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MICROBIOLOGICAL PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF CHRONIC SUPPURATIVE OTITIS MEDIA IN TERTIARY CARE HOSPITAL

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Abstract

Introduction: Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of middle ear cavity and mastoid cavity that may present with recurrent ear discharge or otorrhoea through a tympanic perforation. CSOM may develop in the first six years of life but can persist during adulthood. It is most commonly prevalent in school children and in low socio-economic status. Understanding of the microbiology of chronic suppurative otitis media is important for appropriate and effective treatment, and prevention of complications and antibiotic resistance.

Aim: To determine the microbiological profile of chronic suppurative otitis media and its antimicrobial susceptibility pattern.

Materials and method: Present study includes 151 samples (Ear swabs) obtained from CSOM patients of ENT department. Samples were processed for bacterial and fungal growth and its antimicrobial susceptibility pattern in tertiary care hospital.

Results: Out of 151 samples 124 (82.2%) were culture positive. Among them 68 were males (54.84%) and 56 were females (45.16%). The most predominant organism isolated was *Staphylococcus aureus* 36 (25%), followed by *Pseudomonas aeruginosa*24 (16.66%). In this study fungal organisms were isolated in 24 samples (16.66%) with predominant fungus being *Aspergillus niger 12(50 %). MSSA* were highly sensitive to Doxycycline, Ciprofloxacin and Gentamycin. Gram negative bacterias showed high sensitivity to Piperacillin-Tazobactam, Amikacin, Meropenem and Imipenem.

Conclusion: Now a day, CSOM is more prevalent in Adults. 20.58% of Gramnegative bacteria were ESBL producers, 14.7% were AmpC producers and 26.92% of gram positive were *MRSA*s. Hence CSOM requires culture and sensitivity reports for effective management and to prevent drug resistance.

Key words: csom, otitis media, otomycosis

INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of the middle ear cavity and mastoid cavity that may present with recurrent ear discharge or otorrhoea through a tympanic perforation (WHO). (1) Patients with tympanic membrane (TM) perforations have continuous mucoid discharge, otorrhoea and pain for period of 6 weeks to 3 months, even after medical treatment and are thus recognized as CSOM patients. CSOM usually starts as acute suppurative otitis media (ASOM) or serous otitis media (SOM). The point at which ASOM becomes CSOM remains controversial. It is most commonly prevalent in school children and in low socio-economic status. It is because of financially not able to treat the patients on time, not able to treat fully with appropriate antibiotics with reference to culture and sensitivity reports and poor hygiene.CSOM is the most common cause for temporary deafness in India especially mild to moderate conductive hearing loss. A school survey in Tamil Nadu estimates that prevalence ranged from 16% to 34% of children. They are more prone to permanent hearing loss of lower range. (1) CSOM causes both conductive and SNHLleads to failure of childhood development. (2) CSOM can occasionally spread to adjacent vital structures mastoid bone, facial nerve, labyrinth, lateral sinus

cavity, inter meningeal space and brain leading to mastoid abscess, facial nerve paralysis, deafness, tinnitus, and fatal intracranial complications such as lateral sinus thrombosis, meningitis and intracranial abscess respectively. (3, 4) The microbiology of CSOM varies with different geographical area, time period, season, age, sex, socio-economic status, etc because of the rapid mutations/evolutions by bacteria. Aerobes, anaerobes, and fungi are all potential pathogens causing CSOM. Aerobic bacteria most frequently isolated are *Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella pneumoniae, Proteus mirabilis, Proteus vulgaris, Escherichia coli, Streptococcus pneumoniae, Acinetobacter baumannii, and Klebsiella aerogenes.* The most commonly isolated anaerobes are *Bacteroides spp., Clostridium spp., Prevotella spp., Fusobacterium nucleatum*. Among these, *Pseudomonas aeruginosa* is a commensal in external ear and most pathogenic and invasive leads to destruction of middle ear and mastoid structures by its toxins, enzymes. And most commonly isolated fungi are *Aspergillus niger, Aspergillus flavus, Candida albicans, Candida krusei etc.* (5) Fungus in the middle ear are opportunistic fungus spreads from external ear and to its ability to grow in moist condition like pus leads to mixed or isolated CSOM. Infection from tonsils, adenoids and infected sinuses may also be responsible for the disease. This is most common in children.

