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Evaluation of microbial profile and antimicrobial susceptibility pattern of CSOM patients

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Abstract: Background: Chronic suppurative otitis media (CSOM) is the commonest clinical condition diagnosed in ENT out patients department (OPD) in the developing country like: India. CSOM can lead to serious intracranial/extracranial complications. Hence knowledge of local bacteriological pattern and its antibiotic sensitivity may help for treating them with appropriate antibiotic therapy.

Methods: This prospective study was done with the collaboration of ENT and microbiology department. in a tertiary care centre, India The pus sample was collected from clinically suspected CSOM patients and culture sensitivity as done. Identification of bacterial isolates and antibiotic susceptibility patter was done by standard CLSI guidelines.

Results: On assessing about 122 patients of CSOM, most of them (2 group with male predominance. The commonest organism isolated was Pseudomonas species (24.2%) followed by klebsiella. Pseudomonas species was most sensitive to imipenem, colistin and polymixin b Staphylococcus aureus was mainly sensitive to linezolid and Vancomycin.

Conclusion: The study concludes imipenem for Pseudomonas species and linezolid and Vancomycin for Staphylococcus was most sensitive drug. The appropriate and adequate antibiotic therapy is always recommended for chronic otitis media to avoid complications.

Keywords: Chronic suppurative otitis media; Microbial profile; Antibiotic susceptibility; Pseudomonas aeruginosa; Staphylococcus aureus.

1. Introduction

All A chronic inflammation or ongoing infection of the middle ear cleft, which includes the mastoid air cells, the Eustachian tube, and the middle ear, is known as chronic suppurative otitis media (CSOM) [1,2]. It is the most prevalent infectious ear condition in both children and young adults [3]. Through a ruptured tympanic membrane, it causes chronic, sporadic, or persistent otorrhea or ear discharge for at least two weeks or longer [4]. Although ear infections afflict people of all ages, children tend to experience more severe cases due to their shorter Eustachian tubes, more horizontal posture, more brittle cartilage, and weakened immune systems [5]. Streptococcus pneumoniae, Moraxella catarrhalis, and Haemophilus influenzae are some of the most frequent causal organisms linked to CSOM. Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella pneumoniae, and Proteus species are other microorganisms [6].

However, the type of organism participating in CSOM depends on the geographical location and climatic conditions [7,8]. Low socioeconomic position, substandard housing, poor hygiene, hunger, overcrowding, inadequate antibiotic treatment, inappropriate drug selection, and antibiotic misuse are the main causes of CSOM in underdeveloped countries[9].

The prevalence of CSOM is much higher in the poorer rural community than in the urban society [10]. Reevaluating the current CSOM ecology is more important than ever due to changes in the microbial flora

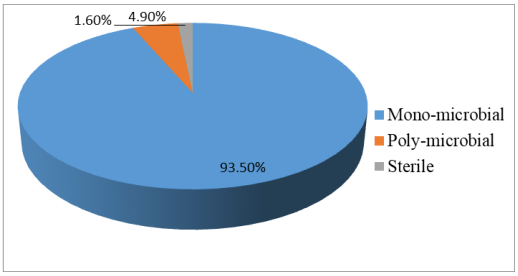

Figure 1. distribution of growth

brought on by the development of sophisticated synthetic antibiotics. The practitioner needs to know their in-vitro antibiotic susceptibility pattern in order to start the right treatment and avoid CSOM problems [11,12].

The investigation was motivated by the changing CSOM ecology and the introduction of strains that were resistant to the widely used antibiotics. In order to ascertain the bacteriological profile of CSOM patients and the pattern of antibiotic susceptibility, the current study was carried out.

