

Original Research Article

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Bacterial Study of CSOM and their Changing Patterns of Antibiotic Sensitivity and Resistance

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ABSTRACT

Chronic Suppurative Otitis Media is the most common childhood infectious disease worldwide. It is the most common cause of hearing impairment in the developing world, although it is infrequently seen in the developed world. It is an inflammatory condition of the ear that causes recurrent ear discharge or otorrhoea, through a perforation of the ear drum or tympanic membrane. It is also found to be the single major cause for conductive deafness, and is responsible for 1.5% speech disorders. To study the spectrum of bacterial etiological agents among patients clinically diagnosed as CSOM. This study was conducted on 105 patients of clinically diagnosed cases of CSOM attending ENT OPD. After proper sample collection by sterile aural swabs, they were immediately sent to the microbiology laboratory for aerobic bacterial culture, isolation and identification. Routine antibacterial susceptibility and detection of MRSA and ESBL was carried as per CLSI guidelines. The commonest age group affected was 10 months-10 years (28.5%) mainly affecting males (60%). Patients were mainly from rural background (81.91%) and majority of cases were reported in the months of July to September (45.7%). Out of 105 patients, Gram negative isolates were 51 (48.5%) and Gram positive isolates were 32 (30.4%) and remaining 17 (16.1%) showed no growth. *P. aeruginosa* (34.3%) was the predominant bacterial organism isolated, followed by *Staphylococcus aureus* (28.6%). Out of 28 isolates of *S. aureus*, 10 (35.7%) were MRSA and out of 18 Gram negative isolates, 5 (27.7%) were ESBL producers. Antibiogram of isolates revealed that Amikacin was the most sensitive drug amongst all gram positive and gram negative organisms. Imipenem was the most sensitive drug among gram negative isolates whereas Vancomycin was the most sensitive drug among gram positive isolates.

Keywords

Chronic Suppurative Otitis Media (CSOM), MRSA, ESBL.

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Introduction

Chronic serous Otitis Media is not the same as Chronic Suppurative Otitis Media. The former may be defined as a middle ear effusion, without perforation, persisting for

more than 1-3 months (Charles, 2006). Chronic Suppurative Otitis Media is characterized by drainage from the middle ear for at least two weeks and is associated

with a tympanic membrane perforation that is usually painless (Dhingra, 2004; Miles *et al.*, 2007).

The disease typically occurs in the young child and generally results from an acute ear infection that is not diagnosed promptly or is inadequately treated. It may also be a sequel of less severe forms of otitis media (otitis media with effusion). Experts dispute the duration of otorrhoea required to determine it as a chronic infection - the World Health Organization's definitions suggest more than two weeks; others contend longer (eg up to six weeks). It is also found to be the single major cause for conductive deafness, and is responsible for 1.5% speech disorders. Hearing loss associated with CSOM hampers educational skills in children that are well recognized by otologists, paediatricians and educators.

With the advent of antibiotics, the availability of newer technology and a growing awareness regarding the disease, the incidence of complications is decreased from 2.3% to 0.04%. But, irrational use of antibiotics has led to the emergence of organisms resistant to the commonly used drugs. Therefore, the study of microorganisms commonly associated with CSOM and their antibiotic sensitivity pattern is vital for the clinician to plan a general outline of treatment for the patient with a chronically discharging ear.

The main of this study includes, investigating bacterial etiological agents amongst patients which are clinically diagnosed as Chronic Suppurative Otitis Media in ENT Outpatient department of a tertiary care hospital of South India. Identifying the organism isolated, using a battery of biochemical reactions.

To study the pattern of antibiotic sensitivity of isolates with reference to Methicillin

resistant *Staphylococcus aureus* (MRSA) and Extended Spectrum of beta lactamases (ESBLs).

Materials and Methods

The study was conducted for a period of one year on 105 patients of all the clinically diagnosed cases of CSOM to the ENT outpatient department in a tertiary care hospital of South India. Ethical clearance was taken and informed consent from the patient/ guardian was also taken.

Ear discharge was collected under aseptic precautions in clinically diagnosed cases of CSOM attending ENT outpatient department.

After all sterile measures, two aural swabs were collected. Both the swabs were processed immediately in the laboratory for aerobic bacterial culture on 5% sheep blood agar, Mac conkey agar and chocolate agar and than kept for incubation at 37⁰C for 48 hours. Second aural swab was used for direct microscopy. Isolation and identification of the organisms were done as per standard laboartory standards.

