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## RESEARCH ARTICLE

# A MICROBIOLOGICAL STUDY OF CHRONIC SUPPURATIVE OTITIS MEDIA

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### INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is one of the most common childhood diseases and according to WHO estimate affects 65 to 330 million people worldwide mainly in developing countries (WHO, 2004). Though exact definition of CSOM is still debated, WHO defines it as chronic inflammation of the middle ear cleft with recurrent discharge through tympanic membrane perforation over a period of at least 3 months. Due to perforated tympanic membrane microorganisms can gain entry into the middle ear via external auditory canal. The spread of micro organisms to adjacent structures of the ear may cause local damage in the ear or intracranial and extracranial complications ranging from persistent otorrhoea, mastoiditis, labyrinthitis, facial nerve palsy to intracranial abscesses or thromboses (Mirza *et al.*, 2008 and Shrestha *et al.*, 2011). Most common organism found associated with CSOM are Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae, Escherichia coli, Aspergillus and Candida (Jakimovska *et al.*, 2002). The disease is mainly classified into two types: 1) mucosal or tubotympanic type affecting the middle ear mucosa & periosteum and 2) squamous or atticofacial type which is an active squamous disease in which squamous epithelium present in middle ear cleft erodes the bone. Whatever may be the type or aetiology of CSOM, increased and irrational use of wide spectrum antibiotics, has

### ABSTRACT

Infection of the middle ear cavity of varying severity with its associated complications is one of the commonest ENT problem in tropical countries like ours. The chronicity of the disease and poor response to routine treatment prompted us to isolate and identify the causative organisms and study antimicrobial susceptibility pattern. Two hundred patients examined over a period of two years were studied. Microbial aetiology could be made in 92% cases with Pseudomonas aeruginosa being the predominant bacterium (41%) followed by Staphylococcus aureus (26.5%). Mixed infection was seen only in 6% cases. Imipenem was found to be the most effective antibiotic against all the bacterial strains. However, in view of its cost, Amikacin seems to be a good alternative both for topical as well as systemic use. However, ototoxicity of Amikacin was observed clinically as well as any documentary evidence viz audiometry BERA (Brainstem Evoked Response Audiometry) and OAE (Oto-Acoustic Emissions) in children. None of our cases studied in this study was found to have ototoxic effects.

resulted in development of resistance among bacterial isolates and change in microbial flora (Sabella *et al.*, 2000). A reappraisal of the modern day flora of CSOM and their in vitro antibiotic sensitivity pattern is very important for clinicians to plan a general outline of treatment in the absence of culture facilities (Indudharan *et al.*, 1999). The present study was therefore undertaken to look for bacterial flora and their antibiotic susceptibility pattern in order to shorten the period of infection associated with discharge in patients of CSOM thereby improving the outcome.

### MATERIALS AND METHODS

The study was conducted in PL Sharma Hospital of Meerut during April 2007 to March 2009 on 200 patients attending ENT OPD with history of chronic ear discharge who have not used antibiotics either topical or systemic for at least 5 days immediately before coming to hospital irrespective of age or sex. Cotton tipped swab was taken from each patient and sent for culture. The culture was done on MacConkey agar and blood agar plates and incubated at 37° C overnight. The plates were examined next day for growth of organisms. The organisms were identified by their culture characteristics, morphology, pigment production, hemolysis on blood agar, motility and biochemical tests. The various organisms isolated were tested for their sensitivity against various antibiotics by Kirby-Bauer method as per CLSI guidelines (NCCLS, 2001).

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No attempt was made to isolate anaerobic bacteria or fungi except Candida.

**RESULTS**

The study was conducted on 200 patients attending ENT OPD of Dr. PL Sharma District Hospital, Meerut. Males outnumbered females (M:F=1.4:1) and the disease was more common in first and second decades of life (Table 1). Tubotympanic variety was more common than atticointral type.

Out of 200 patients 184 showed growth giving an isolation rate of 92%. Bacterial growth was obtained in 178 patients whereas 6 patients had shown growth of Candida spp. Out of these 178 patients majority (166) showed growth of a single bacterium only. However, in remaining 12 patients mixed growth was obtained.

**Table 1** Age and sex wise distribution of patients

Age (Years)	Male	Female	Total
<10	49	33	82
10-19	30	22	52
20-29	15	13	28
30-39	13	07	20
40-49	07	05	12
50-59	03	02	05
≥ 60	01	00	01
<b>Total</b>	<b>118</b>	<b>82</b>	<b>200</b>

**Table 2** Microorganisms isolated from CSOM cases

Microorganism	Number	Percentage
Pseudomonas aeruginosa	82	41.0
Staphylococcus aureus	53	26.5
Proteus spp.	24	12.0
Klebsiella pneumoniae	19	9.5
Escherichia coli	09	4.5
Streptococcus pneumoniae	03	1.5
Candida spp.	06	3.0
No growth	16	8.0
<b>Total</b>	<b>212</b>	

Note: 12 specimens had yielded mixed growth

**Table 3** Organisms seen in mixed culture

Microorganisms	Number
Pseudomonas aeruginosa +Klebsiella pneumoniae	03
Pseudomonas aeruginosa +Escherichia coli	02
Pseudomonas aeruginosa +Staphylococcus aureus	03
Pseudomonas aeruginosa +Proteus spp.	02
Staphylococcus aureus + Klebsiella pneumoniae	01
Staphylococcus aureus + Proteus spp.	01

