

**CHRONIC SUPPURATIVE OTITIS MEDIA- AETIOLOGY AND THEIR ANTIBIOGRAM**

Ramya Sablur Narayana<sup>1</sup>, Malini Jagannatha Rao<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Otolaryngology, ESIC-MC-PGIMSR, Bengaluru, Karnataka.

<sup>2</sup>Assistant Professor, Department of Microbiology, ESIC-MC-PGIMSR, Bengaluru, Karnataka.

**ABSTRACT****BACKGROUND**

Chronic Suppurative Otitis Media (CSOM) is a common infectious chronic ear disease in India. The present study of Department of ENT OPD of ESIC-MC-PGIMSR, Bangalore, was aimed to identify aerobic bacterial isolates associated with CSOM and their antibiogram in patients.

**MATERIALS AND METHODS**

Prospectively studied one hundred and thirteen patients with CSOM with ear swabs taken and cultured for bacteria. The standard method of isolation and identification was followed. Antimicrobial susceptibility of the bacterial isolates was performed by Kirby-Bauer's disc diffusion method.

**RESULTS**

*Pseudomonas aeruginosa* 28 (49.1%) was the most predominant organism followed by *Staphylococcus aureus* 16 (28%). Fungi accounted for 3 (2.6%) of the isolates. The antimicrobial profile of the major isolates showed 75% of *Pseudomonas aeruginosa* and 62.5% of *Staphylococcus aureus* sensitive to ciprofloxacin.

**CONCLUSION**

*Pseudomonas aeruginosa* is the most common isolate followed by *Staphylococcus aureus*. The study of microbial pattern and their antibiotic sensitivity determines the prevalent bacterial organisms causing CSOM in local area and to start empirical and more targeted treatment of otitis media and its complications for successful outcome, thus to prevent the emergence of resistant strains.

**KEYWORDS**

Chronic Suppurative Otitis Media, Aerobic Bacterial Isolates, *Pseudomonas Aeruginosa*, *Staphylococcus Aureus*, Bacterial Resistance.

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**BACKGROUND**

Infections of the middle ear space and their sequelae have plagued mankind from the beginning of time. First described by Hippocrates in 450 BC, this universally observed process continues to present one of the most perplexing medical problems of infancy and childhood, while being the cause of hearing loss in paediatric age group.<sup>1</sup>

Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of middle ear and mastoid cavity, which presents with recurrent ear discharge or otorrhoea through a tympanic perforation. The episode of otorrhoea is provoked by upper respiratory tract infections. This is particularly common in children.<sup>2</sup> CSOM is a destructive disease with irreversible sequel and can proceed to serious intra- and/or extracranial complications.<sup>3</sup> 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.<sup>4</sup> Tubotympanic is called as a safe type or benign type, because much complication is not noted.<sup>5</sup> Whereas life-threatening complications are associated with unsafe or dangerous attico-antral type.

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*Corresponding Author:*

*Malini Jagannatha Rao,*

*Department of Microbiology, ESIC-MC-PGIMSR,*

*Rajajinagar, Bengaluru-560010, Karnataka.*

*E-mail: malinirao74@gmail.com*

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Various complications like mastoid abscess, deafness, lateral sinus thrombosis, paralysis, meningitis and intracranial abscess can occur when there is spread of infection to adjacent structures from middle ear.<sup>6,7</sup> In almost 50% of the cases, there can be complications like hearing loss if there is chronic ear discharge.<sup>8</sup> In childhood, acute otitis media if improperly treated or improperly managed can lead to CSOM, which can be seen in adulthood with chronic ear discharge, maybe up to several years.<sup>9-12</sup> The incidence of chronic suppurative otitis media 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.<sup>13</sup>

CSOM for development may be responsible of wide range of organisms. The increasing emergence of bacterial strains which are resistant to known antimicrobial agents is a significant cause of treatment failure. CSOM has received considerable attention, not only because of its high incidence and chronicity but also because of issues such as bacterial resistance and ototoxicity with both topical and systemic antibiotics.<sup>14</sup> The indiscriminate, haphazard and half-hearted use of antibiotics and the poor follow-up of the patients have resulted in the persistence of low-grade infections.<sup>15</sup> Knowledge of the common causative organisms and their antibiotic sensitivity is helpful in deciding the drug of choice in perioperative management of unsafe CSOM.<sup>16</sup> In-vitro antibiotic sensitivity pattern is very important for the clinician to plan a general outline of treatment for a patient

and can minimise complications that may require surgery for a chronically discharging ear.<sup>4</sup>

Therefore, the microbial culture and sensitivity will help in appropriate management of otitis media and its complications, and thus preventing the emergence of resistant bacterial strains.

