

# Bacterial Etiology of Chronic Suppurative Otitis Media of Patients Attending a Tertiary Care Teaching Hospital

Commonest Microorganisms and their Antibiotic of CSOM

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## ABSTRACT

**Objective:** Chronic suppurative otitis media is a common infectious disease of worldwide prevalence. This study was conducted to identify the commonest microorganisms involved and their antibiotic sensitivity pattern in patients of CSOM.

**Study Design:** Descriptive study

**Place and Duration of Study:** This study was conducted at the Microbiology and ENT Department of Amna Inayat Medical college /Kishwar Fazal Teaching Hospital Sheikhupura from August 2015 to July 2016.

**Materials and Methods:** A total of 85 patients with unilateral or bilateral ear discharge attending the ENT OPD clinically diagnosed as CSOM were selected for the study. Pus samples were taken and sent to microbiology lab for culture and sensitivity. All data was analyzed using SPSS version 21.0.

**Results:** Pseudomonas aeruginosa (36.47%) was the most common organism isolated followed by Staphylococcus aureus (20%), Coagulase negative Staphylococci (9.42%), Methicillin resistant Staphylococcus aureus (8.23%), Escherichia coli (7.05%), Klebsiella pneumoniae (7.05%), Proteus spp. (4.71%), Enterobacter cloacae (3.53%), Aspergillus niger (2.35%), and candida species (1.17%). Drug sensitivity pattern of Pseudomonas aeruginosa showed that Imipenem was active against majority (95%) cases followed by Tazobactam and Levofloxacin (88%), Ceftazidime (85%), Ciprofloxacin (80%) and Gentamicin (75%). Pseudomonas showed complete resistance to augmentin. Among Gram positive organisms Staphylococcus aureus was the most common pathogen and drug sensitivity pattern showed that Vancomycin has 100% susceptibility to all the gram-positive pathogens.

**Conclusion:** Pseudomonas aeruginosa is the most common gram-negative organism isolated from the patients of CSOM and it is highly sensitive to Imipenem. Staphylococcus aureus is the commonest among gram positive organisms and Vancomycin is the most effective drug against gram positive pathogens of CSOM.

**Key Words:** Chronic suppurative otitis media, bacterial pathogens, antibiotic sensitivity.

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## INTRODUCTION

Chronic suppurative otitis media (CSOM) is a socially embarrassing disease of almost all age groups. Globally its pervasiveness is high in people with low socioeconomic status, having potentially serious long-term effects.<sup>1</sup>

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World Health Organization (WHO) has defined chronic suppurative otitis media as a disease stage in which there is chronic infection of the middle ear cleft i.e., Eustachian tube, middle ear and mastoid and in which a non-intact tympanic membrane (e.g., perforation or tympanostomy tube) and discharge (otorrhea) are present for at least 2 weeks or more.<sup>1,2</sup> The main clinical features of CSOM are aural discharge and variable degree of hearing loss. In long standing cases it can also result in a number of otogenic complications like facial nerve palsy, intracranial abscess, and meningitis.<sup>3</sup>

Etiology and pathogenesis of otitis media are multifactorial including genetic predisposition, infections, allergy, environmental, social and racial factors and Eustachian tube dysfunction.<sup>4</sup> CSOM is associated with a number of bacterial pathogens. The study of bacterial pathogens and their antimicrobial sensitivity is very important for a clinician to start the initial antibiotic therapy.<sup>4</sup> The present study was carried out to determine the common microorganisms involved and their antimicrobial susceptibility patterns in patients

with CSOM in our tertiary care setting, so that an antibiotic policy is established for better management of these patients.

## MATERIALS AND METHODS

This descriptive study was conducted in the Microbiology Department of Kishwar Fazal Teaching Hospital/ Amna Inayat Medical College Sheikhpura from August 1, 2015 to July 31, 2016. A total of 85 patients between 5 and 62 years of age, comprising of 46 males and 35 females who were clinically diagnosed as CSOM were selected for the study. Inclusion criteria was patients having tympanic perforation and ear(s) discharge for more than 3 months. Patients with H/O using antibiotics (oral & systemic) for the last 5 days were excluded from the study. All of our patients were from rural background with low socio-economic status. Informed consent from the patients was obtained at the time of enrolment.

Pus swabs were taken aseptically in the Microbiology Department with commercially prepared sterile cotton swabs after cleaning the external auditory canal. Two sterile swabs were used to collect the discharge in each patient. One swab was used for Gram's stain (direct smear examination) and the other swab was used for isolation of causative organism by inoculating on different culture media. The pus swabs were inoculated on Blood, MacConkey & Chocolate agar, incubated aerobically at 37°C for 24-48 hours. Inoculation onto two slopes of Sabouraud's dextrose agar was done and incubated at 25°C & 37°C for 14 days for isolation of fungus.