Prevalence of CSOM

As per WHO prevalence rates of CSOM is categorized by 1-2% as low and 3-6% as high. (1) WHO listed India as high prevalent country 7.8%. (1) Incidence of CSOM in India was 46/1000 (rural population) and 16/1000 (urban areas). (6) CSOM commonly causes hearing impairment in India because of its prevalence in poor socio economic class. (7) it also cause mild to moderate conductive hearing loss in more than 50% . (1)

Pathogenesis of CSOM

Bacterial Biofilm and Cytokines: Biofilms has been identified as common cause for CSOM. Because Biofilms are prone to develop antibiotic resistance. (8, 9, 10) Hence, they are difficult to eradicate and also lead to recurrence. (11) Biofilms has more virulence by firm attachment to damaged tissue, like exposed osteitic bone, ulcerated middle ear mucosa, otological implants such as tympanostomy tubes. (12) Biofilm formation has been demonstrated in the middle ear of CSOM patients, but their precise role in the pathophysiology for CSOM is not well defined. (13). *CONS*&*Pseudomonas aeruginosa* has the ability to form biofilm leads to CSOM. (14)

Complications of CSOM:

The anatomical relation of middle to other structure leads to the infection of middle ear can move to adjacent vital structures like facial nerve, labyrinth, mastoid bone, lateral sinuses, meningeal space and brain. These ends in mastoid abscess, facial nerve paralysis, deafness, permanent tinnitus, lateral sinus thrombosis, meningitis and intracranial abscess. (3)

Microbiology of CSOM:

Microbiology of CSOM differs regarding patient age, geography, and the presence of complications such as spreading to adjacent structures cholesteatomas and these inconsistencies likely impact of some of pathogen variations.

Bacterial aetiology

Bacterial causes (aerobic) of CSOM is*Staphylococcus aureus* (48.69%) and this observation was similar with of microbial flora of CSOM infection in colder regions as in Iran (31.15%) and India (36%). (2) In contrast, other studies from India, Nigeria, and Pakistan showed *Pseudomonas* as most prevalent organism could be due to the variation in microbe diversity, climate and external ear commensal. (15)

Fungal aetiology

Aspergilllusniger, *Penicillium spp., Aspergillus fumigatus* in mycelial fungus, *Candida albicans* and *Candida parapsilosis* in yeast were common. (16) Secondary infection is much more common and results from infection in the middle ear fosse.

Management of CSOM:

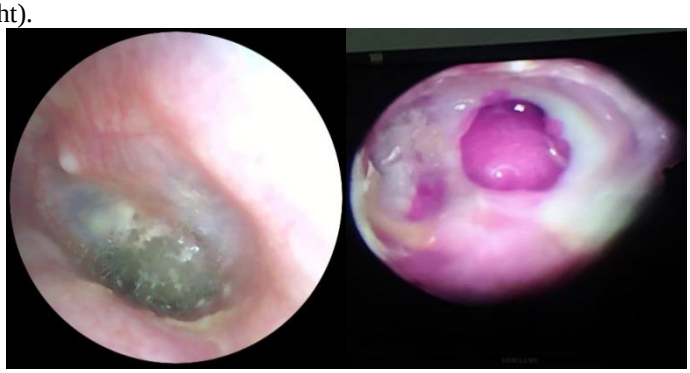
Generally, patients with CSOM are managed conservatively. The aim is to reduce infection and hospital stay and prevent complications. To identify patients with complication and proceed with surgical treatment like mastoidectomy. Aural toilet along with systemic antibiotics is reported as more effective than aural toilet alone OR = 0.31, 95%; CL = 0.23, 0.43 (26, 49, 57, 138, 147, 153).

