



## BACTERIOLOGICAL PROFILE OF CHRONIC SUPPURATIVE OTITIS MEDIA AMONG THE LOW SOCIO-ECONOMIC GROUP OF PEOPLE

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**ABSTRACT** **BACKGROUND:** Chronic suppurative otitis media (CSOM) is characterized by chronic inflammation of the middle ear cleft with recurrent ear discharge through a perforated ear drum. It is a disease of multiple etiology and is well-known for its persistence and recurrence in spite of treatment. This study was planned to help understand CSOM on clinical, social and microbiological grounds to have a better clinical and economical approach towards its treatment.

**METHODOLOGY:** A total of 65 patients were included with complaints of ear discharge for more than 6 weeks and belonging to lower, upper lower and lower middle. Two aural swabs were collected from the affected ear of each patient under aseptic conditions, prior to the instillation of any topical medication and processed for Gram's stain and culture for isolation of aerobic bacterial pathogens as per standard protocol. Antimicrobial susceptibility testing of the aerobic bacterial isolates was as per CLSI guidelines.

**RESULTS:** Out of the total 65 patients, 37 (56.93%) patients were below 30 years of age, while 28 (43.07%) were above 30 years. The most common age group affected was 11-20 years old.

The most common risk factor associated with CSOM was history of previous ear discharge.

Based on socio economic status, maximum number of patients were from the upper lower category. Culture positivity was observed in 51 patients. *Staphylococcus aureus* and *Pseudomonas aeruginosa* were the most common pathogens isolated.

**CONCLUSION:** Knowing the risk factors, bacteriological profile and antibiotic sensitivity pattern of CSOM is important to understand the disease, prescribe effective treatment, prevent, manage complications and development of antibiotic resistance especially among the poorer section of the society, where its prevalence is higher.

**KEYWORDS :** CSOM, Risk factors, Bacteriological profile, Antibiotic susceptibility, *Staphylococcus aureus*, *Pseudomonas aeruginosa*.

### INTRODUCTION

Chronic suppurative otitis media (CSOM) is characterized by chronic inflammation of the middle ear cleft with recurrent ear discharge through a perforated ear drum.<sup>1</sup> It is a disease of multiple etiology and is well-known for its persistence and recurrence in spite of treatment.<sup>2</sup> The chronic inflammation results from the presence of bacteria in the middle ear and mastoid cavity. Bacteria are believed to gain access to the middle ear cleft either from the external auditory canal through a perforation or from the nasopharynx via the eustachian tube or both.<sup>3</sup> CSOM continues for months or years with increasing hearing impairment and can lead to life-threatening infective complications.<sup>3</sup> Even in this era of powerful antibiotics, CSOM still consumes considerable medical expenditure, especially in the poorer sections of the society.<sup>4</sup> Incidence of chronic otitis media is higher in developing countries like India especially among low socioeconomic society due to malnutrition, overcrowding, poor hygiene, inadequate health care and recurrent upper respiratory tract infection.<sup>6</sup> Also, the indiscriminate use of broad-spectrum antibiotics and poor follow up of patients have resulted in the emergence of multiple drug resistant strains of bacteria. *In-vitro* antibiotic sensitivity pattern is very important for the clinicians to plan a general outline of treatment for a patient with a chronically discharging ear. This study was planned to help understand CSOM on clinical, social and microbiological grounds to have a better clinical and economical approach towards its treatment.

### MATERIALS AND METHODS

A total of 65 patients attending the outpatient department of ENT, J A Group of Hospitals, Gajra Raja Medical College, Gwalior with complaints of ear discharge for more than 6 weeks and belonging to lower, upper lower and lower middle category as per the Kuppu-swami scale of socio-economic status were included in the study.<sup>7</sup> Prior approval from the institutional ethical committee was obtained. Written consent was obtained from the patients before taking ear swabs. Children from age group 0 – 10 years were not included in this study due to ethical reasons. Patients belonging to upper and upper middle category of Kuppuswami scale, patients with ear discharge of less than 6 weeks duration or having ear discharge with intact tympanic membrane (otitis externa) and patients receiving antibiotics at the time of presentation or within a week of presentation were excluded. The patients who met the above selection criteria, signed an informed consent and were included in the study. A detailed clinical history regarding name, age, sex, address and socioeconomic status, history of onset and duration of ear discharge, other associated symptoms and

previous antibiotic therapy was taken from the patients. Also, the patients were asked a series of questions from a questionnaire to ascertain the risk factors and socio-economic conditions that predisposed them to the infection.

### Microbiological Processing:

Two aural swabs were collected from the affected ear of each patient under aseptic conditions, prior to the instillation of any topical medication and were immediately transported to the laboratory for processing.

