|---|---|---|
| **Amikacin** | 27 | 93.1% |
| **Ampicillin** | 15 | 51.7% |
| **Ceftriaxone** | 17 | 58.6% |
| **Cefoperazone** | 16 | 55.2% |
| **Imipenem** | 28 | 96.6% |
| **Piperacillin/ Tazobactum** | 20 | 69.0% |
| **Ofloxacin** | 15 | 51.7% |
| **Levofloxacin** | 18 | 62.1% |

The most effective antibiotics against P. Aeruginosa were Imipenem (96.6%) and aminoglycosides (93.1%). Maximum resistance was seen against fluoroquinolones and cephalosporins.

**Table-8: Sensitivity Pattern of Proteus species**

| Proteus spp. (n-25) | Sensitive strains (n) | % |
|---|---|---|
| **Amikacin** | 23 | 92.0% |
| **Ampicillin** | 17 | 68.0% |
| **Augmentin** | 18 | 72.0% |
| **Ceftriaxone** | 9 | 36.0% |
| **Cefoperazone** | 13 | 52.0% |
| **Imipenem** | 24 | 96.0% |
| **Piperacillin/ Tazobactum** | 19 | 76.0% |
| **Ofloxacin** | 20 | 80.0% |
| **Levofloxacin** | 12 | 48.0% |

The most effective antibiotics against Proteus species were Imipenem(96%), aminoglycosides (92%) and ofloxacin. Maximum resistance was seen against cephalosporins and levofloxacin.

**Table-9: Sensitivity Pattern of Klebsiella pneumonia**

| K. pneumonia (n-15) | Sensitive strains (n) | % |
|---|---|---|
| **Amikacin** | 13 | 86.7% |
| **Ampicillin** | 1 | 6.7% |
| **Augmentin** | 5 | 33.3% |
| **Ceftriaxone** | 2 | 13.3% |
| **Cefoperazone** | 3 | 20.0% |
| **Imipenem** | 15 | 100.0% |
| **Piperacillin/ Tazobactum** | 12 | 80.0% |
| **Ofloxacin** | 8 | 53.3% |
| **Levofloxacin** | 9 | 60.0% |

The most effective antibiotics against K. pneumoniae were Imipenem (100%) and aminoglycosides (86.7%). Maximum resistance was seen against ampicillin and cephalosporins.

**Table-10: Sensitivity Pattern of MRSA**

| MRSA (n-10) | Sensitive strains (n) | % |
|---|---|---|
| **Amikacin** | 6 | 60.0% |
| **Ampicillin** | 5 | 50.0% |
| **Augmentin** | 0 | 0.0% |
| **Ceftriaxone** | 4 | 40.0% |
| **Cefoperazone** | 4 | 40.0% |
| **Imipenem** | 8 | 80.0% |
| **Piperacillin/ Tazobactum** | 9 | 90.0% |
| **Ofloxacin** | 1 | 10.0% |
| **Levofloxacin** | 1 | 10.0% |

The most effective antibiotics against Staph aureus were Piperacillin/ tazobactum (90%) and Imipenem (80%). All the isolates showed resistance against Augmentin while 90% were resistant to fluoroquinolones.

**Table-11: Sensitivity Pattern of E. Coli**

| E. Coli (n-5) | Sensitive strains (n) | % |
|---|---|---|
| **Amikacin** | 5 | 100.0% |
| **Ampicillin** | 2 | 40.0% |
| **Augmentin** | 3 | 60.0% |
| **Ceftriaxone** | 3 | 60.0% |
| **Cefoperazone** | 3 | 60.0% |
| **Imipenem** | 5 | 100.0% |
| **Piperacillin/ Tazobactum** | 4 | 80.0% |
| **Ofloxacin** | 3 | 60.0% |
| **Levofloxacin** | 3 | 60.0% |

The most effective antibiotics against E. Coli were Imipenem (100%) and aminoglycosides (100%). Maximum resistance was seen against ampicillin (40%).

**Table-12: Sensitivity Pattern of Bacteroides fragilis**

| Bacteroidesfragilis (n-5) | Sensitive strains (n) | % |
|---|---|---|
| **Amikacin** | 2 | 40.0% |
| **Ampicillin** | 1 | 20.0% |
| **Augmentin** | 0 | 0.0% |
| **Ceftriaxone** | 3 | 60.0% |
| **Cefoperazone** | 2 | 40.0% |
| **Imipenem** | 5 | 100.0% |
| **Piperacillin/ Tazobactum** | 4 | 80.0% |
| **Ofloxacin** | 2 | 40.0% |
| **Levofloxacin** | 2 | 40.0% |

The most effective antibiotics against Bacteroides fragilis were Imipenem (100%) and Piperacillin/ Tazobactum (80%). All the isolates showed resistance against Augmentin.

## CONCLUSION

Staphylococcus aureus and Pseudomonas sp. were found to be the common cause of CSOM in our study. These organisms are found to be less susceptible to the routinely used drugs like ciprofloxacin and cephalosporins. With the development and widespread use of antibiotics, the types of pathogenic micro-organisms and their resistance to antibiotics have changed. 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 without stopping in the middle. This will not only help in minimizing the complications, but also help in preventing the emergence of resistant strains.

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