International Research Journal of Medical Sciences _____ ISSN 2320 –7353
Vol. **2(5),** 6-9, May **(2014)** *Int. Res. J. Medical Sci.*

Microbial Profile and Antibiograms of Active Patients of Chronic Suppurative Otitis Media in Latur, Maharashtra, India

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Available online at: www.isca.in, www.isca.me
Received 15th April 2014, revised 5th May 2014, accepted 25th May 2014

Abstract

Otitis media (OM) is a major health problem in both developed and developing countries. This study taken to determine the pattern of bacterial isolates in Patients with chronic suppurative otitis media (CSOM) in Latur District, Maharashtra (India). A prospective study carried out in dept. of Microbiology, Govt. Medical College, latur among consenting patients with CSOM attending the ENT department over a period of 10 months. Informed consent was obtained from the patients for this study and microbiological analysis done. A total of 168 patients aged 5-70 years with chronic suppurative otitis media were accounted and total 201 bacteria isolated from ear discharge of 168 paients. In the present study, gram-negative bacteria were the dominant isolates (59.7%) while gram positive bacteria were 81(40.3%) The most Common causal organisms isolated were Pseudomonas aeruginosa 57 (28.35) followed by Staphylococcus aureus 49 (24.37%), Coagulase negative Staphylococcus 26(12.93 %), Klebsiella spp. 23(11.44 %).this study indicates the antibiogram trends of the most predominant bacterial isolates in otitis media. Pseudomonas aeruginosa and S. aureus showed high resistant rate (73.6-89.4%) to, tetracycline, Erythromycin and amoxicillin.while P. aeruginosa demonstrated 96.5 % sensitivity to norfloxacin and low level of resistance to gentamicin and ciprofloxacin.

Keywords: Antibiogram, Otitis media, Norfloxacin, *Pseudomonas aeruginosa,* ear discharge.

Introduction

Otitis media (OM) is a major health problem and occurs with a high incidence and prevalence in both developed and developing countries[1,2]. It may be acute, chronic or recurrent. Otitis media is an inflammation of the middle ear and mastoid process which could be acute purulent otitis media, otitis media with effusion and chronic suppurative otitis media[3]. Worldwide, 65-330 million people suffer from otitis media; of these, about 60% experience significant hearing impairment[4]. Otitis media is more common in children, as their eustachian tube is shorter, more horizontal with a more flaccid cartilage which can impair its opening[5]. Infection of the middle ear mucosa subsequently results in ear discharge. Untreated cases of CSOM can result in a broad range of complications. These may be related to the spread of bacteria to structures adjacent to the ear or to local damage in the middle ear itself. Such complications range from persistent otorrhoea, mastoiditis, labyrinthitis, facial nerve paralysis to more serious intracranial abscesses or thromboses[6,7-8]. So the knowledge of the local pattern of infection is essential to enable efficacious treatment of this disorder. The goals of management are to achieve a safe, dry ear, eradicate disease and improve hearing. The objective of this study was to determine the microbial profile (aerobic and anaerobic) and the antibiograms of active CSOM patients in Latur district Maharashtra, India. CSOM is very common in our set up and is seen mostly in populations from areas of low socio economic status.

Material and Methods

Study design: This is the prospective, randomized and longitudinal study performed in the department of ENT and Microbiology, government medical college, Latur from 15th April 2011 to 15th January 2012. Total one hundred and sixty-eight patients of chronic suppurative otitis media with unilateral or bilateral ear discharge were enrolled. Detail clinical history regarding sex, age, route of discharge, antibiotic therapy were taken.

Culture and Identification: As the standard operation procedures showed, pus swabs from the discharging ears were collected using swab techniques by cotton-wool at the microbiology laboratory. Ear discharge samples were plated on MacConkey agar, blood agar and mannitol salt agar and then incubated aerobically at 37^0C for 24 hours. Bacterial species were identified as per the standard microbiological methods[9].

Antimicrobial Susceptibility Testing: Antimicrobial susceptibility tests were done on Mueller-Hinton agar using disk diffusion method as described by Kirby Bauer[10]. The antimicrobial agents tested were: tetracycline (30 µg), cephalotin (30 µg), erythromycin (15 µg), chloramphenicol (30 µg), gentamicin (10 µg), ciprofloxacin (5 µg), norfloxacillin (10 µg), cotrimoxazole (25 µg), ceftriaxone (30µg) and amoxycillin (10µg). Resistance data were interpreted according to Clinical and Laboratory Standards Institute[11].