Routine antimicrobial susceptibility was done on Muller Hinton agar and detection of MRSA and ESBL was carried as per CLSI guidelines. For MRSA detection, disc pottentiation was done and for ESBL detection, disc potentiation and double disc diffusion tests were done (Forber *et al.*, 1998; Washington *et al.*, 2006).

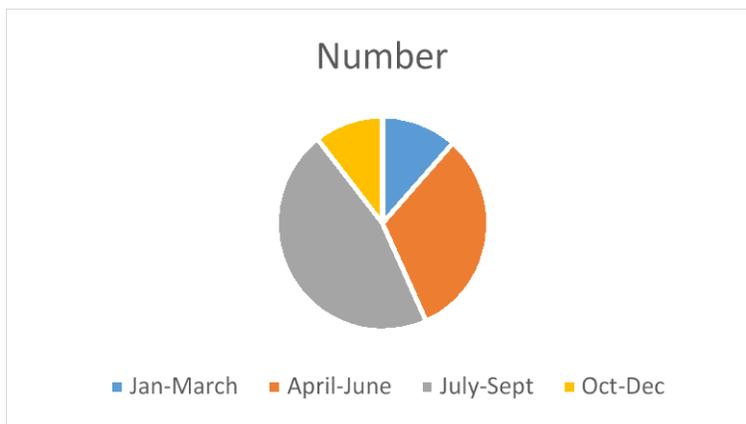
Results and Discussion

Ear swabs were collected from 105 clinically diagnosed patients of CSOM out of which 63 (60%) were males and 42(40%) were females. The predominant age group ranged from 10 months- 10 years.(28.5%).

Maximum number of cases were mainly from rural areas 81.91% as compared to urban 18.09%, where the peak season of

CSOM was observed in the month of July-September (48/45.71%) as shown in the graph.

Graph showing seasonal trend of CSOM patients



Out of 105 patients, 88 were positive for aerobic bacteria culture and remaining 17 were with no growth. Out of these 88 isolates, 83 were monobacterial and 5 were with polybacterial growth. Out of these 83

isolates, *Pseudomonas aeruginosa* was the most predominant organism 33(31.4%) and *Staphylococcus aureus* 28(26.7%) being the second most common organism as shown in Table-1

Organisms	Total no.of cases
<i>P.aeruginosa</i>	33
<i>S.aureus</i>	28
<i>P.mirabilis</i>	09
<i>K.pneumoniae</i>	07
<i>S.pyogenes</i>	04
<i>Acinetobacterspp</i>	02
Mixed growth	05
No growth	17

Antibiotic susceptibility pattern of these 88 isolates showed that Amikacin was the most sensitive drug amongst all the bacterial isolates whereas Vancomycin showed maximum susceptibility to Gram positive isolates. Imipenem showed maximum susceptibility to Gram negative isolates

including *Pseudomonas aeruginosa*.

Out of 28 *Staphylococcus aureus* isolated, 10(35.7%) were MRSA producers and out of 18 Gram negative isolates, 5(27.7%) were ESBL producers.

Antibiotics	Gram positive isolates n=32	Gram Negative isolates n=18	P.aeruginosa isolates n=33
Vancomycin (VA)	100%	-	-
Clindamycin (CD)	21.8%	-	-
Linezolid (LZ)	76.5%	-	-
Erythromycin (E)	53.1%	-	-
Ampicillin (AMP)	59.3%	-	-
Amoxycylav (AMC)	50%	-	-
Ceftriaxone (CTR)	73.5%	55.6%	69.6%
Cefoxitin (CX)	68.7%	-	-
Cefotaxime (CTX)	-	44.4%	-
Ceftazidime (CAZ)	-	38.9%	61.1%
Gentamicin (GEN)	37.4%	38.9%	27.3%
Amikacin (AK)	81.2%	72.2%	66.7%
Imipenem (IPM)	-	94.4%	86.1%
Piperacillin + Tazobactam (TZP)	-	66.7%	63.6%
Cefopodoxime (CPZ)	-	50%	-
Ciprofloxacin (CIP)	-	33.3%	30.4%
Netlimicin (NET)	-	-	39.4%
MRSA	35.7%	-	-
ESBL producers	-	27.7%	-

Maximum cases of CSOM were seen between the age group of 10 months-10years (28.5%) this finding corroborates with the observations made by other researchers (Mohammed *et al.*, 2011; Aggarwal *et al.*, 2013; Shyamala *et al.*, 2012), as there is higher prevalence of children with upper respiratory tract infections. In present study males (60%) were affected more than females (40%) which is in correlated to other studies (Aggarwal *et al.*, 2013; Shyamala *et al.*, 2012). Prevalence of CSOM was seen in rural areas (81.9%) than compared to the urban areas (18.1%). Aggarwal *et al.*, (2013) (56%) and Shaymala *et al.*, (2012) (73%), also showed the predominance of maximum number of cases from rural areas because of their low socio-economic status, poor personal hygiene and lack of education.