2. Material and methods

The prospective study was carried out at a hospital that provided tertiary care over the course of one year (data collection), and patients who had been clinically diagnosed with CSOM were included in the research. Pus samples were collected from the outpatient as well as the inpatient departments and included in this study. In accordance with the case proforma, a comprehensive medical history was collected from each patient. Sample collection - The ear discharge of patients who have been clinically diagnosed with CSOM is collected using sterile cotton wool swabs under aseptic precautions with the assistance of an aural speculum before any topical treatment is infused into the ear. The swabs are subsequently brought into the laboratory for further examination. Transport of the specimen It is imperative that the sample be carried straight to the laboratory where it will be processed. In the event that there is a delay, the samples should be kept in the refrigerator at 4 degrees Celsius. **Culture**-By using the direct streak method, pus samples were inoculated on blood agar (BA) and MacConkey agar (MA). At 37°C, the plates were incubated over night. Pure colony growth in isolation was regarded as a significant pathogen. Two prospective organisms' growth is regarded as significant and processed. **Antimicrobial susceptibility testing:** All bacterial isolates were tested for antimicrobial susceptibility. Each isolate underwent an antimicrobial susceptibility test using the Kirby-Bauer disc diffusion method in accordance with CLSI 2015 guidelines.

2.1. Kirby-Bauer Disk Diffusion Technique

Medium- Muller Hinton agar (MHA) poured to depth of 4mm (25ml) in a flat bottomed 9cm Petri dish.
Inoculum-The inoculums was prepared from the primary culture plates, by touching the top of 3-5 colonies and suspended in peptone water. The turbidity was adjusted to 0.5 McFarland Standards.
Antibiotic disks-Commercially available (HiMedia Lab, Mumbai) disks of 6mm diameter with recommended potency as per CLSI 2015 were used.

3. Results

total of 122 clinically suspected patients of chronic suppurative otitis media (CSOM) were enrolled in the current study. Socio-demographic details of these cases shown in Table 1. Majority of the patients (27.8%) belong to the 11-20 years age group followed by 21.3% were belong to <10 years age group. Out of total cases 56.6% were male and 43.4% were female with male: female ratio was 1.3:1.

Out of 122 pus samples significant growth was seen in 120 (98.36%) samples, were 2 (1.63%) sample showed insignificant or no growth. Amongst the isolated bacteria majority of that 94 (77%) were gram negative, and 28 (23%) were gram positive.

Distribution of isolates were Mono-microbial 114 (93.5%), Polymicrobial 6 (4.9%) and 2(1.63%) were sterile (Figure 1).

Table 1. Socio-demographic distribution of CSOM patients

Social-Demographic Characteristics Of Patient			
Characteristic	**Category**	**Frequency**	**Percent**
Age groups	<10 yrs	26	21.31
	11-20 yrs	34	27.86
	21-30 yrs	21	17.21
	31-40 yrs	18	14.75
	41-50 yrs	16	13.11
	>50 yrs	7	5.74
Religion	Hindu	81	66.39
	Muslim	32	26.22
	Others	09	7.38
Residence	Urban	31	25.40
	Peri urban	74	60.66
	Rural	17	13.93
Type of Family	Nuclear	69	56.56
	Joint	53	43.44
Education status	Illiterate	12	9.84
	Just literate/ primary	52	42.62
	High school /intermediate	56	45.90
	Graduate /PG	2	1.64
Occupation	Professional/Clerical	2	1.64
	Skilled/Unskilled worker	59	48.36
	Business	12	9.84
	Agriculture	17	13.93
	Unemployed	42	34.42

Table 2. Distribution of individual clinical isolates from culture.

Organism	**No. of cases**	**Percentage**
Pseudomonas aeruginosa	29	24.16%
Klebsiella pneumonia	22	18.33%
Proteus mirabilis	21	17.5%
E.coli	19	15.83%
Staphylococcus aureus	13	10.83%
Coagulase negative staph (CONS)	10	8.33%
Acinatobacter spp.	3	2.50%
Enterococcus spp.	2	1.66%
Proteus vulgaris	1	0.83%

Among gram negative bacteria *Pseudomonas aeruginosa* 29 (24.16%) was the predominant followed by *Klebsiella pneumoniae* 22 (18.3%), *Proteus mirabilis* 21 (17.5%), *E.coli* 19 (15.8%), and *Acinatobacter* 3(2.5%) whereas among gram positive bacteria Staphylococcus aureus 13 (10.83%), CONS 10 (8.3%) and *Enterococcus* in 2 (1.6%) cases, Table 2. The pattern of drainage was continuous in 66 (55.1%) and recurrent in 54 (44.9%) ears Pus drainage was mucoid in 30 (45.5%), followed by Mucopurulent in 25 (37.8%) cases (Figure 2).