**Table 4** Antibiotic sensitivity pattern of bacterial isolates

Antibiotics	No. of sensitive strains of bacterium					
	P.aeruginosa (82)	S.aureus (53)	Proteus spp. (24)	K.pneumoniae (19)	E.coli (09)	S.pneumoniae (03)
Amikacin	74	50	20	17	07	03
Amoxycillin	-	26	-	-	04	03
Amoxyclav	-	35	16	-	04	03
Chloramphenicol	-	48	19	15	08	03
Ciprofloxacin	63	41	16	14	07	03
Cotrimoxazole	-	37	-	-	05	02
Ceftriaxone	-	45	17	18	06	03
Ceftazidime	60	48	19	16	06	03
Erythromycin	-	48	-	-	-	03
Gentamicin	49	47	16	15	06	03
Linezolid	-	53	-	-	-	03
Imipenem	81	-	24	19	09	-
Netilmicin	53	-	18	15	07	-
Piperacillin	59	-	20	16	08	-

No growth was seen in 16 patients (8%). Pseudomonas aeruginosa was the predominant organism followed by Staphylococcus aureus and others (Table 2).

The sensitivity patterns of organisms isolated are shown in Table 3. Imipenem and Amikacin were found to be most effective against all gram negative bacteria including Pseudomonas and Linezolid against gram positive cocci.

**DISCUSSION**

Chronic Suppurative Otitis Media and its associated complications are the most common conditions seen by Otologists, Paediatricians and general practitioners. It was observed that first decade of life is the most common (41%) age group and that is the reason that CSOM cases are seen by Paediatricians as well. All other studies have also found this age group to be the commonest (Bansal et al, 2013, Poorey et al, 2002, Michael et al, 2015 & Shyamla et al, 2012).

The reasons for high incidence of CSOM in this age group may be short and wide eustachean tube (Arvind et al,2014) and predisposition to cold and URTI (Gordon et al, 2004). Males were more commonly affected than females (1.4:1). A similar incidence of CSOM in males have been reported by others (Lakshmipathi et al,1965, Mishra et al, 1999, Taneja et al,1995, Poorey et al,2002 & Bansal et al,2013). Male predominance is perhaps due to their more exposed way of life. Out of 200 cases studied, pure growth of a single bacterium was obtained in 166, whereas 12 patients showed mixed bacterial infection. Six patients yielded growth of Candida spp. and no growth was seen in 16 patients. These 16 patients might have been infected either by anaerobic bacteria or by fungi like Aspergillus. Predominance of aerobic bacteria is well known (Bansal et al, 2013 & Poorey et al,2002) whereas anaerobic bacteria are responsible for a minority of cases only (Ayyagari et al, 1981).

In the present study Pseudomonas aeruginosa was found to be the most common organism (41%) cases. Pseudomonas has been shown to be the commonest organism responsible for CSOM by many workers (Bansal et al,2013, Moorthy et al,2013, Varshney et al,1999 & Shazia et al,2012). Its incidence has been reported to vary from about 18% (Lakshmipathi et al, 1965) to 67% (Kenna et al,1986).

The variation in isolation rates may be due to regional and climatic differences. It is the predominant cause of CSOM in tropical regions. However, *Pseudomonas* usually does not inhabit upper respiratory tract and its presence in middle ear cannot be ascribed to invasion through Eustachian tube (Visvanath *et al*, 2012).

The next common organism after *Pseudomonas* in our study was *Staphylococcus aureus* being found responsible for 26.5% cases. Many workers have found *Staphylococcus aureus* to be the most common bacteria in CSOM (Vaishnavi *et al*, 2015, Patricia *et al*, 2006 & Mirza *et al*, 2008) while others have found it to be second commonest (Arvind *et al*, 2014 & Poorey *et al*, 2002). Its incidence has been reported to vary from about 6% (Gulati *et al*, 1969) to 43% (Rao *et al*, 1994).

The other bacteria isolated include *Proteus spp.* (12%), *Klebsiella pneumoniae* (9.5%), *Escherichia coli* (4.5%) and *Streptococcus pneumoniae* (1.5%). The variations in isolation rates of different organisms reported by different workers may be due to antibiotic uses, ethnic, climatic and other geographical factors (Yildirim *et al*, 2005).

Imipenem was found to be effective against all the bacterial species isolated and tested as has been reported by Jang *et al*, 2004. However, it should be used judiciously to avoid development of resistance.

The other very good antibiotic is amikacin and over 85% strains of all bacterial species are sensitive to this antibiotic. Apart from imipenem and amikacin, others like ciprofloxacin, piperacillin, ceftazidime are also effective. The mechanism of resistance is believed to be mediated by formation of biofilms by infecting organisms (Dohar *et al*, 2005).

The microbial predominance and their antibiotic sensitivity pattern has been changing over time. So periodical monitoring of microbiological profile is essential for making effective empirical protocol for the cases in a particular geographical location. Our findings suggest that local and systemic treatment with amikacin might be highly successful.

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