MATERIALS AND METHOD

This is a prospective study with randomized sample collection from Inpatients and outpatients of ENT department after getting approval from Human Ethical Committee (HEC) of the Karpagam Faculty of Medical Sciences and Research, Othakkalmandapam, Coimbatore. Patients with complaints of chronic ear discharge with tympanic membrane perforation for more than 6 weeks of duration with or without complaints of mild ear pain, intermittent fever and complications of CSOM were included. Patients with ear discharge less than 6 weeks, prior topical or systemic antimicrobial, TM perforation due to trauma and sign of cholesteatoma were excluded. A questionnaire was created to record the medical history, examination and investigation reports. After getting the informed written consent from the patients above 14 years of age or written consent from parent/guardian for the patients 14 years and below, samples were collected.

Sample collection:

As per Standard Operating Procedure (SOP) for pus collection, under Strict Aseptic Precautions (SAP) ear discharge over the tympanic membrane with perforation was collected through a sterile aural speculum or otoscope by 4 separate sterile cotton swabs and secured in a sterile screw capped plastic container were used for the direct Grams staining, aerobic bacterial culture, 10% KOH (Potassium Hydroxide) mount and fungal culture. Fig: Otoscopic findings of CSOM ear showing fungal growth (Left) and large perforation with inflammation (Right).



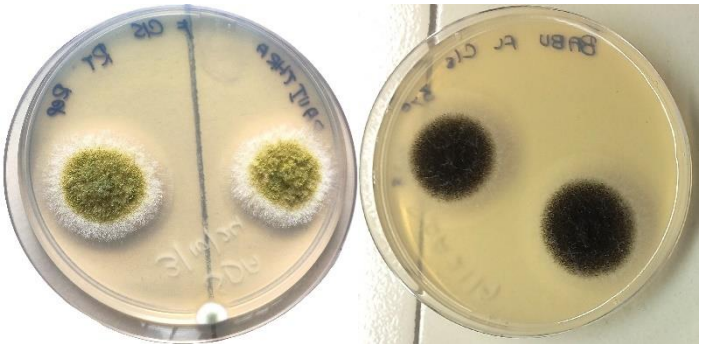
Bacterial identification:

Direct smear examination & aerobic bacterial culture were done usingBlood agar (BA), Chocolate agar (CA), Mac Conkey agar (MAC) incubated under 37ºC for 48 hours. According to the results organisms were classified up to species level using biochemical tests.

Phenotypic antibiotic susceptibility tests were done according to CLSI guidelines 2019 in Muller Hinton Agar (MHA) using Kirby Bauer Disk diffusion technique using Hi Media antibiotic discs. The quality control was performed with *Escherichia coli* strain ATCC 25922 &*Staphylococcus aureus* ATCC 25923. The isolates were screened for mec-A Mediated Oxacillin Resistance using Cefoxitin drug by the Disk diffusion technique. Inducible clindamycin resistance was tested by 'D- test' as per CLSI guidelines. All Gram-negative isolates were screened for ESBL producer by double disk diffusion method &AmpC beta-lactamase producers.

Fungal identification:

Direct examination with a drop of 10% Potassium hydroxide solution (10% KOH) for the presence of fungal elements (hyphae, pseudo-hyphae, spores). Fungal culture was done in *Sabouraud Dextrose Agar* (SDA) medium with 20mcg/ml Gentamicin and incubated at 37ºC and 22ºC (Room temperature) up to 4 weeks for fungal evaluation. Grams stain showing budding yeast cells were processed for Germ Tube Test (GTT) and inoculated in Candida Chrom Agar (CCA) and urease medium for species identification of Candida as per standard CLSI guidelines. Antifungal susceptibility for *Candida* species were done according to CLSI guidelines 2019 in Mueller-Hinton agar (MHA) by Kirby Bauer Disk diffusion technique using Hi-Media's antifungal disks. Fungal culture on SDA showing *Aspergillus flavus* (Left) and *Aspergillus niger* (Right).



