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CLINICAL AND BACTERIOLOGICAL PROFILE OF CHRONIC SUPPURATIVE OTITIS MEDIA IN A RURAL AREA OF PUDUCHERRY, INDIA

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ABSTRACT

Chronic suppurative otitis media (CSOM) is defined as persistent or intermittent infected discharge through a non-intact tympanic membrane having duration of three months or more. CSOM has direct impact on the hearing of patient causing conductive and sensorineural hearing loss and also on child development. Antibiotics are used to treat the infections but most of the organisms are acquiring resistance. The bacterial isolated vary in various geographical areas with different antibiotic sensitivity patterns. In developing countries this problem is increasing rampantly due to misuse of antibiotics and inadequate antibiotic treatment. Hence the study was aimed to identify the prevalence of bacterial species involved in CSOM and their antibiotic sensitivity pattern in a rural area of Puducherry. A total of 105 patients clinically diagnosed of CSOM were involved and the samples were collected and cultured for aerobic bacterial isolates. The organisms isolated were Pseudomonas aeruginosa (37.6%), Staphylococcus aureus (19.4%) and Acinetobacter species (10.3%) and fungi Aspergillus species (25%) and Candida non albicans (75%). Perception of etiological agents of CSOM and their antimicrobial susceptibility is of vital importance for an effective treatment, prevention of complications and emergence of antibiotic resistance.

INTRODUCTION

Otitis media is an infection of middle ear caused by bacteria, fungi and virus resulting in inflammation of the mucosal lining. Recurrent otitis media can damage ossicles, facial nerve and cochlea. This may result in permanent hearing loss and can occasionally lead to fatal intracranial infections. Otitis media can be of acute, subacute or chronic. The acute form is acute suppurative otitis media usually associated with the infection in the upper respiratory tract whereas persistent form is known as chronic suppurative otitis media (CSOM) (Jang CH and Park, 2004).The chronic form is still a major problem in developing countries like India. WHO has classified the countries into different groups according to the prevalence of CSOM like highest (> 4%), High (2-4%), low (1-2%), and lowest (<1%) in which India comes under highest category (WHO, 1998).

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CSOM is one of the most common diseases of all age groups, especially of children with frequent upper respiratory tract infections and poor socioeconomic conditions. CSOM is defined as persistent or intermittent infected discharge through a non-intact tympanic membrane having duration of three months or more.[2] CSOM, is usually classified into two main groups: tubotympanic and atticoantral disease. CSOM has direct impact on the hearing of patient causing conductive and sensorineural hearing loss and also on child development (WHO, 1998). The risk factors for CSOM are frequent upper respiratory tract infections, nasal diseases, poor living conditions with poor access to medical care and bottle feeding in children. Living in congested centers like Balarwadi, family history of otitis media are some of the additional risk factors for CSOM (WHO, 1998; Wintermayer and Nahata 1994; Adair- Bischoff CE and Sauve, 1998). The most frequently isolated bacteria may be aerobes like Pseudomonas aeruginosa, Staphylococcus aureus, Proteus species, klebsiellapneumoniae, Escherichia coli or anaerobes like Bacteroides, Peptostreptococcus, Proprionibacterium and fungi like Aspergillus species and Candida species.

But these organisms vary in various geographical areas with different antibiotic sensitivity patterns (Tahira *et al.,* 2009). Antibiotics are used to treat the infections but most of the organisms are acquiring resistance. In developing countries this problem is increasing rampantly due to misuse of antibiotics and inadequate antibiotic treatment. As topical antibiotic treatment is often effective and seldom harmful, most experts would start with a wide - spectrum antibiotic on an empiric basis and make a request for cultures if drug resistance is suspected (WHO 1998). The aim of our present study was to identify the prevalence of bacterial species involved in CSOM and their antibiotic sensitivity pattern in a rural area of Puducherry.

MATERIALS AND METHODS

Design: Prospective, Cross - sectional study
Place of study: Rural health centers and Govt hospital of our region
Study duration: Two months

Subjects and Methods

Patients (n= 105) attending our rural health centers and Govt hospital with chronic discharging ears of more than 3 months duration was examined after getting their consent. Clinical details were collected with the prepared questionnaires and clinical examination was done and findings were recorded. Discharge from the ear was collected by using sterile swabs. Samples were transported immediately to the Microbiology laboratory for aerobic bacterial culture and inoculated in MacConkeys agar, Blood agar, and Chocolate agar and incubated at 37°C for 24 - 48 hours. Growth was identified by its colony morphology and standard biochemical tests. Antibiotic susceptibility test was done as per the CLSI guidelines. The results were analyzed statistically.

