CLINICO-BACTERIOLOGICAL EVALUATION OF DISCHARGING EARS OF CHRONIC SUPPURATIVE OTITIS MEDIA IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: *Discharging ears and deafness are the major otolaryngological problems faced in India. Chronic suppurative otitis media (CSOM) is well known for its recurrence, bacterial resistance, ototoxicity, fatal complications and chronic hearing loss which has negative impact on development of speech, language and social interaction. The present study was carried out to find out an association between aerobic bacteria and nature of discharge as well as type of CSOM.*

Material and Methods: *Active discharge over 2 weeks through the perforated tympanic membrane from 113 patients with history regarding nature of discharge and type of perforation was collected using sterile cotton swab with all aseptic precautions followed by immediate direct examination of ear discharge with Gram stain and aerobic culture. Identification and antimicrobial susceptibility testing of isolates was done by standard protocol.*

Results: *Of 113 patients of CSOM, safe CSOM was found in 116(84.6%) and unsafe CSOM in 21(15.4%) ears. P. aeruginosa 41(23.8%) and S. aureus 41 (23.8%) were observed as most common aerobic bacteria. Mucopurulent 16(33.3%) and foetid 6(54.5%) discharge was mainly associated with P. aeruginosa and purulent 24(40.6%) and mucoid 8(26.6%) discharge with S. aureus. Highest percentage sensitivity against Gram positive organisms and Gram negative organisms (P. aeruginosa & Enterobacteriaceae) was observed for Ciprofloxacin.*

Conclusion: *Most common aerobic bacteria associated with safe CSOM was S.aureus, while P.aeruginosa was found associated with unsafe CSOM. P.aeruginosa was found mostly associated with mucopurulent discharge and S.aureus was with purulent discharge. S.aureus was found to be mostly associated with purulent discharge and P.aeruginosa with mucopurulent discharge in safe CSOM. P.aeruginosa was found to be mostly associated with foetid discharge and S.aureus with purulent discharge in unsafe CSOM*

Key words: *Aerobic bacteria; Chronic suppurative otitis media; Nature of discharge; Safe CSOM; Unsafe CSOM*

INTRODUCTION

Chronic suppurative otitis media is probably the most commonest disease seen in the ENT outpatient department [1]. Prevalence of chronic suppurative otitis media (CSOM) in India may range from 3-15%. CSOM is defined as a long standing infection of a part or whole of the middle ear cleft [2]. It is characterized by recurrent or persistent ear discharge (otorrhoea) over 2 weeks through a perforated tympanic membrane with variable degree of hearing loss[3,4]. CSOM is a disease of multiple etiologies [5] and bacteria play an important role [6]. CSOM is well known for its recurrence, bacterial resistance, ototoxicity and fatal complications like meningitis, mastoid abscess, facial nerve palsy, brain abscess, etc [7, 8]. It can cause chronic hearing loss which has a negative impact on the development of speech, language and social interaction as well as school or work place performance [9]. Central perforations are referred to as safe CSOM as they are rarely associated with complications while marginal and attic perforations are referred to as unsafe and dangerous CSOM as they are commonly associated with complications [10]. For the management of CSOM knowledge of the pathogens and its anti-biogram is imperative [11]. So, the present study was carried out to know about the nature of discharge, identify the pathogen and it's antibiogram to help clinician in instituting appropriate therapy.

MATERIAL AND METHODS

The present study was carried out from January 2010 to December 2010. In this span of one year, 113 patients, clinically diagnosed as chronic suppurative otitis media [4] in the ENT outpatient department of GMC, Miraj were selected as cases for the present study. The detailed history of each patient regarding age, sex, duration of discharge, type of discharge, whether disease is unilateral or bilateral, associated hearing loss and type of perforation was obtained.

Inclusion criteria: Patients with ear discharge over 2 weeks with a perforated tympanic membrane [3] were taken as subjects. Patients of both the sexes and all ages were included. Patients with less than 2 weeks ear discharge were not included in the study.

Sample Collection: Active discharge through the perforated tympanic membrane of these patients was collected by using sterile thin cotton swabs by no-touch technique and with all aseptic precautions [12, 13 and 14]. Care was taken not to touch the pinna or any part of the ear with the swab [14]. Two swabs were collected from the affected ear and processed immediately.