The quality control was performed with *Candida albicans* strain ATCC 10231. Moulds / Filamentous fungi were identified by means of colony morphology and microscopic examination at 10x and 40 x magnification using Lactophenol Cotton Blue (LPCB) staining after teasing the colonies in a glass slide. (17)

RESULTS

Out of 151 samples 124 (82.2%) showed positive culture, 20 (13.2%) had no growth, 7 (4.6%) were skin contaminants. (Table 9)

Out of 124 culture positive samples, 68 were males (54.84%) and 56 were females (45.16%). at the ratio of 1.22:1 (Male: Female). Chart: 1 shows the various age groups starting from 0-80 years. 20 sample shows polymicrobial, so 144 isolates totally were included in study. Table: 1 shows symptom wise sample number.

Chart 1: Age wise distribution of Ear swab samples (N, %)

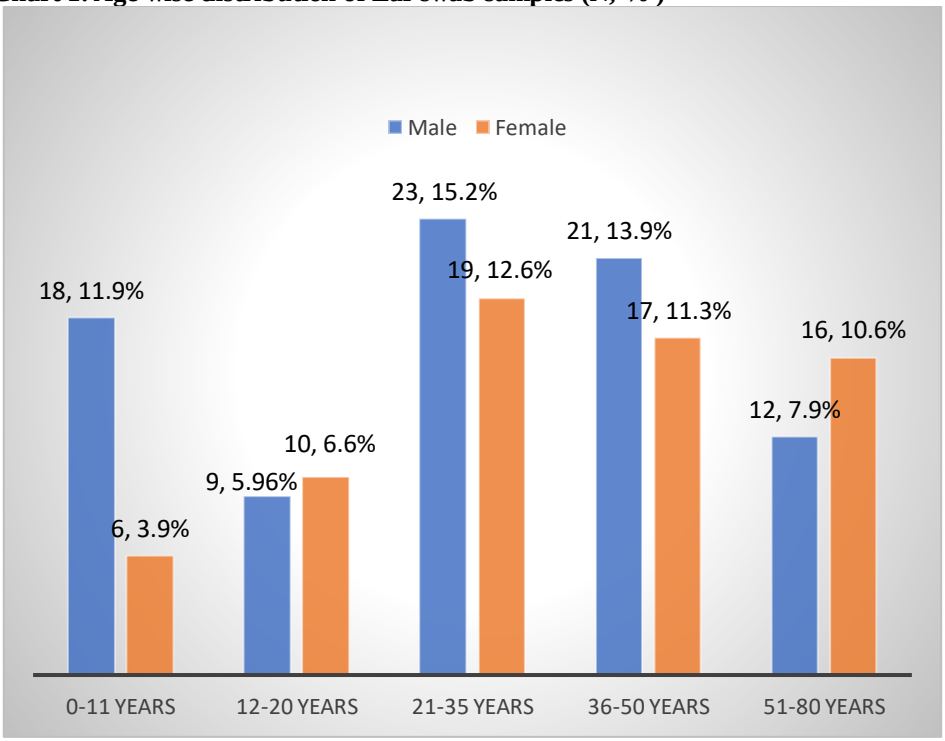


Table: 1 Symptoms of CSOM (N, %)

Symptoms	N	%
Ear discharge only	81	53.64
Ear discharge with HOH	33	21.86
Ear discharge with otalgia	22	14.56

Ear discharge with , HOH and otalgia	15	9.94
Total	151	100%

(HOH- Hard of hearing)

Culture positives:

Among 151 ear swab samples 7 shows multiple growths (more than 3 types) were not included in this study (31), 144 samples were considered for statistical data. Among 144 samples 16 samples showed no growth and 4 samples showed *Diphtheroids* growth also considered as no growth, totally 20 among 144 samples showed no growth.