The isolates were identified based on colony appearance, Gram stain, culture characteristics and biochemical tests as described by Cheesbrough.<sup>5</sup> Antibiotic susceptibility testing was performed on Mueller-Hinton agar plates using Kirby Bauer disc diffusion method and the results were interpreted as per Clinical Laboratory and Standards Institute (CLSI) guidelines (2018).<sup>6</sup> The antibiotics tested were

Amoxycylav (20/10 µg), Co-trimoxazole (25 µg), Gentamicin (10 µg), Amikacin (30 µg), Cephalexin (30 µg), Cefuroxime (30 µg), Cefotaxime (30 µg), Ciprofloxacin (5 µg), Levofloxacin (5 µg), Linezolid (10 µg), Vancomycin (5 µg), Imipenem (10 µg), Piperacillin/Tazobactam (100/10µg), Sulbactam/Cefoperazone (75/30µg) and Cefoxitin (30µg) for Methicillin resistant Staphylococcus aureus (MRSA). Susceptibility for fungal isolates was not done.

## RESULTS

Of the 85 patients, 4 showed bilateral ear discharge. Single growth was obtained from 81 samples. *Pseudomonas aeruginosa* (36.47%) was the most common organism isolated followed by *Staphylococcus aureus* (20%), Coagulase negative Staphylococci (9.42%), Methicillin resistant *Staphylococcus aureus* (8.23%), *Escherichia coli* (7.05%), *Klebsiella pneumoniae* (7.05%), *Proteus spp.* (4.71%), *Enterobacter cloacae* (3.53%), *Aspergillus niger* (2.35%), and *Candida* species (1.17%).

**Table No.1: Frequency of bacterial pathogens isolated from patients of CSOM**

Type of Organism	Number=85	Percentage
<i>Pseudomonas aeruginosa</i>	31	36.47
<i>Staphylococcus aureus</i>	17	20
CoNS	8	9.42
MRSA	7	8.23
<i>Escherichia coli</i>	6	7.05
<i>Klebsiella pneumoniae</i>	6	7.05
<i>Proteus spp.</i>	4	4.71
<i>Enterobacter cloacae</i>	3	3.53
<i>Aspergillus niger</i>	2	2.35
<i>Candida</i>	1	1.17

CoNS= Coagulase negative Staphylococci, MRSA= Methicillin resistant *Staphylococcus aureus*.

**Table No.2: Antibiogram Of Gram-Negative Isolates (N=50)**

Type of organism	Total No. (n=50)	AUG (%)	GM (%)	AK (%)	CAZ (%)	CP (%)	LEV (%)	IM (%)	TZ (%)
<i>P. aeruginosa</i>	31(36.47%)	0	75	70	85	80	88	90	88
<i>E. coli</i>	6(7.05 %)	28	55	80	71	22	80	90	72
<i>Klebsiella</i>	6(7.05%)	0	88	100	50	70	100	60	75
<i>Proteus</i>	4(4.71%)	40	65	75	80	80	75	75	70
<i>Enterobacter</i>	3(3.53%)	0	60	72	68	80	70	50	50

AUG- Augmentin, GEN- gentamicin, AK- amikacin, CAZ- Cefotaxime, CP-Ciprofloxacin, LEV- Levofloxacin, IM-Imipenem, TZ- Tazobactam/Piperacillin.

**Table No.3: Antibiogram of Gram-Positive Isolates (N=32)**

Type of organism	Total No. (n=32)	AMP (%)	AUG (%)	PR (%)	TE (%)	COT (%)	Gm (%)	AK (%)	CP (%)	LZ (%)	VM (%)
<i>S. aureus</i>	17(20%)	22	92	90	41	60	55	58	72	96	100
CoNS	8(9.42%)	40	100	100	50	66	46	52	66	100	100
MRSA	7(8.23%)	0	0	0	0	0	0	0	0	92	100

AMP- Ampicillin, AUG- Augmentin, PR- Cephalexin, TE- Tetracyclin, COT-Trimethoprim/ Sulphamethoxazole, GM- Gentamycin, AK- Amikacin, CP-Ciprofloxacin, LZ-Linazolid, VM-Vancomycin.