Sample Processing: Direct examination of the ear discharge was done immediately after collection using Gram's stain. The sample was subjected to aerobic culture on blood agar and Mac Conkey's agar. Identification of the isolate was done by standard protocol.

Antimicrobial Susceptibility Testing [15]: Broth cultures of all the aerobic bacteria isolated were made and matched with the 0.5 McFarland turbidity standards. The susceptibility testing of the antibiotics was done on Mueller-Hinton agar by Kirby-Bauer Disk Diffusion technique as per CLSI guidelines. The plates were then incubated at 37^0c for 18-24 hours.

Follow up: All the patients were prescribed antibiotics initially for 5 days. The reports of antimicrobial us susceptibility testing were informed to the concerned ENT surgery on 3rd day. The patients were then followed on 6th day of the start of treatment. All the patients were subjected to otoscopic examination and if otorrhoea was not found post treatment, then that indicated clinical success.

RESULTS

Out of 113 patients, 89 (78.8%) had unilateral disease, while 24 (21.2%) had bilateral disease, so 137 ears of 113 patients were found to be affected. Out of 137 ears, unsafe CSOM was found in 21 (15.4%) ears, while safe CSOM was found in 116 (84.6%) ears. Among 137 ears, culture positive were 119 (86.8%) and culture negative were 18 (13.2%). Aerobic bacteria isolated from 119 ears were found to be 148 (86.1%). The most common aerobic bacteria observed were *P. aeruginosa* (23.8%) and *S. aureus* (23.8%). Out of 148 aerobic bacterial isolates, 26(17.5%) were associated with unsafe CSOM while 122(82.4%) with safe CSOM (Table 1). Mucopurulent 16(33.3%) and foetid 6(54.4%) discharge was mainly associated with *P. aeruginosa*, while purulent 24(40.6%) and mucoid 8(26.6%) discharge with *S. aureus* (Table 2). Unsafe CSOM, in the present study, was found mainly associated with purulent 15(57.1%) and foetid 11(42.3%) discharge, whereas safe CSOM was mainly associated with mucopurulent 48(39.3%) and purulent 44(36.0%) followed by mucoid 30(24.5%) discharge (Table 3). The highest percentage sensitivity against Gram positive organisms was observed for Ciprofloxacin (Table 4). Ciprofloxacin was found to be having highest percentage sensitivity for *P. aeruginosa* (95.1%) and *Acinetobacter spp*. (100%) (Table 5). The highest percentage sensitivity for *enterobacteriaceae* family was found to be for Ciprofloxacin followed by Amikacin (Table 6).

Table 1: Aerobic bacteria associated with unsafe and safe CSOM

Aerobic bacteria	Unsafe CSOM	Safe CSOM	Total
P. aeruginosa	10 (24.3%)	31 (75.6%)	41(100%)
S. aureus	9 (21.9%)	32 (78.0%)	41(100%)
CONS	1 (5.5%)	17 (94.4%)	18 (100%)
P. mirabilis	2 (25%)	6 (75%)	8 (100%)
E.coli	2 (25%)	6 (75%)	8 (100%)
Enterococcus spp.	1 (14.2%)	6 (85.7%)	7 (100%)
Corynebacterium spp.	1 (14.2%)	6 (85.7%)	7 (100%)
K. pneumoniae	0	5 (100%)	5 (100%)
P. vulgaris	0	3 (100%)	3 (100%)
C. freundii	0	3 (100%)	3 (100%)
C. diversus	0	2 (100%)	2 (100%)
Acinetobacter spp.	0	2 (100%)	2 (100%)
S. pneumoniae	0	2 (100%)	2 (100%)
S. pyogens	0	1 (100%)	1 (100%)
Total	**26(17.5%)**	**122(82.4%)**	**148(100%)**