The first swab was used to make a smear on a clean glass slide for direct smear examination after staining it with Gram's stain and the presence of inflammatory cells, bacteria and their number was noted.<sup>8</sup> The second swab was inoculated on to culture media (nutrient agar, blood agar and MacConkey agar) for isolation of aerobic bacterial pathogens. After overnight incubation at 37°C the plates were examined for evidence of growth and further identification was done as per standard protocol.<sup>9</sup>

Antimicrobial susceptibility testing of the aerobic bacterial isolates was performed by Kirby-Bauer disc diffusion method using Mueller Hinton agar as per CLSI guidelines.<sup>10</sup>

### Statistical Analysis:

The data was analyzed using SPSS software. Chi-square test was used to test the statistical significance of the association between potential variables.

### RESULTS AND OBSERVATIONS

Out of the total 65 patients suspected of having CSOM of bacterial etiology included in the study, 37 (56.93%) patients were below 30 years of age, while 28 (43.07%) were above 30 years. The most common age group affected was 11-20 years old.

**Table 1: Risk factors association with Chronic Suppurative Otitis Media**

S.No.	Risk factors	No. of patients (n=65)	Percentage
1.	Previous ear discharge	41	63.07%
2.	Crowded place	38	58.46%
3.	Kuchha house	35	53.84%
4.	Bathing in contaminated pond	20	30.76%

5.	URTI*	16	24.61%
6.	Smoking	10	15.38%
7.	Diabetes	04	6.15%

\*Upper respiratory tract infections

The most common risk factors associated with CSOM were history of previous ear discharge (63.07%), living in a crowded place (58.46%) and kuchha house (53.84%).

**Table 2: Distribution of patient by Socio-economic status**

Socio economic status (score)	No. of patients (n=65)	Percentage	P value
Lower Middle (11-15)	12	18.46	0.001
Upper Lower (5-10)	45	69.23	
Lower (<5)	08	12.30	

Based on the Kuppuswami scale<sup>7</sup> for socio economic status, maximum number of patients were from the upper lower category (69%) with a Kuppuswami scale score of 5-10 followed by lower middle (18.5%) and lower category (12%). There was a significant correlation between socio economic status and hearing loss (p= 0.001). Culture positivity was observed in 51 patients with 42 patients having monomicrobial infection and 9 patients showing two types of bacterial isolates on cultures. Gram positive bacteria were more commonly isolated with *Staphylococcus aureus* accounting for the maximum number of cases. Among Gram negative bacteria *Pseudomonas aeruginosa* was the most common pathogen followed by *Klebsiella pneumoniae*, *Citrobacter koseri* and *Proteus mirabilis* respectively.

**Table 3: Bacteriological profile of aerobic bacteria isolated in CSOM**

Type of organism	No. of isolates (n = 60)	Percentage
<b>Gram positive bacteria</b>	<b>31</b>	<b>51.7</b>
a. <i>Staphylococcus aureus</i>	24	40
b. Coagulase negative staphylococci (CONS)	06	10
c. β- hemolytic <i>Streptococci</i>	01	1.6
<b>Gram negative bacteria</b>	<b>29</b>	<b>48.3</b>
a. <i>Pseudomonas aeruginosa</i>	20	33.3
b. <i>Klebsiella pneumoniae</i>	05	8.3
c. <i>Citrobacter koseri</i>	02	3.3
d. <i>Proteus mirabilis</i>	02	3.3

**Table 4: Antibiotic resistance pattern among the gram-positive bacterial isolates**

Gram Positive Bacteria								
Organism	AMP	AMC	AZM	CP	VA	CX	DO	CIP
<i>Staphylococcus aureus</i> (24)	20	12	14	16	0	16	14	14
Coagulase negative <i>Staphylococci</i> (6)	2	2	1	2	0	2	1	2
β- hemolytic <i>Streptococci</i> (1)	0	0	0	0	0	-	0	0

**Table 5: Antibiotic resistance pattern among the gram-negative bacterial isolates**

Gram negative Bacteria								
Organism	AMP	AMC	AK	CPM	CA	CIP	MR	PT
<i>Pseudomonas aeruginosa</i> (20)	20	15	5	12	10	12	2	2
<i>Klebsiella pneumoniae</i> (5)	5	3	1	3	3	2	1	1
<i>Citrobacter koseri</i> (2)	1	1	0	1	1	0	0	0
<i>Proteus mirabilis</i> (2)	1	1	0	1	1	0	0	0

AK- Amikacin, AMP- Ampicillin, AMC- Amoxiclav, AZM- Azithromycin, VA- Vancomycin, E- Erythromycin, CIP- Ciprofloxacin, GEN- Gentamicin, CAC- Clavulanic acid, NX- Norfloxacin.

Table 4 shows the antimicrobial susceptibility pattern of isolated Gram-positive bacteria. Methicillin-resistant *Staphylococcus aureus* (MRSA) was isolated from 16 patients and constituted 66% of all *Staphylococcus aureus* isolates. All isolated *Staphylococcus aureus* organisms were sensitive to vancomycin.