Inclusion Criteria

Patients of any age and both sexes
Ear discharge of more than 3 months duration with non-intact tympanic membrane

Exclusion criteria

Patients receiving antibiotics at the time of presentation or previous one week. Discharge with intact tympanic membrane (Otitis externa) and less than three months of duration.

RESULTS

A total of 105 patients presented with the complaints of CSOM in the ENT department of our hospital. The age of the patients attended was from 1-70 years and most of the patients were in the age groups of 20-50 years and equal distribution of patients among 2nd, 3rd and 4th decades of life. (Table 1). Among the participants, 50 (48%) were females and 55 (52%) were males. Bilateral ear CSOM was seen in 7 (7%) patients and unilateral manifestation in 98 (93%) patients. (Figure 1) The socio economic statuses of the patients with CSOM were of middle class (62%) and lower socio economical group (40%).

Table 1. Age and distribution of Patients (n= 105)

Age	Number (%)
0 - 10 years	6 (5.7%)
10 - 20 years	14 (13.3%)
20 - 30 years	24 (23%)
30 - 40 years	24 (23%)
40 - 50 years	23 (22%)
50 - 60 years	11 (10.4%)
60 - 70 years	3 (2.8%)

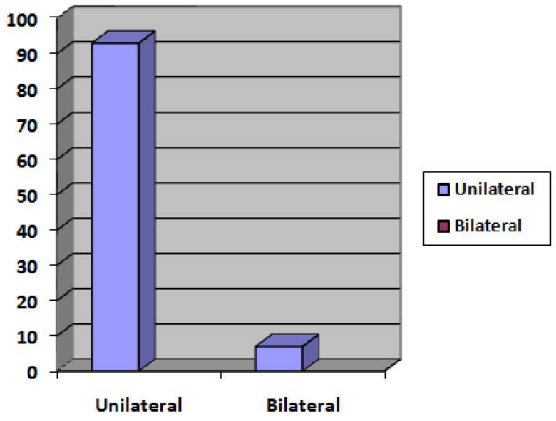

Figure 1. Site distribution of the ear infection (n= 105)

The clinical details collected and factors associated with CSOM were given in Table 2 and 3. The samples collected from CSOM were subjected to culture and sensitivity in which the Gram staining of the direct smear showed the type of bacteria and absence of inflammatory cells in most of the samples. Out of 105 samples, 89 showed a significant isolates (95%) and no growth was observed in 16 (15%).

Table 2. Clinical findings in CSOM

Clinical Features	No. of cases
Temperature	
Afebrile	105 (100%)
Febrile	0 (0%)
Pain & Itching	
Yes	85 (81%)
No	20 (19%)
Discharge	
Duration	>3 months (100%)
Nature of the discharge	
Mucoid	55 (52%)
Purulent	34 (32%)
Mucopurulent	16 (15.2%)
Odour of the discharge	
Odourless	28 (27%)
Foul smelling	77 (63%)
Loss of hearing	
Yes	20 (19%)
No	85 (81%)
Types of CSOM	
Tubo tympanic	65%
Attico - antral	35%

Among the 89 isolates, 80 (90%) were grown as a single pathogen and 9 (10%) were multiple isolates. The most common organisms isolated were Pseudomonas aeruginosa 29 (37.6%), Staphylococcus aureus 15 (19.4%), Acinetobacter species 8 (10.3%), and Proteus mirabilis 06 (7.7%), Klebsiella species 06 (7.7%), Escherichia coli 05 (6.4%), Nonfermentors 03 (3.8%), Citrobacter species 02 (2.5%), Enterococcus 02 (2.5%), Enterobacter 01(1.2%), Aspergillus species 03 (25%) and Candida non albicans 09 (75%).

Table 3. Factorsassociated with CSOM

S.NO	Associated risk factors	No of cases (%)
1.	Unhygienic ear pricking	82 (78%)
2.	Socio economic status	
	Lower strata	40 (38%)
	Middle strata	65 (62%)
3.	Nutritional status	
	Thin built	42 (42%)
	Well built	63 (60%)
4.	Upper respiratory tract infections	
	Very often	67 (64%)
	Occasional	38 (36%)
5.	Rhinitis	
	Allergic rhinitis	50 (48%)
	Seasonal Rhinitis	55 (52 %)

Table 4. Microbial profile of CSOM

Type of organisms	Number of isolates (n= 77 + 12 =89)
Pseudomonas aeruginosa	29 (37.6%)
Staphylococcus aureus	15 (19.4%)
Acinetobacter species	08 (10.3%)
Proteus mirabilis	06 (7.7%)
Klebsiella species	06 (7.7%)
Escherichia coli	05 (6.4%)
Non –fermentors	03 (3.8%)
Citrobacter species	02 (2.6%)
Enterococcus species	02 (2.6%)
Enterobacter species	01(1.3%)
Candida- non albicans	09 (75%)
Aspergillus niger	03(25%)