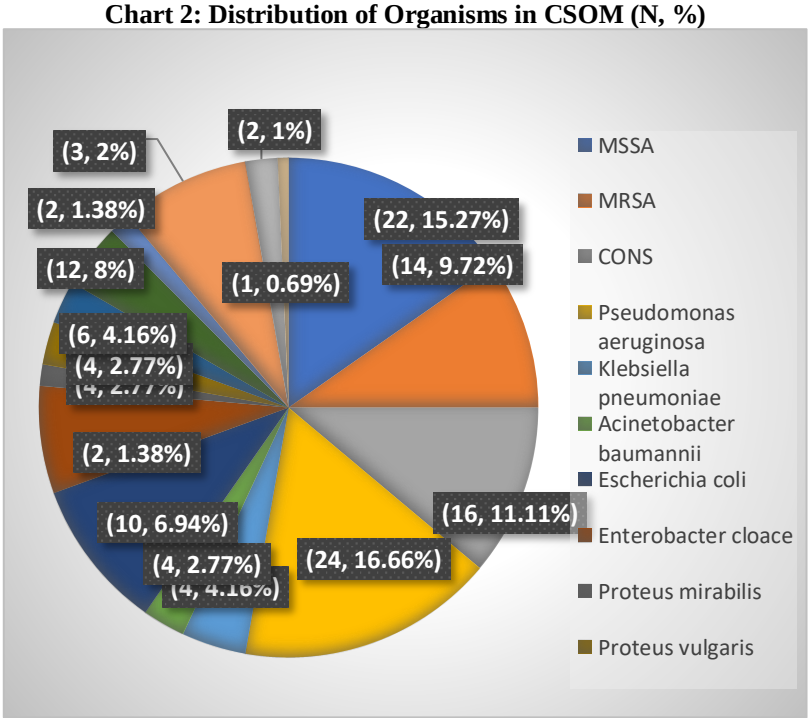
Out of 144 isolates Mono-microbials were present in 104 (72.22%), Poly-microbial were present in 20 (13.88%) and no growth in 20 (13.88%). Mono-microbial were almost distributed evenly in adult age groups 21-35 years, 36-50 years and 51-80 years as 15.27%, 15.27% and 16.66% respectively. Poly-microbial (mixed growth) was common in the age group 21-35 years (6.94%).

Out of 104 mono-microbial growth (pure culture), 88 were bacteria and 16 were fungal (15.39%). As always *Staphylococcus aureus* commonly isolated (34.64%) followed by *Pseudomonas aeruginosa* (13.46%), *CONS* (13.46%), *Escherichia coli* (5.75%), *Enterobacter cloacae* (5.76%). Out of 16 fungus isolated *Aspergillus spp*. is most common (62.5%), *Candida spp.* (37.5%) and 12 were isolated from females (75%) and 4 from males (25%). (Chart: 2)

Poly-microbial profile:

Out of 20 poly-microbial growth 10 were accompanied with *Pseudomonas aeruginosa* (50%), 8 with *Escherichia coli* (40%), 4 with *Proteus vulgaris* (20%), 4 with *Enterobacter cloacae* (20%). *Pseudomonas aeruginosa* was accompanied commonly by Enterobacteriacae (80%). *Aspergillus spp.* (30%) was accompanied commonly by *Escherichia coli* (66.67%) and *Pseudomonas aeruginosa* (33.33%). 2 isolates had *MR-CONS* combined with *Enterobacter cloacae.*

Chart 2: Distribution of Organisms in CSOM (N, %)



Mycological profile of CSOM

Out of 144 isolates 24 isolates were fungal (16.67 %), of which 12 were *Aspergillus niger* growth (50%), 8 were *Candida spp* (33.33%), 3 were *Aspergillus flavus* (12.5%) and 1 was *Aspergillus fumigatus* (4.16%) respectively. *Aspergillus niger* was found to be the predominant fungus detected in the current study. Candida species 8 (100%) *Candida spp.* isolates were sensitive to commonly using antifungals like Fluconazole, Ketoconazole, Itraconazole, Amphotericin B. and resistant to Nystatin.

Staphylococcus aureus (MSSA) were 100% sensitive to Vancomycin and Linezolid. They were highly sensitive to Doxycycline (90.9%), followed by Ciprofloxacin (72.7%), Gentamycin (63.63%).

