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MICROBIOLOGICAL STUDY ON CHRONIC SUPPURATIVE OTITIS MEDIA (CSOM) IN A TEACHING HOSPITAL OF SEMI-URBAN SETUP

Medical Science

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ABSTRACT

BACKGROUND: Chronic Suppurative Otitis Media (CSOM) is a commonly encountered infection of the middle ear all over the world. Commonly a disease of the developing countries and an estimated two thirds of the world hearing impaired population is believed to be distributed among the developing countries. CSOM affects about 4.76 % i.e. 31 million cases, with 22.6% of cases occurring annually in under-fives.

PATIENTS AND METHODS: A total of 120 ear swabs were collected for culture and antimicrobial sensitivity testing (AST) from patients attending ENT department over a period of one year from October 2016 to September 2017. All the samples were processed in the dept. of microbiology for possible etiological aerobic bacteria and fungi using standard techniques. The antimicrobial sensitivity testing was done using Kirby-Bauer method.

RESULTS: Out of 120 CSOM patients, 127 microorganisms were isolated. Most common organism isolated was Pseudomonas aeruginosa (20.83%) followed by Escherichia coli (20%), Staphylococcus aureus(19.16%),Proteus mirabilis (14.16%) Klebsiella pneumoniae (5%) and Coagulase Negative Staphylococcus (1.60%). Among fungi, Aspergillus spp(3.33%) and Candida spp (1.60%) were isolated. The isolated organisms showed higher susceptibility to Sparfloxacin(75%) followed by Ciprofloxacin (71.87%), Amikacin(62.5%) and Lomefloxacin (48.95%) and most of the isolates were resistant to Cefadroxil (81.25%).

CONCLUSION: Due to the variations in microbial flora in CSOM patients, continuous isolation of the microorganisms and their antibiogram in clinically diagnosed CSOM patients are essential for effective therapeutic protocols. This will go a long way in preventing complications and spread of multidrug resistant strains in particular geographical area. Educating the patients and general public regarding indiscriminate use, misuse or abuse of antibiotics will help to reduce the disease burden of CSOM on individual, state and the society .

KEYWORDS

Antimicrobial sensitivity, CSOM, Kirby-Bauer method, Pseudomonas aeruginosa,Sparfloxacin.

INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is defined as persistent discharge of pus through a perforated tympanic membrane for more than two weeks [1]. CSOM is a commonly encountered infection of the middle ear, all over the world. Traditionally, the prevalence of CSOM has been found as a by product of surveys for hearing loss, of which it is the major cause. An estimated two thirds of the world hearing impaired population is believed to be distributed among the developing countries [2].Commonly a disease of the developing world, with malnutrition, overcrowding, substandard hygiene, frequent upper respiratory tract infections and under resourced health care (all factors linked to low socioeconomic status) are listed as risk factors[3,4]. CSOM affects about 4.76 % *i.e.* 31 million cases, with 22.6% of cases occurring annually in under-fives[5].

The complications of Otitis Media are divided into two groups namely 'Intratemporal complications' and 'Intracranial complications'. Intratemporal complications include mastoiditis, petrositis, facial paralysis and labyrinthitis. Intracranial complications include extradural abscess, subdural abscess, meningitis and brain abscess [6]. Most common organisms associated with CSOM are *Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae* and *Escherichia coli;* and among fungi, Aspergillus species and Candida species[7].

CSOM has received considerable attention not only because of high incidence and chronicity but also issues such as bacterial resistance and ototoxicity with both topical and systemic antibiotics[8].The mainstay of treatment is two fold : Meticulous aural toilet and instillation of topical antimicrobial agent(s). Knowledge of local microorganism pattern causing CSOM and their antimicrobial sensitivity pattern is essential to start an effective and cost beneficial empirical treatment[9].

The present study is intended to isolate the common microorganisms and determine the antimicrobial sensitivity pattern among the patients suffering from CSOM, attending ENT department .so that it will be helpful to prevent infection and forthcoming complications of CSOM.