(Table 4) Antibiotic sensitivity tests revealed that the most predominant isolate of Pseudomonas aeruginosa showed 100% susceptibility to Piperacillin- tazobactam and Ceftazidime - Clavalunic acid, Imipenem (96%), Ciprofloxacin (89%) and Amikacin (82%). Staphylococcus aureus showed 100% susceptibility to Vancomycin and Linezolid, Clindamycin (93%), Oxacillin Ciprofloxacin and Amoxycillin- Clavalunic acid (73%), Penicillin (7%) Drug resistance strains like MRSA (27%) and ESBL (57%) in the gram negative bacilli were detected by phenotypic methods. (Table 5)

DISCUSSION

Chronic suppurative otitis media (CSOM) is a condition of the middle ear that is characterized by persistent or recurrent discharge through a chronic perforation of the tympanic membrane. Microorganisms gained entry into the middle ear through perforated tympanic membrane. Untreated cases of CSOM end up with the complications such as persistent otorrhoea, mastoiditis, labrynthitis, and facial nerve paralysis to more serious complications like intracranial abscesses or thrombosis. The disease is considered to be a major problem in the developing world with a high morbidity and mortality. Early bacteriological diagnosis of all cases will assure accurate and appropriate effective therapy. Selection of antibiotics is influenced by its efficacy, resistance of bacteria, safety, risk of toxicity and cost. Knowledge of the local microorganisms' pattern and their antibiotic susceptibility is essential to formulate a protocol for empirical antibiotic therapy.

Out of total 105 samples collected from CSOM samples 89 (85%) showed growth of microorganisms. The isolation rates of microorganisms vary from one place to another and all reference studies showed the isolation rate as more than 80%. The age distribution of the patients in our study were equally distributed among 2^{nd}, 3^{rd}, 4^{th} decades (23%) and it is supported by the study conducted by (Shrestha *et al.,* 2011). in Nepal reported that the CSOM is common in all the age groups. However many studies reported that CSOM is common in children and young adults (Shazia and Janardhan, 2012; Vishwanath *et al.,* 2012; Orji FT and Dike BO, 2015).The disease is common in children because of short and wider Eustachian tube, nutritional deficiency, poor sanitation, general poverty etc. Also in our study CSOM was noted in the middle age groups owing to seasonal variations lead to allergic rhinitis, frequent upper respiratory tract infections, unhygienic ear pricking, polluted environments etc.

The sex distribution among CSOM cases of our study was showing that male patients (52%) were slightly higher than female patients (48%). This finding is supported by many studies in different places (Shrestha *et al.,* 2011; Shazia P and Janardhan RR, 2012; Vishwanath *et al.,* 2012; Orji and Dike, 2015) but differs from the study performed by (Loy AHC et *al.*, 2002; Prakash *et al., 2013*) where the female patients were affected more than male. The unilateral ear involvement (93%) was more in our study than bilateral CSOM (7%) which is common findings noted in most of the studies in different regions (Orji and Dike, 2015).

Table 5. Antibiotic sensitivity Sensitivity rate of isolated bacteria in Percentage (%)

Organisms isolated	COT	AMC	AK	CIP	CTX/CA	CAC	IMP	PIT	P	OX	E	CD	VA	LZ	HLG
P.aeruginosa	-	-	82	89	57	100	96	100	-	-	-	-	-	-	-
S.aureus	33	73	87	73	-	-	-	-	7	73	67	93	100	100	-
Acinetobacter	75	12	100	100	37	100	100	100	-	-	-	-	-	-	-
P.mirabilis	67	50	100	83	67	100	100	100	-	-	-	-	-	-	-
KlebsiellaSpp	50	17	67	100	33	100	100	100	-	-	-	-	-	-	-
E.coli	20	40	100	60	40	100	100	100	-	-	-	-	-	-	-
Non-fermentors	67	33	67	67	33	67	65	65	-	-	-	-	-	-	-
Citrobacterspp	50	50	100	100	50	100	100	100	-	-	-	-	-	-	-
Enterococcus spp	-	-	-	50	-	-	-	-	0	-	50	-	100	100	50

COT - Cotrimoxazole, AMC - Amoxycillin + Clavalunic acid, AK - Amikacin, CIP - Ciprofloxacin, CTX - Ceftaxime, CA- Ceftazidime, CAC- Ceftazidime + Clavalunic acid, IMP- Imipenem, PIT - Piperacillin - tazobactam, P - Penicillin, OX - Oxacillin, E - Erythromycin, CD - Clindamycin, VA – Vancomycin, LZ - Linezolid, HLG