This study was performed to determine the aerobic bacterial flora and their antibiotic susceptibility pattern in cases of CSOM who attended the ENT Department OPD with complaints of chronically discharging ear.

## MATERIALS AND METHODS

This prospective descriptive study was conducted for a period from Aug 2013 to Feb 2014 at ESIC-MC-PGIMSR, Rajajinagar, Bangalore, a tertiary care hospital. One hundred and thirteen patients, who presented to the ENT department with a history of chronic discharging ear were studied.

The study was approved by our Institutional Ethical Committee and the written informed consent (signed by patient or parent/ guardian) was obtained at enrolment. A total of 113 patients clinically diagnosed with CSOM were included in the study.

### Inclusion Criteria

1. Patients who attended the outpatient clinics with ear discharge for more than 6 - 12 weeks.
2. Topical/ systemic antibiotics were stopped or not received for 14 days before the study.

### Exclusion Criteria

1. Immunocompromised patients, patients on dialysis, receiving immunosuppressive drugs, diabetic, tuberculosis.
2. Children and adults with cleft lip/ cleft palate deformation.

### Statistical Analysis

Since this is a descriptive study, the results were analysed as percentage.

After obtaining consent from the patient, the ENT surgeon collected the sample by pulling the pinna of the ear outward, laterally and backwards after which the sterile swab stick was gently introduced into the external auditory meatus and then gently rotated and the pus specimen was collected.

Two pus samples were collected from the middle ear and the samples were immediately sent to the Microbiology Laboratory for bacterial studies. In the laboratory first swab was used for Gram staining, acid fast staining and KOH mount. The ear discharges were examined microscopically (in 10% potassium hydroxide) for the presence of epithelial cells, pus cells, budding yeast cells, fungal hyphae and spores, etc. The second swab was inoculated on blood agar, MacConkey's agar and chocolate agar media and was incubated at 37°C for 24 hrs. The organisms were identified by using standard procedure. The antimicrobial susceptibility of the aerobic bacterial isolates was performed by Kirby-Bauer's disc diffusion method.<sup>17,18</sup>

## RESULTS

The study included 113 patients in the age ranged from 6 months to 70 years with 42 (37.1%) cases seen in peak age group of 31 - 40 years followed by 25 (22.1%) cases in age

group of 21 - 30 years. The male and female distribution was 66 (58.4%) and 47 (41.6%) respectively, (Table 1).

Out of total 113 ear swabs processed monomicrobial growth was seen in 57 (50.4%), whereas 8 (7.1%) samples showed polymicrobial growth, 26 (23.1%) samples showed no growth, 19 (16.8%) showed the growth of skin commensal and 3 (2.6%) showed fungal growth (Table 2).

*Pseudomonas aeruginosa* 28 (49.1%) was the most predominant organism followed by *Staphylococcus aureus* 16 (28%), *Acinetobacter* spp. 4 (7%), *Citrobacter* spp. 3 (5.3%) and *Klebsiella pneumoniae* and *Proteus mirabilis* 2 (3.5%) each and *Enterobacter cloacae* and *Streptococcus* spp. 1 (1.7%) each, (Table 3).

The antibiotic susceptibility pattern of the 28 isolates of *pseudomonas* shows 100% susceptibility to imipenem followed by piperacillin-tazobactam (92.8%), amikacin (64.3%), ciprofloxacin (75%), co-trimoxazole showed highest resistance (85.7%) followed by Amoxycylav (67.9%), (Figure 1).