Results and Discussion

Total 201 ear discharge cultures were examined. 99 (58.9%) ear discharges were from children and 70 (41.1%) from adults. There was almost equal distribution of otitis media among the sexes [females: 92 (54.7%) and males 76 (45.3%)]. Among children (0-18years), peak prevalence of otitis media (33.9%) was documented in children with the age group 0-10 years and (25 %) was documented in children with age group of 11-18 years. From the 169 patients enrolled in the study, there were 201 isolates. From total isolates gram positive bacteria accounted for isolates of ear discharge 81(40.3%) while 120 (59.7%) gram-negative bacteria were isolated from ear discharge of 169 patients. The most Common causal organisms isolated were *Pseudomonas aeruginosa* 57 (28.35) followed by Staphylococcus aureus 49 (24.37%), *Coagulase negative Staphylococcus* 26(12.93 %), *Klebsiella spp.* 23(11.44 %).

The antimicrobial sensitivities of the bacteria were tested and, *Pseudomona* spp. and *E. coli* showed high levels of susceptibility (87-100%) to norfloxacin, ciprofloxacin and gentamicin. However, high resistance rates were documented for erythromycin (90.8-97%), amoxycillin (80.8-100%) and tetracycline (61.1-89%). *S. aureus* exhibited resistance rates ranging from 40.7-86% to amoxycillin, tetracycline and cotrimoxazole. However, most of the isolates were highly sensitive (90-93.4%) to ciprofloxacin, norfloxacin and gentamicin (table- 5). The overall antimicrobial susceptibility demonstrated that norfloxacin, ciprofloxacin and gentamicin revealed high level of sensitivity (85.6-96.6%). However, 65.6-83% resistance rate was documented for tetracycline and amoxycillin (table- 6).

Table-1
Age Distribution of Patients (n=168)

Age	Number
< 10 years	57 (33.9 %)
11-18	42 (25%)
19-30	28 (16.66 %)
31-40	18 (10.71%)
41-50	11 (6.54 %)
>50	3 (1.78)

Table-2
Sex distribution of Patients (n=168)

Sex	Number (%)
Male	76(45.24%)
Female	92(54.76%)

Table-3
Site distribution (n=168)

Site	Number (%)
Right ear	63(37.6)
Left Ear	57(33.8)
Bilateral	48(28.6)

Table-4
Microbial profile of CSOM (n= 168)

Types of organisms	Number of isolates (%)
Gram negative bacteria	
Pseudomonas aeruginosa	57(28.35%)
Enterobacter spp.	18(8.95%)
Escherichia coli	13(6.46%)
Citrobacter	9(4.47%)
Klebsiella spp.	23(11.44 %)
Gram positive bacteria	
Staphylococcus aureus	49(24.37 %)
Coagulase negative Staphylococcus	26(12.93 %)
Sreptococcus pneumoni	6(2.98)
Total isolates	201(100 %)

Discussion: In the study area, ear discharge cultures were one of the most frequently requested clinical specimen for culture and antimicrobial susceptibility testes. This indicated that otitis media is a common health problem of all age groups. Among children, peak-age prevalence was observed in the age group under five years. This is in agreement with previous studies conducted in Ethiopia[12,13] and Nigeria[14]. This is due to the fact that younger children are more prone to otitis media related to the immaturity of their immune status, the shorter and horizontal nature of Eustachian tubes, frequent exposure to upper respiratory tract infections and malnutrition[15]. In the present study, gram-negative bacteria were the dominant isolates (59.7%) of the discharging ears compared to gram- positive bacteria. Moreover, Tesfaye from Addis Ababa and Wariso from Nigeria have reported 60.5% and 75% of gram- negative bacteria, respectively[13,14]. *Pseudomonas aeruginosa* and *Staphylococcus aureus* were the most dominant isolates. This trend conforms to findings of other studies done in Ethiopia[12,15-17]. In contrast, Tesfaye from Addis Ababa reported *S. aureus*, *Proteus* spp, and *Pseudomonas* spp. as predominant causes for chronic otitis media[13]. Very low isolation rate of *Pseudomonas* spp. were reported from Gondar in Ethiopia[17]. However, several studies elsewhere in the world have reported that the most common isolated organisms were *Pseudomonas* spp. followed by *S. aureus*[9,10,18]. Possible explanation to this difference in isolation rate might be related to the effect of climate. Bacterial colonization of otitis media increases as temperatures rise which in turn increases the isolation rate of bacteria[11]. Moreover, Mohoney reported that *S. aureus* was the common isolate in patients' complaint in the first week after the onset of ear discharge while *Proteus* spp. And *Pseudomonas* spp. was common isolates in patients presenting lately 2 months after onset of ear discharge[19]. *Proteus* spp. were the commonest isolates in pediatrics compared to adults. This is in agreement with others studies in Ethiopia[16,17]. However, in India, Saini reported that *S. aureus* was the commonest isolate in pediatric patients[20]. The reason may be children with discharging ears may not be noticed for early diagnosis[19]. Previous studies have indicated that otitis media is one of the major causes for