Antimicrobial sensitivity patterns of gram-negative organisms were tested and results are shown in Table 2. Antimicrobial sensitivity patterns of gram-positive organisms were tested and results are shown in Table 3

## DISCUSSION

Chronic suppurative otitis media is a common condition in most of the developing countries.<sup>7</sup> Most of the cases first present to a variety of healthcare personnel including general physicians. Though some cases surface to ENT specialists – a situation that is not a peculiarity in Pakistan but a norm in most of the developing world especially Southeast Asia. Culture and sensitivity of ear discharge is infrequently carried out.<sup>8-10</sup> This trend means bacteriological characteristics of most of CSOM cases remains concealed. Chances of complications such as hearing impairment increases substantially if effective empirical and or sensitive antibiotics are not instituted in a timely fashion.<sup>11-14</sup> This situation that provided a perfect rationale to conduct current study at a newly opened tertiary health setting in outskirts of Lahore i.e. Kishwar Fazal Teaching Hospital/ Amna Inayat Medical College Sheikhpura.

Our study yielded a positive culture in 96% of samples. Comparable studies from other tertiary health settings of Pakistan have yielded 84% to 97% positive cultures.<sup>15-17</sup> In our study, frequency of microorganisms in descending order was *Pseudomonas aeruginosa* (36.47%), *Staphylococcus aureus* (20%), Coagulase negative *Staphylococci* (9.42%), Methicillin resistant *Staphylococcus aureus* (8.23%), *Escherichia coli* (7.05%), *Klebsiella pneumoniae* (7.05%), *Proteus spp.* (4.71%), *Enterobacter cloacae* (3.53%), *Aspergillus niger* (2.35%), and *Candida species* (1.17%). An agreement study by Tariq et al found that *Pseudomonas aeruginosa* (38%) was the most common bacterial isolate, followed by *staphylococcus* (28%), *Proteus mirabilis* (21%), *E coli*, (3%), *Klebsiella* (3%) and *Candida* (2%) The results are in comparison to our study.<sup>16</sup> Khan and coworkers demonstrated that *Pseudomonas aeruginosa* was found in 51 (42.5%) cases followed by *Staphylococcus aureus* in 28 (23.4 %) cases, MRSA (Methicillin Resistant *Staphylococcus aureus*) in 7(5.8%) cases, *Proteus* in 6 (9.2%) cases, *Klebsiella* in 8 (6.7%) cases and *E-Coli* in 6 (5%) case (18). Hydri et al. studied 140 patients of CSOM and found *Pseudomonas aeruginosa* was the most common organism isolated alone in 76 ears and in combination with other micro-organisms in 18 ears, followed by *staphylococcus aureus* in 23 and MRSA in four cases. Mixed organisms were found in 20 patients.<sup>15</sup> Zakirullah and colleagues also concluded that the most common causal organisms isolated from CSOM cases were *Pseudomonas aeruginosa* in 35 (31.8%) and *Staphylococcus aureus* in 32 (29.1%) followed by *Proteus species* in 16 (14.55%) and *Morganella* in nine (8.25%) cases.<sup>19</sup> Fatima et al. isolated *Pseudomonas aeruginosa* in 141 (68.44%) cases of CSOM which was

the most common microbe in their study and was followed by *Staphylococcus aureus* in 53 (25.72%).<sup>20</sup> Study by Chaudhary and coworkers differs from our study, that from 47% of CSOM cases *Staphylococcus aureus* was isolated, followed by *Pseudomonas aeruginosa* (34%).<sup>21</sup> Most of these recent publications from within Pakistan have shown invariably consistent bacteriology in CSOM with minor differences in overall frequency of microbes causing CSOM. Our study findings are therefore consistent with recent literature from within the country where socioeconomic and demographic characteristics of studied population were generally alike.

According to our study, drug sensitivity pattern of *Pseudomonas aeruginosa* showed that Imipenem was active against majority (95%) cases followed by Tazobactam and Levofloxacin (88%), Ceftazidime (85%), Ciprofloxacin (80%) and Gentamicin (75%). *Pseudomonas* showed complete resistance to Augmentin. Among Gram positive organisms *Staphylococcus aureus* was the most common pathogen and drug sensitivity pattern showed that Vancomycin has 100% susceptibility to all the gram-negative pathogens. Drug sensitivity patterns of *Pseudomonas aeruginosa* and *Staphylococcus aureus* varied from study to study but the differences were significant.<sup>19-23</sup> In short, the microbial predominance and their antibiotic sensitivity pattern is not generalizable.<sup>24-25</sup> Therefore, we strongly suggest that periodical monitoring of microbiological profile is essential for making effective empirical protocol for the cases in a particular geographical location<sup>25-26</sup>

## CONCLUSION

*Pseudomonas aeruginosa* is the most common gram-negative organism isolated from the patients of CSOM and it is highly sensitive to Imipenem. *Staphylococcus aureus* is the commonest among gram positive organisms and Vancomycin is the most effective drug against gram positive pathogens of CSOM.

### Author's Contribution:

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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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