



BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SUSCEPTIBILITY PATTERN OF CHRONIC SUPPURATIVE OTITIS MEDIA IN A TERTIARY CARE HOSPITAL

Microbiology

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ABSTRACT

Background: Chronic Suppurative Otitis Media is a long standing infection of a part or whole of the middle ear cleft characterized by continuous or intermittent discharge through a persistent tympanic membrane perforation. It is a major cause of hearing disability and morbidity in poor socioeconomic developing countries with prevalence of 4%. **Objective:** To determine the bacterial profile of Chronic Suppurative Otitis Media and antibiotic sensitivity pattern of aerobic isolates. **Methods:** A study of 50 samples was done in the Department of Microbiology from January 2023 to July 2023. The ear swabs were aerobically cultured and bacterial isolates were identified by standard bacteriological methods. **Results:** Out of 50 samples, 76% showed positive culture, 24% showed no growth and 78% were males, 22% were females. The commonest bacteria isolated was *Pseudomonas aeruginosa* (28.9%) followed by *Staphylococcus aureus* (26.3%). *Pseudomonas aeruginosa* showed maximum sensitivity to meropenem (90.9%), amikacin (81.8%), gentamicin (81.8%) and ceftazidime (63.6%). *Staphylococcus aureus* showed maximum sensitivity to linezolid (100%), gentamicin (85.7%), amikacin (85.7%) and amoxycylav (57.2%). **Conclusion:** The study of microbial pattern and antibiotic sensitivity pattern determines the organism causing chronic suppurative otitis media and helps to start appropriate treatment of otitis media and its complications for successful outcome.

KEYWORDS

INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a chronic inflammation of middle ear and mastoid cavity that may present with recurrent ear discharge or otorrhoea through a tympanic membrane perforation. It is a disease of multiple etiology and it often leads to conductive hearing loss and constitutes a risk factor for permanent sensorineural hearing loss because of inner ear injury as well as intracranial complications.¹ Its incidence is particularly common among low socio-economic groups due to malnutrition, overcrowding, poor hygiene, inadequate health care, and recurrent upper respiratory tract infection.² According to WHO, the prevalence of CSOM in India is more than 4% and it falls among those countries where urgent attention is needed.³ Risk factors include frequent episodes of acute otitis media, other respiratory tract infections and tympanic membrane rupture as well as factors underlying the resource limited living conditions such as overcrowding, poor nutrition, hygiene, chronic infectious disease, immunocompromised status, environmental factors, nutritional factors and facial anomalies etc.⁴ The microbiology of CSOM is unique as polymicrobial aerobic and anaerobic flora were isolated from over half of the cases. Aerobic and facultative organisms, mainly *Staphylococcus aureus* and gram negative bacilli (including *Pseudomonas aeruginosa*), were long considered to be the major pathogens causing CSOM.⁵ Changes in the microbial flora following the advent of sophisticated antibiotics increase the relevance of reappraisal of modern day flora of CSOM. Their in vitro antibiotic susceptibility pattern is very important to the clinician to initiate an appropriate treatment and prevent the complications of CSOM.⁵ The objective of the study was to determine the bacterial profile of Chronic Suppurative Otitis Media and antibiotic sensitivity pattern of aerobic isolates.

MATERIAL AND METHODS

A prospective observational study was conducted in the Department of Microbiology, Government Medical College, Amritsar from January 2023 to July 2023. Aural swabs were collected from patients suffering from Chronic Suppurative Otitis media (CSOM) attending the otolaryngology department of the tertiary care hospital. Aerobic bacterial culture was done and isolates were identified by standard

microbiological techniques. The particulars of the patient including medical history, demographic characteristics, clinical features were recorded on a designed proforma for each patient. Patients with complaints of intermittent or persistent ear discharge in one or both ears for at least four weeks, irrespective of age and sex were included in the study.