CONS – Coagulase Negative Staphylococci

Table 2: Association of aerobic bacterial isolates with the nature of discharge

Aerobic bacteria	Purulent	Mucopurulent	Mucoid	Foetid	Total
P. aeruginosa	13	16	6	6	41
S. aureus	24	7	8	2	41
CONS	6	5	6	1	18
P. mirabilis	5	2	0	1	8
E.coli	3	3	1	1	8
Enterococcus spp.	2	2	3	0	7
Corynebacterium spp.	1	4	2	0	7
K. pneumoniae	1	3	1	0	5
P. vulgaris	2	1	0	0	3
C. freundii	0	1	2	0	3
C. diversus	1	1	0	0	2
Acinetobacter spp.	1	1	0	0	2
S. pneumoniae	0	1	1	0	2
S. pyogens	0	1	0	0	1
Total	**59**	**48**	**30**	**11**	

Table 3: Association of aerobic bacterial isolates with the nature of discharge and type of CSOM

	Unsafe CSOM					Safe CSOM				
Aerobic Bacteria	**Purulent**	**Mucopurulent**	**Mucoid**	**Foetid**	**Total**	**Purulent**	**Mucopurulent**	**Mucoid**	**Foetid**	**Total**
P. aeruginosa (n=41)	4(26.6%)	0	0	6(54.4%)	10	9(20.4%)	16(33.3%)	6(20%)	0	31
S. aureus (n=41)	7(46.6%)	0	0	2(18.1%)	9	17(38.6%)	7(14.5%)	8(26.6%)	0	32
CONS (n=18)	0	0	0	1(9.0%)	1	6(13.6%)	5(10.4%)	6(20%)	0	17
P. mirabilis (n=8)	1(6.6%)	0	0	1(9.0%)	2	4(9.0%)	2(4.1%)	0	0	6
E.coli (n=8)	1(6.6%)	0	0	1(9.0%)	2	2(2.5%)	3(6.2%)	1(3.3%)	0	6
Enterococcus spp. (n=7)	1(6.6%)	0	0	0	1	1(2.2%)	2(4.1%)	3(10%)	0	6
Corynebacterium spp. (n=7)	1(6.6%)	0	0	0	1	0	4(8.3%)	2(6.6%)	0	6
K. pneumoniae (n=5)	0	0	0	0	0	1(2.2%)	3(6.2%)	1(3.3%)	0	5
P. vulgaris (n=5)	0	0	0	0	0	2(4.5%)	1(2.0%)	0	0	3
C. freundii (n=3)	0	0	0	0	0	0	1(2.0%)	2(6.6%)	0	3
C. diversus (n=2)	0	0	0	0	0	1(2.2%)	1(2.0%)	0	0	2
Acinetobacter spp. (n=2)	0	0	0	0	0	1(2.2%)	1(2.0%)	0	0	2
S. pneumoniae (n=2)	0	0	0	0	0	0	1(2.0%)	1(3.3%)	0	2
S. pyogens (n=1)	0	0	0	0	0	0	1(2.0%)	0	0	1
Total	**15(57.6%)**			**11(42.3%)**	**26(100%)**	**44(36.0%)**	**48(39.3%)**	**30(24.5%)**		**122(100%)**

Table 4: Antimicrobial susceptibility pattern of Gram positive organisms

	Pn	Ox	Cn	CoT	E	G	Cf
***S. aureus* (n=41)**	11 (26.8%)	-	40 (97.5%)	22 (53.6%)	33 (80.4%)	34 (82.9%)	36 (87.8%)
***CONS* (n=18)**	6 (33.3%)	-	-	8 (44.4%)	14 (77.7%)	15 (83.3%)	15 (83.3%)
***Enterococcus spp.* (n=7)**	7 (100%)	-	-	-	-	-	-
***Corynebacterium spp.* (n=7)**	4 (57.4%)	-	-	5 (71.4%)	6 (85.7%)	6 (85.7%)	7 (100%)
***S. pneumonia* (n=2)**	-	2 (100%)	-	1 (50%)	2 (100%)	-	-
***S. pyogens* (n=1)**	1 (100%)	-	-	-	1 (100%)	-	-

CONS – Coagulase Negative Staphylococci

Pn- Penicillin, Cn- Cefoxitin, CoT- Cotrimoxazole, E- Erythromycin, G- Gentamicin, Cf- Ciprofloxacin

Table 5: Antimicrobial susceptibility pattern of Gram negative bacilli (*P. aeruginosa* & *Acinetobacter spp*.)