Gram negative bacterial isolates (members of Enterobacteriaceae) was shown maximum resistant to Ampicillin & amoxicillin-clavulunic acid whereas least resistance to imipenem and netilmicin Details descriptions of resistance pattern were shown in Table 3.

Pseudomonas aeruginosa shown maximum resistant to Netilmicin (89.6%) followed by Amikacin (86.2%) and maximum sensitive to Imipenem (100%), Colistin and Polymixin-B. Acinatobacter spp shown maximum reristant to Ampicillin (100%) followed by Amoxyclav (95.23%), Piperacillin (90.40%), Cephazolin. It was found maximum sensitive to Imipenum (100%) Piperacillin+Tazobactum and Aztreonam [Figure 3].

Staphylococcus aureus shown maximum resistant to Penicillin (84.61%) followed by, Norfloxacin(76.92%), Co-trimoxazole (61.53%), Teicoplanin (53.84%). It was found maximum sensitive to Linezolid and Vancomycin (100%).

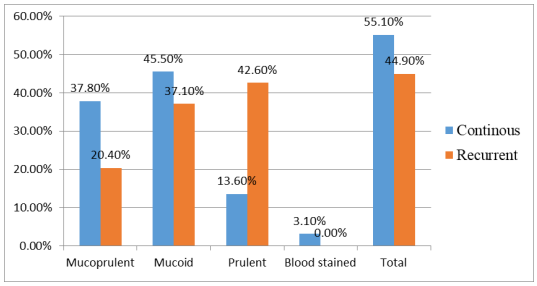

Figure 2. Types & Pattern of pus discharge

Table 3. Antibiotic resistance pattern of members of Enterobacteriaceae family (n=70

Drugs	*Klebsiella pneumonia (n=22)*	*Proteus mirabilis (n=21)*	*Proteus vulgaris (n=1)*	*E.coli (n=19)*
AMP	21 (95.5)	21 (100)	1 (100)	16 (84.21)
AMC	17 (77.3)	20 (95.23)	1 (100)	12 (63.16)
CZ	15 (68.2)	18 (85.71)	-	11 (57.89)
CX	12 (54.5)	14 (66.67)	-	6 (31.57)
CXM	9 (40.9)	10 (47.61)	-	14 (73.68)
CAZ	6 (27.3)	21 (100)	1 (100)	9 (47.37)
CTX	12 (54.3)	18 (85.71)	1 (100)	9 (47.37)
CPM	8 (36.4)	10 (47.62)	-	7 (36.84)
PI	16 (72.2)	19 (90.40)	1 (100)	11 (57.89)
PIT	7 (31.8)	20 (95.23)	1(100)	6 (31.57)
AT	5 (22.7)	6 (28.57)	-	8 (47.36)
IPM	1 (4.5)	0 (0)	0 (0)	2 (10.52)
GEN	7 (31.8)	11 (52.38)	O (0)	8 (47.36)
AK	5 (22.7)	O (0)	0 (0)	3 (15.78)
NET	3 (13.6)	0 (0)	0 (0)	2 (10.53)
TEI	11 (50)	-	-	14 (73.68)
COT	11 (50)	20 (95.23)	1 (100)	9 (47.37)

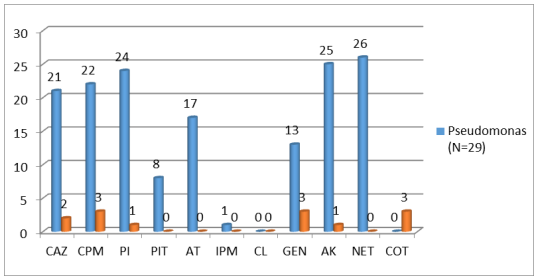

Figure 3. Antibiotic resistance pattern of Pseudomonas and Acinatobacter spp.