Ear discharge were collected under aseptic conditions using two pre sterilized cotton swabs after mopping out excess discharge from external auditory canal from the patients with symptoms of CSOM. The samples were properly labelled and transported immediately to the microbiological laboratory for further processing. One swab was used for microscopy for Gram staining and second swab was used for aerobic culture. The bacterial isolates grown were identified based on morphology, cultural characteristics and biochemical reactions according to standard microbiological techniques. Antimicrobial susceptibility testing of bacterial isolates were performed by Kirby bauer disc diffusion method as per CLSI guidelines.⁶

RESULTS

Out of 50 cases, 39(78%) were males and 11(22%) were females and maximum cases were reported from age group 41-60 years (Table 1). Thirty eight(76%) were culture positive, 12(24%) were culture negative. The most common isolate was *Pseudomonas aeruginosa* (28.9%) followed by *Staphylococcus aureus* (26.3%) and Coagulase negative *Staphylococci* (18.4%) (Table 2). Gram positive isolates showed maximum sensitivity to linezolid and amikacin, gram negative isolates were seen maximum sensitive to Meropenem and piperacillin –tazobactam (Table 3).

Table 1: Demographic details of CSOM cases.

Sex	N (%)
Male	39(78%)
Female	11(22%)
Age in Years	
1-20	14(28%)
21-40	11(22%)

41-60	16(32%)
61-80	9(18%)
>80	0(0%)
Socioeconomic Class	
Lower Middle	20(40%)
Upper Middle	25(50%)
Upper	5(10%)

Table 2: Distribution of CSOM Cases.

Isolate of CSOM	No. of cases	Percentage
<i>Pseudomonas aeruginosa</i>	11	28.9%
<i>Staphylococcus aureus</i>	10	26.3%
Coagulase negative Staphylococci	7	18.4%
<i>Klebsiella pneumoniae</i>	5	13.27%
<i>Escherichia coli</i>	4	10.5%
<i>Acinetobacter baumannii</i>	1	2.63%

Table 3: Antimicrobial sensitivity pattern of bacterial isolates

Gram Positive Isolates	E	GEN	AK	CIP	CL	LZ	AMC	AMP	
Coagulase negative Staphylococci (n=7)	4(57.2%)	6(85.7%)	6(85.7%)	4(57.2%)	5(71.4%)	7(100%)	4(57.2%)	3(42.8%)	
<i>Staphylococcus aureus</i> (n=10)	6(60.0%)	9(90.0%)	9(90.0%)	6(60.0%)	9(90.0%)	10(100%)	6(60.0%)	5(50.0%)	
Gram Negative Isolates	GEN	CIP	CF	MP	CFZ	PC TZ	AMC	AMP	AK
<i>Pseudomonas aeruginosa</i> (n=11)	9(81.8%)	6(54.5%)	7(63.6%)	10(90.9%)	7(63.6%)	9(81.8%)	6(54.5%)	5(45.5%)	9(81.8%)
<i>Klebsiella pneumoniae</i> (n=5)	4(80.0%)	3(60.0%)	3(60.0%)	5(100%)	3(60.0%)	4(80.0%)	3(60.0%)	4(80.0%)	4(80.0%)
<i>Escherichia coli</i> (n=4)	3(75.0%)	2(50.0%)	3(75.0%)	4(100%)	3(75.0%)	3(75.0%)	2(50.0%)	2(50.0%)	3(75.0%)
<i>Acinetobacter baumannii</i> (n=1)	1(100%)	0(0%)	0(0%)	1(100%)	1(100%)	1(100%)	-	-	1(100%)

E- Erythromycin; GEN- Gentamicin; AK -Amikacin; CIP- Ciprofloxacin; CL- Clindamycin; LZ- Linezolid; AMC- Amoxycylav; AMP- Ampicillin; CF- Ceftriaxone; MP- Meropenem; CFZ- Ceftazidime; PCTZ- Piperacillin-tazobactam.

DISCUSSION-

CSOM and complications associated with this are the most common conditions seen by the otologist, pediatrician, and the general practitioners. Early bacteriological diagnosis of all the cases will assume accurate and appropriate effective therapy.