Patients and Methods

The present prospective study was carried out over a period of one year from October 2016 to September 2017. A total of 120 ear swabs were collected for culture and antimicrobial sensitivity testing (AST) from patients attending ENT department. Two sterile cotton swabs were used to collect the samples from each patient .

Inclusion criteria: Patients of all age groups, both genders, who were not under antibiotic treatment (topical or systemic) for at least five preceding consecutive days were included in the present study.

Exclusion criteria: Patients who were suffering with current febrile illness, recent ear surgery or an in situ-grommet or tympanostomy tube, recent mastoid surgery, congenital ear or hearing problems, obstructed middle ear (polyp) and ear discharge due to cholesteatoma.

One swab was inoculated on Blood agar and MacConkey agar and the second swab was inoculated on Sabouraud dextrose agar(SDA). Blood agar and MacConkey agar plates were incubated aerobically at 37°C for 24 hours and SDA slants were incubated at 25°C (in BOD incubator) for 72 hours. Bacterial isolates were identified basing on Colony morphology, Gram stain and Biochemical reactions using standard techniques[10]. Fungal culture isolates were identified with Gram stain, Lacto Phenol Cotton Blue mount and colony morphology on SDA slant. All bacterial isolates were subjected to AST on Mueller - Hinton Agar, using disc diffusion technique[11] with the following antimicrobial discs containing Gentamicin(G10mcg), Amikacin (AN30mcg), Ampiclox (ACX20mcg), Azithromycin (AZ15mcg), Cefadroxil (CD30mcg), Cefuroxime (CR30mcg), Cefotaxime (CF30mcg), Ceftriaxone (CTX30mcg), Cefperazone (CFP75mcg), Ceftazidime (CPZ30mcg), Ciprofloxacin(CIP5mcg), Sparfloxacin (SF5mcg), Lomefloxacin (LM10mcg), Clarithromycin (CLR15mcg), Roxithromycin(RX15mcg), Netilmicin (NET30mcg) and Sulbactum (SLB20mcg) obtained from Himedia, Mumbai.

Results

Out of 120 CSOM patients, Majority occurred in the age group between 16-30 years followed by less than or equal to 15 years. Males were 76(63.3%) and females were 44(36.7%) with a male to female ratio of 19:11. (Table-1)

Out of 120 CSOM patients, 127 microorganisms were isolated. Most common organism isolated was *Pseudomonas aeruginosa* (20.83%) followed by *Escherichia coli* (20%), *Staphylococcus aureus* (19.16%), *Proteus mirabilis* (14.16%) *Klebsiella pneumoniae* (5%) and *Coagulase Negative Staphylococcus*(1.60%). Among fungi, Aspergillus spp(3.33%) and Candida spp(1.60%) were isolated. (Table-2)

Out of 120 CSOM patients, 95(79%) patients were culture positive for pure growth, 7(6%)patients showed mixed growth and 18(15%) patients showed no growth in culture aerobically .(Table-3)

Sparfloxacin(75%) was the most effective antibiotic followed by Ciprofloxacin (71.87%), Amikacin(62.5%) and Lomefloxacin (48.95%) and most of the isolates were resistant to Cefadroxil (81.25%). (Table-4)

Discussion:

CSOM is characterized by chronic inflammation of the middle ear cleft with recurrent ear discharge through a persistent perforated ear drum. The chronic inflammation results from the presence of bacteria in the middle ear and mastoid cavity. Bacteria are believed to gain access to the middle ear cleft either from the external auditory canal through the perforation or from the nasopharynx via the eustachian tube or both[12]. CSOM is an important cause of preventable hearing loss particularly in the developing world and a cause for serious concern, particularly in children, because it may have long-term effects on early communication, language development, auditory processing, educational process, and physiological and cognitive development [13].