Table 5 shows the antimicrobial susceptibility pattern of gram negative otopathogens. Multi resistant *Pseudomonas aeruginosa* was found in 4 patients and accounted for 10% of all *Pseudomonas aeruginosa* isolates. Meropenem and piperacillin/tazobactam were the most

effective antibiotics however 02 *P. aeruginosa* isolates were resistant to them. The isolated *P. aeruginosa* were highly resistant to ampicillin (100%), ciprofloxacin (40%), and ceftriaxone (30%) respectively.

## DISCUSSION

Out of the 65 cases of CSOM studied the maximum cases were observed in the 11- 20 age group. Rakesh et al reported the highest incidence among 11-20 year age, which is in accordance with the present study.<sup>11</sup> The most commonly encountered risk factors were history of previous ear discharge (63.07%), living in a crowded place (58.46%), kuchha house (53.84%) followed by bathing in contaminated pond, upper respiratory tract infections (URTI), smoking and diabetes. These findings like association with URTI, smoking and diabetes correlated with previous studies. Viral URTI promotes the replication of the bacteria and increases inflammation in the nasopharynx and endotracheal tube.<sup>12</sup>

Based on socio-economic status of the Kuppu-swami scale, 66.15% of the patients were from upper lower category, 16.92% to the lower middle and 10.76% to the lower category of socio-economic status. There is a significant correlation between socio economic status and hearing loss (p= 0.001). Lower socioeconomic class people generally live in congested room and maintain poor personal hygiene, which favour the transmission of infectious agents.<sup>13</sup> Majority of the patients presented with multiple complaints. Various reports concerning this hazard originated from poor housing, environmental and occupational conditions. Studies have report overcrowding, poor living conditions, exposure to cigarette smoke, and lack of access to medical care as major risk factors for otitis media.<sup>13,14</sup> Majority of patients in the study group were from rural areas and were living in crowded conditions, in large families, having unhygienic practices, such as bathing in contaminated ponds and rivers, unsterile ear piercing, cleaning ears with aseptic things such as matchsticks, hairpins, pen-refills, etc.

The bacteriological profile of chronic suppurative otitis media revealed *Staphylococcus aureus* as the most common isolate (38.46%). It was followed in order of prominence by *P. aeruginosa* (23.07%), Coagulase negative staphylococcus (23.07%), *Klebsiella pneumoniae* (7.69%), *Citrobacter* species (2.56%) and *Proteus mirabilis* (2.56%).

Many authors have reported *Staphylococcus aureus* as the most predominant organism in CSOM which is in accordance with this study whereas *Pseudomonas aeruginosa* was the most predominant organism among the cases of CSOM reported by several workers with an incidence ranging from 21% to 52.94%.<sup>2,15,16</sup> *K. pneumoniae* was isolated from 3 cases (7.69%) in the present study. CONS was found in 9 patients (23.07%) in this study while other studies have reported the incidence of 7.7% by Dilshad Arif et al<sup>17</sup> 3.75% by Ashutosh Rawat et al.<sup>18</sup>

In this study monomicrobial etiology was found to be more common with polymicrobial infections attributing for 17% of the cases. Many authors have reported monomicrobial etiology to be more common than the polymicrobial in the causation of otitis media.<sup>16</sup> All the pathogenic strains isolated in the present study were tested against various antibiotics. Amikacin and meropenem were found to be the most effective drugs for gram negative bacteria while vancomycin and amoxycylav were found to be most effective for gram positive bacteria in vitro. MRSA isolates were more in our study as compared to most studies but all these isolates were showing sensitivity to vancomycin.<sup>19</sup>

Although otological administration is effective in most cases with otorrhea, refractory and recurrent suppurative otitis media have also been reported. In such cases, systemic antibiotics are also necessary. Therefore, before antibiotic administration locally or systemically, it is imperative to culture aural discharges from CSOM patients and obtain antimicrobial susceptibility patterns, to best guide antibiotic usage. The antibiotic sensitivity patterns revealed that irrational use of antibiotics has led to development of resistance and must be stopped. For empirical treatment local antibiogram must be kept in mind because the commonly prescribed antibiotics such as aminoglycosides and fluoroquinolones have also found to be ineffective in many cases.

However, there were some limitations to the present study. Our aerobic bacterial culture method couldn't identify all pathogens. The limited paediatric patients made it difficult to compare the difference with adult patients. In addition, the sample size was not large enough and there was a lack of a multicentred design.

**CONCLUSION**

Chronic suppurative otitis media is a disease of public health importance in the present days in developing countries like India. Recurrent upper respiratory tract infection, slum and rural dwellers, low education, bathing in contaminated dirty water, foreign body, and low socioeconomic status are contributing factors for developing CSOM in the present era. Irregular, haphazard and indiscriminate use of antibiotics has precipitated the emergence of multi drug resistant bacteria. Therefore, culture of ear swabs, mass education, with definite treatment strategy /policy will reduce the disease occurrence and recurrence. By having a deep insight into the predisposing factors, we can take preventive measures at primordial and primary levels, which is the need of the hour.

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