In this study it was observed that the incidence of CSOM was mainly seen during

the month of July- September (45.7%). This is correlated with other studies like Wakode *et al.*, (2006) with maximum number of cases seen during the month of July to October and Maji *et al.*, which showed that maximum number of cases was seen during the months of May- October.

Out of 105 patients, 88 were positive for aerobic bacteria culture and remaining 17 were with no growth. Out of these 88 isolates, 83 were monobacterial and 5 were with polybacterial growth (83/5), which correlated with the study of Sharma *et al.*, (2010) (70/10), Kshitiz *et al.*, (2004) (147/26).

The present study *Pseudomonas aeruginosa* 33(31.4%) was the predominant organism followed by *Staphylococcus aureus* 28(26.6%), *Proteus mirabilis* 9(5.7%), *Klebsiella pneumonia* 7(4.7%),

Streptococcus pneumoniae 4(3.8%), *Acinetobacter* 2(1.9%) respectively.

Pseudomonas aeruginosa 33(31.4%) was the most prominent isolate which correlated with other studies done by Arvind *et al.*, (2014), Hirapure *et al.*, (2014), Madana *et al.*, (2011) and Sinha *et al.*, (1999), whereas Prakash *et al.*, (2013) and Srivastava *et al.*, (2013) showed *Pseudomonas aeruginosa* as the second most commonest organism causing CSOM.

Second most predominant organism in the present study was *Staphylococcus aureus* 28(26.6%) which correlated with the studies of Arvind *et al.*, (2014), Hirapure *et al.*, (2014), Madana *et al.*, (2011) and Sinha *et al.* *Staphylococcus aureus* was the first predominant organism in studies done by Prakash *et al.*, (2013) and Srivastava *et al.*, (2010).

In the present study out of 28 *Staphylococcus aureus* isolates, 10(35.7%) were MRSA producers and remaining 18(64.2%) were MSSA producers. The present study correlates with the study of Bipasa Chakraborty *et al.*, (2013) with 11(34.4%), Raghvendera Singh Gaur *et al.*, (2013) with 8(17.4%) and Bansal Sulabh *et al.*, (2013) with 10(27.8%) of MRSA producers.

In the present study among 18 Gram negative isolates, 5(27.7%) were ESBL producers which correlated with the study of Bipasa Chakraborty *et al.*, (2014) having 8(28.6%) ESBL producers.

In the present study Vancomycin (100%) was the most sensitive antibiotic of all which was correlated with the study of Arvind *et al.*, (2014), Srivastava *et al.*, (2010) and Bipasa Chakraborty *et al.*, (2014). Amikacin was the second most sensitive antibiotic to many Gram positive isolates accounting for 81.2% which is correlated with the study of Arvind *et al.*,

(2013) and Bansal *et al.*, (2013). In the present study Imipenem (94.4%) was the most sensitive drug among the *Pseudomonas aeruginosa* isolates which correlates with the study of Arvind *et al.*, (2013) and Aggarwal *et al.*, Also Ceftriaxone is the second most sensitive drug in the present study which is in correlation with the work done by Aggarwal *et al.*, Other antibiotics like Amikacin, Ceftazidime, Piperacillin and Tazobactam were also sensitive *Pseudomonas* which was correlated with the study of Bipasa Chakraborty *et al.*, Bansal *et al.* In the present study Imipenem was the most sensitive drug for the gram negative isolates accounting for 86.1% which was correlating with the study of Arvind *et al.*, and Bipasa Chakraborty *et al.*, (2014).

In conclusion, the present study highlights the bacterial profile of clinically diagnosed cases of CSOM, wherein polybacterial and monobacterial infections were isolated. *Pseudomonas aeruginosa* was the predominant organism which was isolated. Amikacin was the most sensitive drug amongst all the isolates. Since there are regional variations in aetiological agents and their antimicrobial susceptibility patterns, it is pertinent to carry out prospective studies to observe the profile of aetiological agents and their resistance patterns in order to prescribe appropriate and effective antibiotics and prevent emergence of multi drug resistant (MDR) bacteria.

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