The cardinal symptoms of CSOM include purulent otorrhoea and progressive conductive deafness. Medical management of CSOM involves elimination of infection and controlling of otorrhea. Ototopical agents are highly effective and powerful tools for clinicians and are used as first-line agents for otorrhea [14].

In the present study, out of 120 patients, males(63.3%)were affected more, compared to females(36.7%) and 102(85%) patients showed culture positivity. Various studies by Prakash R et al.[13],Singh AH et al.[9],Nikakalagh et al.[15] and Agrawal A et al. [16] showed predominance of *Staphylococcus aureus* as the most common pathogen, however culture positive patients in our present study were mainly due to *Pseudomonas aeruginosa*(20.83%), consistent with studies of Kumar R et al [7] and Lakshmi G J et al [17]. The other organisms isolated were *Escherichia coli*(20%), *Staphylococcus aureus*(18.33%), *Proteus mirabilis* (14.16%),*Klebsiella pneumonia* (5%), Aspergillus spp (3.33%),*Coagulase negative staphylococcus*(1.60%) and Candida spp (1.60%). Many studies on CSOM have revealed that the most frequently isolated bacteria were *Pseudomonas aeruginosa, Staphylococcus aureus, Coagulase negative Staphylococcus, Proteus spp, Klebsiella spp* and *fungi* [18,19,20,21]. The present study showed *Escherichia coli*(20%) as the second most common organism. The variations in isolation rates of different organisms reported by different workers may be due to antibiotic use, ethnic climatic and other geographical factors [22].

Bacteria in the present study showed higher susceptibility to Sparfloxacin(75%) followed by Ciprofloxacin(71.87%), Amikacin (62.5%) and Lomefloxacin(48.95%). Cefadroxil(18.75%) found to be least effective drug in the present study. *Pseudomonas aeruginosa* had higher sensitivity to ciprofloxacin(88%) which is comparable with study of Alsaimary I E et al. [23]. Studies carried out in Pakistan revealed that more than 90% isolates of *Pseudomonas aeruginosa* were sensitive to Ciprofloxacin [20]. Ciprofloxacin is an effective and safe therapeutic drug for Acute Otitis Media and CSOM [24]. The other antibiotics showing higher efficacy for *Pseudomonas aeruginosa* were Ceftazidime(80%), Sparfloxacin(76%) and Lomefloxacin(64%) .

Conclusion:

Due to the variations in microbial flora in CSOM patients, continuous isolation of the microorganisms and their antibiogram in clinically diagnosed CSOM patients are essential for effective therapeutic protocols. This will go a long way in preventing complications and spread of multidrug resistant strains in particular geographical area. Educating the patients and general public regarding indiscriminate use, misuse or abuse of antibiotics will help to reduce the disease burden of CSOM on individual, state and the society .

TABLE-1: Age and sex distribution among 120 patients of CSOM studied

Age in years	Male(n=76)		Female(n=44)		Total(n=120)	
	Number	Percent	Number	Percent	Number	Percent
≤15	14	11.7	7	5.8	21	17.5
16-30	34	28.3	21	17.5	55	45.8
31-45	14	11.7	4	3.3	18	15.0
46-60	8	6.7	7	5.8	15	12.5
>60	6	5.0	5	4.2	11	9.2
Total	76	63.3	44	36.7	120	100

TABLE- 2: Occurrence of microorganisms from 120 patients of CSOM studied

Organisms	Number	Percent
Gram positive		
Staphylococcus aureus	23	18.11
Coagulase negative Staphylococcus	2	1.57
Diphtheroids	6	4.72
Gram negative		
Escherichia coli	24	18.89
Klebsiella pneumoniae	6	4.72
Proteus mirabilis	17	13.38
Pseudomonas aeruginosa	25	19.68
Fungus		
Candida spp	2	1.57
Aspergillus spp	4	3.14
No growth	18	14.17