Drug susceptibility pattern for *Staphylococcus aureus* showed 100% susceptibility to vancomycin and tetracycline followed by 87.5% susceptibility to gentamicin and amikacin, 81.3% of isolates were susceptible to erythromycin and 62.5% susceptibility to ciprofloxacin (Figure 2). Among the *Staphylococcus aureus*, 3 (17.6) were Methicillin-resistant *Staphylococcus aureus* (MRSA).

Age in Years	Male	Female	Total (%)
0-10	6	2	8 (7.1)
11-20	10	3	13 (11.6)
21-30	13	12	25 (22.1)
31-40	22	20	42 (37.1)
41-50	9	5	14 (12.4)
51-60	4	4	8 (7.1)
61-70	2	1	3 (2.6)
<b>Total</b>	<b>66 (58.4 %)</b>	<b>47 (41.6%)</b>	<b>113 (100)</b>

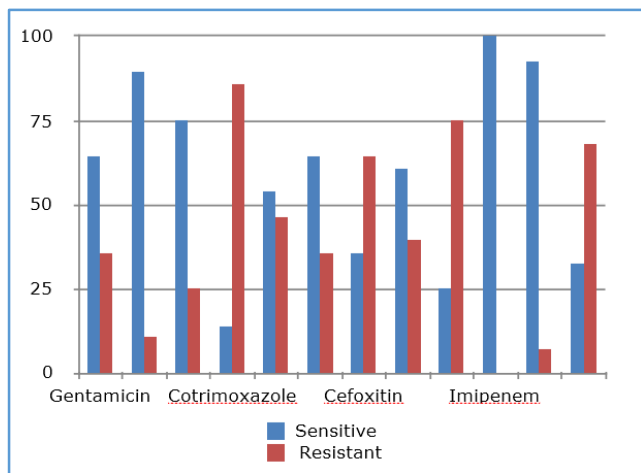
**Table 1. Age and Sex-Wise Distribution of Samples**

Sl. No.	Type of Isolate	No. (%)
1	Pure Bacterial Isolate	57 (50.4)
2	Mixed Culture	08 (7.1)
3	No Growth	26 (23)
4	Commensal	19 (16.8)
5	Fungal	03 (2.6)
6	<b>Total</b>	<b>113 (100)</b>

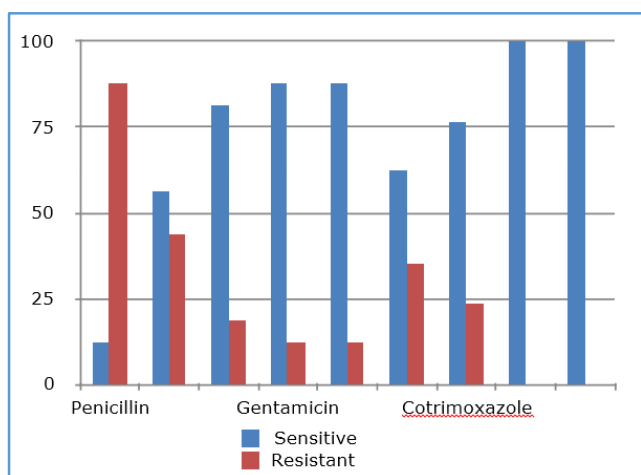
**Table 2. Type of Isolate**

Sl. No.	Microorganism	No. (%) n=57
1	<i>Pseudomonas aeruginosa</i>	24 (49.1)
2	<i>Staphylococcus aureus</i>	16 (28)
3	<i>Acinetobacter</i> spp.	4 (7)
4	<i>Citrobacter</i> spp.	3 (5.3)
5	<i>Klebsiella</i> spp.	2 (3.5)
6	<i>Proteus mirabilis</i>	1 (1.7)
7	<i>Enterobacter</i> spp.	1 (1.7)
8	<i>Streptococcus</i> spp.	57