Among MRSA and MR-CONS isolates apart from Vancomycin and Linezolid 71.4% and 75% isolates were sensitive to Doxycycline respectively. Highly resistant to commonly used Antibiotics like Penicillin, Ampicillin, Amoxycillin, Ampicillin-Clavulanate and Erythromycin. D-test positive in 8 isolates of *Staphylococcus* spp. (22.2%) . (Table: 2)

Table: 2 Antibiotic susceptibility pattern of Gram-positive bacteria (N, %)

Isolate	Total	P		VA		LZ		CX		CIP		E		CD		DO		GEN	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
MSSA	22	0	0	22	100	22	100	22	100	16	72.7	14	63.6	16	72.7	20	90.9	14	63.63
MRSA	14	0	0	14	100	14	100	0	0	6	42.8	6	42.8	8	57.1	10	71.4	4	28.57
MR-CONS	16	0	0	16	100	16	100	0	0	6	37.5	6	37.5	8	50	12	75	10	62.5

(P-Penicillin, VA-Vancomycin, LZ-Linezolid, CX-Cefoxitin, E-Erythromycin, CD-Clindamycin, DO-Doxycycline, GEN-Gentamycin, S-Sensitive, R-Resistant)

Among Gram negative isolates *Pseudomonas aeruginosa* was most common and highly sensitive to Amikacin (91.66%), Meropenem (91.66%), Imipenem (91.66%) followed by moderately sensitive to Gentamycin (85.71%), Cefoperazone-Sulbactam (75%), Piperacillin-Tazobactam (75%) and less sensitive to Ceftazidime, Ciprofloxacin, Chloramphenicol, Ceftriaxone respectively.

Pesudomonas aeruginosa was followed by *Escherichia coli* which was highly sensitive to Meropenem (83.33%), Imipenem (83.33%), Chloremphenicol (83.33%), Piperacillin-Tazobactam (85.74%), Amikacin (71.42%), Gentamicin (71.42%) and less sensitive to Ampicillin, Amox-clav, Norfloxacin and Ciprofloxacin respectively. Among the Gram negative isolates, 14 were ESBL producers & 10 were AmpC producers. Those AmpC producers were sensitive only to third line drugs like Chloramphenicol, Colistin and Meropenem (Table: 3)

Drugs		*Pseudomonas aeruginosa*		*Enterobacter cloacae*		*Escherichia coli*		*Klebsiellar neumoniae*		*Acinetobacterbaumannii*		*Proteus vulgaris*		*Proteus mirabilis*	
	Isolate	24		10		14		6		4		4		2	
		S	R	S	R	S	R	S	R	S	R	S	R	S	R
AMP	N	**IR**	**IR**	**IR**	**IR**	0	14	**IR**	**IR**	**IR**	**IR**	**IR**	**IR**	0	2
	%	**IR**	**IR**	**IR**	**IR**	0	100	**IR**	**IR**	**IR**	**IR**	**IR**	**IR**	0	100
AK	N	22	2	6	4	10	4	6	0	2	2	2	2	2	0
	%	91.66	8.34	60	40	71.42	28.58	100	0	50	50	50	50	100	0
GEN	N	20	4	6	4	10	4	6	0	2	2	2	2	2	0
	%	85.71	14.29	60	40	71.42	28.58	100	0	50	50	50	50	100	0
CTX	N	7	17	**IR**	**IR**	8	6	6	0	0	4	2	2	2	0
	%	28.57	71.43	**IR**	**IR**	57.14	42.86	100	0	0	100	50	50	100	0
CAZ	N	14	10	**IR**	**IR**	8	6	6	0	0	4	2	2	2	0
	%	58.33	41.67	**IR**	**IR**	57.14	42.86	100	0	0	100	50	50	100	0
CFS	N	18	6	**IR**	**IR**	8	6	6	0	4	0	2	2	2	0
	%	75	25	**IR**	**IR**	57.14	42.86	100	0	100	0	50	50	100	0
PIT	N	18	6	8	2	12	2	6	0	4	0	4	0	2	0
	%	75	25	80	20	85.74	14.26	100	0	100	0	100	0	100	0
CIP	N	14	10	6	4	2	12	4	2	2	2	2	2	2	0
	%	58.33	41.67	60	40	14.28	85.74	66.66	33.34	50	50	50	50	100	0
TOB	N	14	10	8	2	**ND**	**ND**	4	2	2	2	4	0	2	0
	%	58.33	41.67	80	20	**ND**	**ND**	66.66	33.34	50	50	100	0	100	0
MRP	N	22	2	5	5	12	2	6	0	0	4	4	0	2	0
	%	91.66	8.34	50	50	85.74	14.26	100	0	0	100	100	0	100	0
IPM	N	22	2	5	5	12	2	6	0	0	4	4	0	2	0
	%	91.66	8.34	50	50	85.74	14.26	100	0	0	100	100	0	100	0
C	N	13	11	**ND**	**ND**	12	2	**ND**	**ND**	2	2	**ND**	**ND**	**ND**	**ND**
	%	55.55	45.45	**ND**	**ND**	85.74	14.2	**ND**	**ND**	50	50	**ND**	**ND**	**ND**	**ND**