Table -3: Single and mixed growth among 120 CSOM patients studied

S.No	Single Growth	No.	%
1	*Staphylococcus aureus*	20	16.6
2	*Coagulase Negative Staphylococcus*	2	1.6
3	Diphtheroids	6	5
4	*Escherichia coli*	19	15.83
5	*Klebsiella pneumoniae*	5	4.16
6	*Proteus mirabilis*	21	17.5
7	*Pseudomonas aeruginosa*	16	13.33
8	Candida spps	2	1.6
9	Aspergillus spps	4	3.33
	TOTAL	95	79.16
	MIXED GROWTH		
1	*Staphlococcus aureus+Escherichia coli*	1	0.83
2	*Staphylococcus aureus+Klebsiella pneumoniae*	1	0.83
3	*Staphylococcus aureus+Protues mirabilis*	1	0.83
4	*Proteus mirabilis+Escherichia coli*	3	2.5
5	*Pseudomonas aeruginosa+Escherichia coli*	1	0.83
	TOTAL	7	5.83
	NO GROWTH	18	15

Table - 4: Antimicrobial Sensitivity Pattern of Bacterial isolates in the present study.

S. NO	Isolated Organisms	G (10 mcg)	AN (30 mcg)	ACX (20 mcg)	AZ (15 mcg)	CD (30 mcg)	CR (30 mcg)	CF (30 mcg)	CTX (30 mcg)	CFP (75mcg)	CPZ (30 mcg)	CIP (5 mcg)	SF (5 mcg)	LM (10 mcg)	CLR (15 mcg)	RX (15 mcg)	NET (30 mcg)	SLB (20 mcg)
1	***Staphylococcus aureus* n=22 (%)**	14 (63.63)	14 (63.63)	9 (40.90)	14 (63.63)	12 (54.54)	14 (63.63)	12 (54.54)	NT	15 (68.18)	NT	10 (45.45)	15 (68.18)	NT	12 (54.54)	12 (54.54)	NT	NT
2	***CONS* n=2 (%)**	1 (50.00)	2 (100)	2 (100)	2 (100)	2 (100)	2 (100)	0	NT	1 (50)	NT	2 (100)	2 (100)	NT	2 (100)	1 (50)	NT	NT
3	***Escherichia coli* n=24 (%)**	15 (62.5)	19 (79.16)	NT	NT	2 (8.33)	NT	4 (16.66)	10 (41.66)	17 (70.83)	9 (37.5)	16 (66.66)	14 (58.33)	14 (58.33)	NT	NT	12 (50)	8 (33.33)
4	***Klebsiella pneumoniae* n=6 (%)**	4 (66.66)	5 (83.33)	NT	NT	0	NT	1 (16.66)	1 (16.66)	0	0	2 (33.33)	6 (100)	4 (66.66)	NT	NT	5 (83.33)	0
5	***Proteus mirabilis* N=17 (%)**	4 (23.52)	9 (52.94)	NT	NT	0	NT	6 (35.29)	6 (35.29)	7 (41.17)	14 (82.35)	17 (100)	16 (94.11)	13 (76.47)	NT	NT	5 (29.41)	3 (17.64)
6	***Pseudomonas aeruginosa* n=25 (%)**	5 (20.00)	11 (44.00)	NT	NT	2 (8)	NT	7 (28)	9 (36)	8 (32)	20 (80)	22 (88)	19 (76)	16 (64)	NT	NT	4 (16)	9 (36)

G-Gentamicin, AN-Amikacin, ACX-Ampiclox, AZ-Azithromycin, CD-Cefadroxil, CR-cefuroxime, CF-Cefotaxime, CTX-Ceftriaxone, CFP-Cefperazone, CPZ-Ceftazidime, CIP-Ciprofloxacin, SF-Sparfloxacin, LM-Lomefloxacin, CLR-Clarithromycin, RX-Roxithromycin, NET-Netilmicin, SLB-Sulbactum. NT – Not Tested

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