The Tubotympanic or safe type (65%) was more in our study than atticoantral or unsafe type (35%). It is comparable to other studies in different regions (Prakash *et al.,* 2009, Kamran *et al.,* 2011) but study reported by Chowdury *et al.,* 2002 revealed that both types of CSOM was equally noted in their population. The socio - economic status of the patients noted in our study was middle strata (62%) and lower economic strata (40%). Most of the studies reported that lower groups are being affected rather than middle and rich population. More of middle strata involvement in our study may be due to exposure to the polluted environment of the city and history of unhygienic ear pricking revealed in many patients. The microbial profile of CSOM in our study is supported by many other similar studies. The most common isolates of our study was Pseudomonas aeruginosa 29 (37.6%), followed by Staphylococcus aureus 15 (19.4%), Almost all the studies consistently revealed the preponderance of bacteria in CSOM is being either Pseudomonas aeruginosa followed by Staphylococcus aureus or vice versa. (Gul *et al.,* 2007, Tahira *et al.,* 2009, Ahamad and Kudi, 2003) Comparative analysis with other study showed that isolation of Acinetobacter species (10.3%) was higher in our study which is an upcoming pathogen from an environment and also as a nosocomial pathogen.

The isolation rate of gram negative bacilli was higher in our study (62%) and gram positive cocci were only 19.4%. The gram positive bacteria like coagulase negative staphylococcus (17%) and Diptheroids (5%) isolated in our study were interpreted as a commensals along with clinical correlations. The fungal etiology noted in our study was 12 (13.4%) in which Candida - non albicans 09 (75%) and Aspergillus niger in 3 (25%) samples which is supported by other studies. (Mirza *et al.*, 2008, Kamran *et al.,* 2011, Harvinder and Sonia, 2011). Antibiotic susceptibility test was carried out for all significant isolates which is depicted in Table 5. The overall sensitivity rate of ciprofloxacin for all gram negative bacilli was 86% which is one of the commonly used topical antibiotics. Study conducted in the same region two years before showed that sensitivity rate of Ciprofloxacin to gram negative bacilli was 92% which was higher than our study. (Madana *et al.,* 2011) Decreased sensitivity of Ciprofloxacin and also increased detection of Extended Spectrum of Beta Lactamases (ESBL) producers (57%) were noted among gram negative bacilli.

As all the gram negative bacilli including Pseudomonas aeruginosa isolated in our study were showing 100% susceptibility to Ceftazidime - Clavalunic acid, Imipenem and Piperacillin – tazobactam which can be formulated as an empirical therapy for all gram negative bacilli and also for ESBL producers. The sensitivity rate of Ciprofloxacin and Amikacin to gram positive cocci in our study was only 62% and 87% respectively in which the common isolate was Staphylococcus aureus which showed higher sensitivity to Vanconycin and Linezolid, (100%) and Clindamycin (93%) which can be designed as an empirical therapy for S.aureus and also for MRSA (27%). Comparative analysis of antibiogram of different studies showed the declining sensitivity of the first line of antibiotics and detection of drug resistant strains like ESBL, MRSA etc. may be due to number of factors including injudicious use of antibiotics, inappropriate dosage and easy accessibility and developing enzymatic resistance. Multi drug regimen with local and oral or injectable antibiotics is considered better treatment in drug resistant isolates.

Conclusion

- The most common organisms isolated in our study was Pseudomonas aeruginosa followed by Staphylococcus aureus, Acinetobacter species, Klebsiella species, Proteus mirabilis, Escherichia coli, Non- fermentors, Citrobacter species, Enterococcus species and Enterobacter species. The most common fungal isolates were Candida - non albicans (75%) and Aspergillus niger. (25%)
- The most commonly used topical antibiotics like Amikacin and Ciprofloxacin were showing declined activity for both gram positive and gram negative bacteria.
- All the gram negative bacilli including Pseudomonas aeruginosa were showing a susceptibility rate of 100% to Ceftazidime - Clavalunic acid, Piperacillin - tazobactam and Imipenem and the gram positive cocci was showing 100% sensitivity to Vancomycin and Linezolid. Hence these drugs can be used after obtaining local antibiogram for empirical therapy.
- The emergence of drug resistant strains like ESBL, MRSA and declining activity of first line antibiotics to gram negative bacilli and gram positive cocci are being increased; the routine use of topical antibiotics in CSOM is not justifiable.
- Judicious use of antibiotics is recommended and also the patient must complete a course of treatment as prescribed, because inadequate treatment may cause the emergence of resistant microorganisms.
- Continuous and periodic evaluation of Microbiological pattern and their antibiotic sensitivity of CSOM are obligatory to decrease the impending risk of complications by early institution of appropriate treatment.
- The common precipitating factor revealed in our study was unhygienic ear pricking. This and other associated factors can be avoided by giving proper health education on cleanliness and sanitation.

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