	Ak	G	Ce	To	C	Cf
***P. aeruginosa* (n=41)**	38 (92.6%)	36 (87.8%)	37 (90.2%)	35 (85.3%)	23 (56.0%)	39 (95.1%)
***Acinetobacter spp.* (n=2)**	2 (100%)	2 (100%)	2 (100%)	1 (50%)	1 (50%)	2 (100%)

Ak- Amikacin, G- Gentamicin, Ce- Ceftazidime, To- Tobramycin, C- Chloramphenicol, Cf- Ciprofloxacin

Table 6: Antimicrobial susceptibility pattern of Gram negative bacilli (*Enterobacteriaceae*)

	A	Ak	G	COT	Cp	Cu	CTX	C	Cf
***P. mirabilis* (n=8)**	2 (25%)	7 (87.5%)	6 (75%)	5 (62.5%)	3 (37.5%)	4 (50%)	7 (87.5%)	1 (12.5%)	7 (87.5%)
***E. coli* (n=8)**	3 (37.5%)	7 (87.5%)	7 (87.5%)	4 (50%)	3 (37.5%)	4 (50%)	7 (87.5%)	3 (37.5%)	7 (87.5%)
***K. pneumonia* (n=5)**	1 (20%)	5 (100%)	4 (80%)	1 (20%)	1 (20%)	2 (40%)	3 (60%)	2 (40%)	3 (60%)
***P. vulgaris* (n=3)**	1 (33.3%)	2 (66.6%)	3 (100%)	2 (66.6%)	2 (66.6%)	2 (66.6%)	2 (66.6%)	2 (66.6%)	3 (100%)
***C. freundii* (n=3)**	1 (33.3%)	2 (66.6%)	3 (100%)	2 (66.6%)	2 (66.6%)	3 (100%)	3 (100%)	1 (33.3%)	3 (100%)
***C. diversus* (n=2)**	0	2 (100%)	1 (50%)	2 (100%)	1 (50%)	2 (100%)	2 (100%)	1 (50%)	2 (100%)

A- Ampicillin, Ak- Amikacin, G- Gentamicin, COT- Cotrimoxazole, Cp- Cephalexin, Cu- Cefuroxime, CTX- Cefotaxime, C- Chloramphenicol, Cf- Ciprofloxacin