Table 4. Antibiotic resistance pattern of gram positive bacteria (n= 25).

Drugs	Staphylococcus aureus (N=13)	CONS (N=10)	Enterococcus spp.(N=2)
NX	10 (76.92)	8 (80)	2 (100)
NIT	1 (7.69)	3 (30)	1 (50)
P	11 (84.61)	10 (100)	2 (100)
AMP	-	-	1 (50)
CX	2 (15.38)	3 (30)	-
OX	2 (15.38)	2 (20)	-
GEN	4 (30.76)	3 (30)	-
AK	2 (15.38)	2 (20)	-
TOB	6 (46.15)	6 (60)	-
NET	3 (23.07)	5 (50)	-
TEI	7 (53.84)	7 (70)	1 (50)
COT	8 (61.53)	7 (70)	-
LZ	0 (0)	0 (0)	0 (0)
VA	0 (0)	0 (0)	0 (0)
HLG	-	-	0 (0)
HLS	-	-	0 (0)

Enterococcus spp showed maximum resistant to, Norfloxacin and Penicillin (100%). It was found maximum sensitive to Linezolid (100%) and Vancomycin, High level Gentamycin and High level Streptomy

4. Discussion

Chronic suppurative otitis media (CSOM) was the major health issue in developing countries, culture and sensitivity testing help in early proper diagnosis and choosing appropriate antibiotics for CSOM patients may help in prevention of its complications and reduce surgical intervention.

The present study was undertaken on 122 clinically diagnosed CSOM patients, out of which most of the patients (27.8%) were 11-20 years age group, similar finding also reported by Priscilla, et al. [13], Saraswati et al. [14], Kumar et al. [15] and Hiremath et al. [16]. In the present study, males were affected more than female with male to female ratio was 1.3:1 which is in concordance with the other studies like Rathi S et al. [17], Agrawal A et al. [18] and Kombade et al. [19].

Pure growth (monomicrobial) was obtained in 93.5% of CSOM cases in the present study, accordance to the P Goyal et al. [20] obtained 86.2% pure growth in their study.

Continuous mucoid/Mucopurulent ear discharge from the CSOM patient was the common in our study, concordance finding reported by Wan Draman et al. [21].

In our study gram negative bacteria was predominantly isolated from CSOM pus culture which were comparable with the other studies: Kiran Yadav et al. [22], Molla et al. [23] and Malkappa et al. [24] also isolated gram negative bacteria predominantly in their study.

Pseudomonas aeruginosa was the most common isolate found in current study, similar to many others like, Salah Uddin Ahmmed et al. [25], Susmita et al. [26] and Monica Edwin et al. [27], whereas Sah et al. [28] found staphylococcus aureus was the predominant organism in their study. in our study pseudomonas species was higher susceptibility rate to imipenem, colistin and polymixin B, similar results also reported by Garima et al. [29]. In case of E. coli, Klebsiella and proteus species, imipenem was the most sensitive drug in current study, accordance to the Pavani K [30]. Higher rate of methicillin resistant staph aureus (MRSA) was reported in the present study, concordance to many other studies: Ajay K et al. [31] and Rath S et al. [32]. Staphylococcus aureus and CONS was showed maximum susceptibility against Vancomycin and linezolid, our finding consistent to the study conducted by Mahajan RK et al. [33].

5. Conclusion

Emergence of Pseudomonas aeruginosa as most common aerobic isolate and high incidence of Methicillin Resistant Staphylococcus aureus in present study indicates the necessity of continuous evaluation of bacteriological profile and antimicrobial susceptibility testing in all CSOM cases Hence, early diagnosis,

knowledge of regional etiological agents and an effective antibiotic policy can curtail the development of CSOM in fatal cases.

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Conflicts of Interest: The authors declare no conflict of interests.

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