**Table 3. Organisms Isolated from Pure Culture**



**Figure 1. Antibiotic Susceptibility (%) of *Pseudomonas aeruginosa***



**Figure 2. Antibiotic Susceptibility (%) of *Staphylococcus aureus***

**DISCUSSION**

India is one of the countries with high prevalence of CSOM.<sup>19</sup> Our study revealed monomicrobial growth in 50.4% of samples. Polymicrobial growth is seen in 7.1% of samples, this may be attributed to improper collection of ear swab. 23% of samples were sterile, probably because of prior antibiotic therapy which the patient might not have revealed during the history taking. Coagulase negative Staphylococcus (CONS) grew in 16.8% of samples. CONS is usually considered as commensal organism of the skin, but rarely can become an opportunistic pathogen. Fungal infections of the middle ear are common as fungi thrive well in moist pus. The most commonly found fungi in CSOM are *Candida* species and *Aspergillus* species.<sup>20</sup> In the present study fungal aetiology was found in 3 (2.6%) cases, out of which 2 were *Candida albicans* and one isolate was *Aspergillus niger* (Table 2).

Studies of microbiology of chronic discharging ears have revealed that the most frequently isolated bacteria were *Pseudomonas aeruginosa* (31.1%), *Staphylococcus aureus* (19.1%), *Proteus mirabilis* (7.7%), *Klebsiella* spp. (1%) and fungi. Review of literature of bacterial flora in CSOM in different states of India showed *P. aeruginosa* as the main isolate.<sup>21</sup> Our study also revealed that *Pseudomonas aeruginosa* (49.1%) was the most common isolate in CSOM

followed by *Staphylococcus aureus* (28%). Anaerobic culture was not carried out.

The increased rate of isolation of *Pseudomonas aeruginosa* has its own implications, as this organism is an important cause of nosocomial infections and has developed resistance to even many potent antibiotics. *Pseudomonas* infections are mostly seen where there is discontinuity of normal skin or when normal flora is replaced by it due to constant use of topical antibiotics. The easy availability of the over-the-counter topical antibiotic drops and their rampant use breeds an environment where organisms like *Pseudomonas aeruginosa* can grow and cause serious intra and extracranial complications.<sup>22</sup>

Antimicrobial susceptibility of *Pseudomonas aeruginosa* in our study revealed that 100% isolates were susceptible to Imipenem, 92.8% isolates were susceptible to Piperacillin-tazobactam, 89.3% susceptible to Amikacin and 75% susceptibility to Ciprofloxacin.

Globally, a change has been noticed in the susceptibility of *Pseudomonas aeruginosa* towards Quinolones in the last few decades. One study carried out in 1996 in Turkey revealed only 6% of *Pseudomonas aeruginosa* isolates to be resistant to Ciprofloxacin,<sup>23</sup> whereas in South Korea in a study carried out in 2004 ciprofloxacin resistance was noted in 100% of the isolates.<sup>24</sup> In the Indian scenario, 30% resistance in Uttarakhand study<sup>13</sup> and 62.5% resistance in Raghavendra Singh Gaur et al<sup>25</sup> was noted. In contrast, our study has shown 75% of isolates still susceptible to Ciprofloxacin. With these type of results in the present era, the otorhinolaryngologist has to depend on Ciprofloxacin oral preparations to treat *Pseudomonas aeruginosa*, though the organism is retaining its susceptibility to higher antibiotics that are available in injectable form and can be prescribed in complicated forms of *Pseudomonas aeruginosa* infection.

While for *Staphylococcus aureus*, 81.3% of the isolates were susceptible to erythromycin and only 62.5% were susceptible to ciprofloxacin.

Therefore, evaluation of microbiological pattern in local area becomes helpful in prescribing empirical antibiotics for successful treatment of otitis media and thus minimising its complications and emergence of resistant strains.

**CONCLUSION**

*Pseudomonas aeruginosa* and *Staphylococcus aureus* were found to be the most common cause of CSOM in our study. 75% of *Pseudomonas aeruginosa* and 62.5% of *Staphylococcus aureus* were susceptible to the routinely used drug ciprofloxacin. Also, the resistance pattern of the microorganisms usually keeps changing. So it is desirable for laboratory to culture all cases of CSOM for bacteria and fungus on a routine basis. Hence, routine use of topical antibiotics for any case of CSOM as empirical therapy must be reviewed and judicious 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 minimising the complications, but also help in preventing the emergence of resistant strains.

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