DISCUSSION

Chronic suppurative otitis media is a disease that can cause significant morbidity [7]. Out of these 113 patients, unilateral disease was observed in 89(78.8%), while bilateral disease was seen in 24(21.2%) patients. That is why; total 137 ears of 113 patients were found to be affected. The behavioral nature of the children which includes playing with or inserting contaminated objects into the ears probably makes the prevalence of unilateral disease more common [16]. Study of type of CSOM whether safe or unsafe is necessary in order to treat them at the earliest. In our study, among the 137 ears, unsafe CSOM was found in 21(15.4%) whereas safe CSOM was found in 116(84.6%) ears. A prevalence of 21.5% of unsafe CSOM was found by Baruah et al (1972) [17] in their study which is similar to our findings. Though, the prevalence of unsafe CSOM is less, but early detection of unsafe CSOM is very important because in a developing country like India, disease can progress to develop various complications like brain abscess, meningitis, etc due to poor hygiene, malnutrition, etc. [18]. Out of these 137 ears, total culture positive ears were 119(86.8%) and 18(13.2%) ears were cultures negative. This could be due to some bactericidal and bacteriostatic properties of middle ear effusion on many strains of organisms (Sirala, 1955) [19]. From 119 total culture positive ears, 148(86.1%) aerobic bacteria were isolated. Baruah et al (1972) in their study obtained prevalence of aerobic bacteria in causation of CSOM to be 88.2% [17]. The isolation of type of organism probably could be influenced by the hygienic conditions, nutrition, etc of the patients in the particular area. Among the 148 aerobic bacteria isolated, the most common bacteria observed were *P. aeruginosa* (23.8%) and *S. aureus* (23.8%). Loy AHC (2002) also reported *P. aeruginosa* (33.3%) and *S. aureus* (33.3%) both as most common aerobic bacteria isolated in their study [20]. According to Mawson (1963), *P. aeruginosa* normally do not inhabit the upper respiratory tract and its emergence in chronic middle ear infection cannot be ascribed to the primary derivation from the Eustachian tube. It is considered mostly as secondary invader from external auditory canal gaining access to the middle ear via a defect in tympanic membrane resulting from an acute episode of otitis media [5]. Whereas, the frequency of *S. aureus* in middle ear infections can be attributed to their ubiquitous nature and high carriage of resistant strains in the external auditory canal and upper respiratory tract (Shambaugh)[5]. In both the type of CSOM *P. aeruginosa* and *S. aureus* are the predominant aerobic bacteria associated. So, similar pattern of aerobic bacterial agents were observed in causation of safe and unsafe CSOM. Chhangani (1976) also obtained the same result in their study [21]. Though, similar organisms were isolated from both safe and unsafe CSOM, early diagnosis and reporting of the etiological agent and its sensitivity pattern helps the clinician in instituting appropriate treatment early in both the types of CSOM and thus will prevent the life-threatening complications like meningitis, cerebral abscesses, etc. due to unsafe CSOM. The study of nature of discharge can probably give a clue of the type of etiological agent. In the present study, mucopurulent 16(33.3%) and foetid 6(54.5%) discharge was mainly associated with *P. aeruginosa* while purulent 24(40.6%) and mucoid 8(26.6%) discharge was found mainly associated with *S. aureus*. A study by Chhangani (1976) reported *P. aeruginosa* to be mainly associated with foetid discharge followed by purulent, while *S. aureus* was found to be mainly associated with purulent and mucoid discharge[21]. In another study, by Srivastava V.K (1979) *P. aeruginosa* was mainly associated with foetid followed by purulent discharge while *S. aureus* mainly with purulent followed by mucoid discharge [1]. Unsafe CSOM, in the present study, was found mainly associated with purulent 15(57.1%) and foetid 11(42.3%) discharge, whereas safe CSOM was mainly associated with mucopurulent 48(39.3%) and purulent 44(36.0%) followed by mucoid 30(24.5%) discharge. *P. aeruginosa* was found associated with 6(54.5%) foetid discharge of unsafe CSOM and 16(33.3%) mucopurulent discharge of safe CSOM. While, 7(46.6%) purulent discharge of unsafe CSOM and 17(38.6%) purulent discharge of safe CSOM was associated with *S. aureus* followed by mucoid discharge 8(26.6%). Purulent discharge 1(6.6%) of unsafe CSOM was associated with *P. mirabilis*, *E.coli*, *Enterococcus spp*. and *Corynebacterium spp*. respectively. Mucoid discharge 6(20%) and 3(10%) of safe CSOM was associated with *CONS* and *Enterococcus spp*. respectively. It was observed that by knowing the nature of discharge, type of CSOM and causative aerobic bacteria can be known. In the present study, *S. aureus* was observed to be sensitive to Ciprofloxacin (87.8%) followed by Gentamicin (82.9%) which is comparable with Zaria L. et al (2011) [16] who reported 83.3% sensitivity of Ciprofloxacin for *S. aureus*. In the present study, Ciprofloxacin was found to be having highest percentage sensitivity for *P. aeruginosa* (95.1%) which is comparable with study by Alam A et al,(2007) [22] . The highest percentage sensitivity for *Enterobacteriaeceae* family was observed for Ciprofloxacin followed by Amikacin which is similar to Alsaimary I. et al (2010) [23].

CONCLUSION

Most common aerobic bacteria associated with safe *CSOM* were S.aureus, while P.aeruginosa was found mostly associated with mucopurulent discharge and S.aureus was with purulent discharge.

S.aureus was found to be mostly associated with purulent discharge and P.aeruginosa with mucopurulent discharge in safe CSOM. P.aeruginosa was found to be mostly associated with foetid discharge and S.aureus with purulent discharge in unsafe CSOM

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How to Cite this Article: Wahane I. C., Kulkarni A. V. Clinico-Bacteriological Evaluation of Discharging Ears of Chronic Suppurative Otitis Media in A Tertiary Care Hospital. India sJ Microbiol Res 2015;2(2):89-96.