Table: 3 Antibiotic susceptibility pattern of Gram negative isolates (N, %)

AMP-Ampicillin, AK-Amikacin, GEN-Gentamicin, CTX-Ceftriaxone, CFS-Cefoperazone-sulbactam, TOB-Tobramycin, MRP-Meropenem, IPM-Imipenem, C-Chloramphenicol, IR-Intrinsic resistance, ND-Not Done

DISCUSSION

CSOM is one of the major public health problem worldwide and also in India. It is one of the preventable cause for hearing loss apart from other infections like Toxoplasma, Cytomegalovirus, Rubella, HIV and LCMV (Lymphocytic chorio meningitis virus) especially in developing countries. Only a handful of studies are available across the world including India regarding CSOM.

This study aims in determining the common bacterial and fungal isolates, their antimicrobial susceptibility pattern causing Chronic suppurative otitis media helps to choose their antimicrobial wisely. Males were predominant in all the studies across the globe including this current study even though no anatomical difference between male and female.

The common age group affected were 21-35 years (27.81%), which is in accordance with the study by Ahmed et al (18), Vishwanath et al (19) showing with the most affected age group being 15-25 years (33%). Which is in contrast with other studies showing CSOM is more prevalent in younger age group 1-10 years followed by 11-20 years by Harshika et al. (20)

Regarding symptoms 81(53.64%) patients out of 151 had only ear discharge whereas 33 (21.86%) had ear discharge with deafness, 22 (14.56%) had ear discharge with pain, 15 (9.94%) had all the symptoms of CSOM. This is in close relation with findings observed in other studies by Shashidhar Viswanath et al (19) and Karan Sharma et al (21)

Out of 144 isolates 104 (72.22%) were identified as mono-microbial, 20 (13.88%) were poly-microbial and 20 (13.88%) shows no growth shows that CSOM is more with polymicrobial. The most predominant isolate was *Staphylococcus aureus* 36 (25%) (14 were *MRSA*). A similar number of isolates were reported by Srivastava et al (29.2%) (30), Rajat Prakash et al (4), Kukreja et al (33.9%), Friedmann study (32.7%). (22) In contrast, other study from India such as from Harshika et al (33.09%), Poorey et al (37.21%), Deb T et al (37.73%) showed different trends as *Pseudomonas aeruginosa* was the most prevalent organism (27, 28, 29) and this could be due to the variation in micro-organisms in different regions and effects of climate. The second predominant isolate was *Pseudomonas aeruginosa* 24 (16.66%).

In this study 20 poly-microbials were isolated, out of which *Pseudomonas aeruginosa* with Enterobacteriacae (50%) were more commonly seen. The next common combination was *Escherichia coli* with *Aspergillus spp*. (20%).