frequent antibiotic use in children and being key contributor to antibiotic resistance[21,22]. Thus, this study presents antibiogram trends of the most predominant bacterial isolates in otitis media. *P. aeruginosa* and *S. aureus* showed high resistant rate (73.6-89.4%) to, tetracycline, Erythromycin and amoxicillin. Moreover, 96-100% resistance level of tetracycline and erythromycin were reported by Wariso from Nigeria[14]. However, in this study *P. aeruginosa* demonstrated 96.5% sensitivity to norfloxacin and low level of resistance to gentamicin and ciprofloxacin. In the present study, *S. aureus* revealed a high level of resistance to amoxycillin which is in agreement with a report from Pakistan[10]. In the present study *S. aureus* showed 100 % sensitive to gentamicin which is different from others finding[14]. Most of *S. aureus* exhibited low levels of resistance (4.6-10%) to ciprofloxacin, gentamicin and norfloxacin which is also reported by Tesfaye G. et al[13] and Yismaw G. et al[17]. Most of the isolates were resistant to amoxycillin, erythromycin, tetracycline, cotrimoxazole and chloramphenicol. This is comparable with results from Ethiopia[12,14], Nigeria[14] and Iraq[9]. However, *Pseudomonas* spp. were highly sensitive to norfloxacin, ciprofloxacin, and gentamicin, similar to reports of findings in Gondar in Ethiopia[17], Brazil[18] and Pakistan[10].

Conclusion

The present study indicated that otitis media is common health problem in children and adults imply a major healthcare burden in the area. *S. aureus* and *Pseudomonas* spp. were the dominant isolates in otitis media. Most of the isolates showed high levels of antimicrobial resistance to commonly prescribed antimicrobials. However, gentamicin, Ciprofloxacin and norfloxacin have great antimicrobial activity against most of the bacterial isolates *In vitro*. Therefore, culture and susceptibility testes have paramount importance for better management of otitis media and drug-resistant infections.

Table-5
Antibiogram of Bacterial pathogen isolated from patient of CSOM at GMC Latur

	P. aeruginosa [t=57]		***Enterobacter sp [t=18]***		***E. coli [t=13]***		***Citrobacter [t=9]***		***Klebsiella spp. [t=23]***		***S. aureus [t=49]***		***CNS [t=26]***		***Sreptococcus pneumoni [t=6]***	
	R	%	R	%	R	%	R	%	R	%	R	%	R	%	R	%
Tetracycline	46	80.7	13	72.2	9	69.2	7	77.8	15	65.2	26	53.0	10	38.4	6	100
Gentamicin	7	12.2	3	16.7	4	30.7	1	11.2	3	13	3	6.1	8	30.7	--	-
Chloramphenicol	27	47.3	9	50	5	38.4	2	22.3	14	60.8	8	16.3	21	80.7	--	-
Cotrimoxazol	31	54.3	10	55.6	9	69.2	5	55.6	14	60.8	21	42.8	11	42.3	3	50
Erythromycin	51	89.4	15	83.4	10	76.9	9	100	19	82.6	9	18.3	--	-	1	16.6
Cephalothin	34	59.6	12	66.6	8	61.5	5	55.6	15	65.2	8	16.3	-	-	2	33.3
Ciprofloxacin	6	10.5	2	11.2	3	23	1	11.2	2	8.6	2	4.0	-	-	4	66.6
Amoxycillin	42	73.6	18	100	11	84.6	9	100	21	91.3	43	87.7	20	76.9	3	50
Norfloxacin	2	3.5	--		--	--	---		---	-	3	6.1	-	-	2	33.3

R- Numbers of isolates shows resistance against antibiotics; t- Total number of isolates tested.

Table-6
Overall Sensitivity and Resistance Pattern of Antimicrobial Agents tested for Bacterial isolates of otitis media

Antibiotics	**Resistance Isolates**	**Sensitive Isolates**
Tetracycline	132(65.6)	69(34.4)
Gentamicin	29(14.4)	172(85.6)
Chloramphenicol	86(42.7)	115(57.3)
Cotrimoxazol	104(51.7)	97(48.3)
Erythromycin	114(56.7)	57(43.3)
Cephalothin	84(41.7)	117(58.3)
Ciprofloxacin	20(9.9)	181(90.1)
Amoxycillin	167(83.0)	34(17)
Norfloxacin	7(3.4)	194(96.6)

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