Among the study participants (50), age group of cases ranged from 0 to 80 years and the prevalence of CSOM was particularly high among those aged between 41-60 (32%) years followed by 0-20 years (28%). These findings are in correlation with that of Vishwanath et al and Loy et al, where maximum number of patients infected were in third decade.^{7,8} In the study by Chirwa et al, 61.5% patients were of 18-40 years of age.⁹ In the present study, gender wise, relatively high proportion of males (78%) had CSOM compared to females (22%). This is in accordance with the study by J. Chauhan et al, in this study, CSOM in males with 53.12% and females 46.87%.³ Similar findings were reported the study by Y.K. Harshika et al, with male predominance (53.07%) in the occurrence of CSOM when compared to females (46.92%).¹³ Another hospital based study at Agartala in which 51.54% of males and 48.46% females were affected with CSOM.¹⁰ The higher incidence in males was probably was due to the fact that males are more involved in outdoor activities making them more prone to develop infection and exposed to moisture.³ Out of 50 samples cultured, 38 (76%) showed growth and 12 (24%) showed no growth. This is in comparison to study by Kombade S P et al, where out of 153

samples cultured, bacterial growth was obtained in 126 (82.4%) and 27(17.6%) showed no growth.¹¹ Y.K. Harshika et al, also reported culture positivity rate of 89.23% among CSOM cases.¹³ The microbiological assessment of the swabs collected from patients with CSOM revealed gram negative bacteria (55.2%) as the commonest microbe compared to gram positive bacteria (44.7%). These findings were in agreement with studies done by Kombade SP et al and VC Suresh Chander et al, in these studies, gram negative bacteria 69.2% and 78% exceeded gram positive bacteria 30.8% and 22%.^{11,12} Among gram negative organisms, *Pseudomonas aeruginosa* is the most predominant organism isolated (28.3%) followed by *Klebsiella pneumoniae* (13.27%) and among the gram positive isolates *Staphylococcus aureus* (26.3%) was the most common organism isolated. This is in comparison to study by V.C. Suresh Chander, where *Staphylococcus aureus* came out to be (90.9%) and *Pseudomonas aeruginosa* 52.56%.¹² A study by Kombade SP et al., most common isolate found was *Pseudomonas aeruginosa* (55.8%) followed by *Staphylococcus aureus* (27.5%).¹¹ Similar studies conducted by Vishwanath et al (32.2%), Kumar et al (46%), Deb et al (79%), and Poorey et al (35.7%) also reported *Pseudomonas aeruginosa* as the predominant organism.^{10,14,15} The occurrence of *Pseudomonas aeruginosa* as the predominant organism in this study could be attributed to numerous factors. It uses the pili to attach to the necrotic or diseased epithelium of the middle ear. Once attached, the organism produces enzymes such as proteases and lipopolysaccharides to elude from normal defense mechanism of the body required for fighting infections. In addition, the organism acts as an opportunistic pathogen, which flourishes in the external auditory canal and causes suppurative otitis media.⁵

In present study, *Pseudomonas aeruginosa* was highly sensitive to meropenem (90.9%), gentamicin (81.8%), amikacin (81.8%), and piperacillin-tazobactam (81.8%) followed by ceftazidime (63.6%) and ciprofloxacin (54.5%). Study done by Kombade SP et al, *P. aeruginosa* showed maximum sensitivity to piperacillin-tazobactam (95.5%), amikacin (77.8%), gentamicin (74.2%).¹¹ Also, in study done by Hiremath B et al, *Pseudomonas aeruginosa* showed maximum sensitivity to piperacillin (91.11%), followed by gentamicin (71.11%), amikacin (71.11%), ceftazidime (51.11%).⁵ *Staphylococcus aureus* showed 100% sensitivity to linezolid, 90.0% sensitivity to both gentamicin and amikacin, 60.0% were found to be sensitive to amoxycylav. In a study by Y. K. Harshika et al, *Staphylococcus aureus* isolates were 100% sensitive to linezolid and were highly sensitive to gentamicin (96.8%).¹³ In this study, most of the organisms were found to be resistant to cell wall inhibitors like penicillin group of drugs and cephalosporins. So, antibiotic susceptibility testing serve as a useful guideline for choosing the appropriate antimicrobial.

CONCLUSION –

CSOM is a major public health problem in poor and developing countries like India. According to a report by WHO, India belongs to the highest (>4%) CSOM-prevalent countries.¹¹ Understanding of the microbiology of the chronic otitis media is important for efficient and effective treatment, and prevention of complications and antibiotic resistance.¹² Early bacteriological diagnoses of all the cases will assume accurate and appropriate effective therapy.

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