In Gram positive bacteria MSSA were highly sensitive to Doxycycline (90.9%), followed by Ciprofloxacin (72.7%), Gentamycin (63.63%). This is similiar to study by Sanjana et al (80) but in contrast with other study results showing high sensitivity to Gentamycin (96.8%) by Harshika et al. (20). Majority of *Pseudomonas aeruginosa* isolates were highly sensitive to Amikacin (91.66%), Imipenem (91.66%), Meropenem (91.66%), Gentamicin (85.71%) and Piperacillin-Tazobactam (75%) our findings correlate with the study done by Harshika et al (20) wherein Amikacin was found to be the most effective drug followed by Imipenem, Gentamicin, Piperacillin-Tazobactam. Another study showing similar findings was Prakash et al (4). In the present study Pseudomonas was less sensitive to Ceftriaxone, Ciprofloxacin, Cefipime. These findings correlate with the study of Sanjana et al (23).

Other than Pseudomonas, gram negative bacteria like *Escherischia coli* was more sensitive to Amikacin (85.42%), Piperacillin-Tazobactam (83.33%), Meropenem (83.33%), Gentamicin (71.42%).

In 68 gram negative bacilli higher incidence of coliforms like 14 *Escherischia coli* (20.58%), 10 *Enterobacter cloacae* (14.70%), 6 *Klebsiella pneumoniae* (8.82%) and these findings were tandem to reports by Poorey and lyer et al(74), whereas some other authors have reported lesser incidence of coliforms in their study, *E.coli* (7.33%), *Klebsiella* (9.42%) by Prakash et al (4), E.coli (12%), *Klebsiella spp* (5%) by Shyamala et al reported. More frequent isolation of fecal bacteria like *E. coli*, *Klebsiella* and water bacteria like *Pseudomonas* indicates that individuals are following poor hygiene practices.

Piperacillin-Tazobactam (PIT) were sensitive to 75-100% *Pseudomonas aeruginosa* (75%), *Enterobacter cloacae (80%)*, *Escherichia coli (*85.74%), *Klebsiella pneumonia,Acinetobacter baumannii &Proteus spp*(100%).

In case of Gram positive bacteria more than 80% were *MSSA* in studies conducted in India. But in this study only 61.2% were *MSSA*. *MRSA* infections in patients with CSOM show more resistance pattern to antibiotics than those in patients with OME and AOM. (24) The extensive use of antibiotics over the counter leads to MDR which can produce both primary CSOM and post-operative infections. Along with patient's poor follow up resulted in the persistence of low-grade infections. Which leads to change in CSOM organism and their in vitro AST pattern.

In this study, out of 68 Gram negative bacilli 14(20.58%) were ESBL producers, this is in accordance with18.3% ESBL in CSOM by Khatoon et al. (25) and in Upasana et al (26) showing 27.87% of ESBLs.

In this study out of 68 gram negative bacteria 10 (14.7%) were AmpCs which is lower than other study by Khatoon et al (25).

Most researcher are focused on bacterial flora of CSOM. The importance of mycology of CSOM has been increasing in the recent years because of the excessive use of broad-spectrum antibiotics, corticosteroids and cytotoxic chemotherapy and immune deficiency conditions like inflammation treatment.

In this study fungal organisms were isolated in 24 samples with predominant fungus being *Aspergillus niger 12(50 %)*. These findings clearly say that fungal growth may be attributed to the environmental effects like more fungal growth in high humid areas.

CONCLUSION

The current study shows a higher incidence in adult age group of 21-35 years. Monomicrobial infection was found in 104 (72.22%) and polymicrobial in 20 (13.88%). Thus, polymicrobial is also common in CSOM. *Staphylococcus aureus* was found to be the most predominant organism causing CSOM followed by Pseudomonas aeruginosa. 20.58% of Gram-negative bacteria were ESBL producers. All were sensitive to Meropenem, Imipenem, Piperacillin-Tazobactam and Cefoperazone-Sulbactam. 14.7% of gram-negative bacteria were AmpC producers, all were sensitive to Meropenem and Imipenem. 26.92% of gram positive were *MRSA*, predominantly sensitive to Doxycycline. 42.30% of gram positive were MSSA, predominantly sensitive to Doxycycline, Gentamicin and Ciprofloxacin. Among the fungus *Aspergillus niger* was found to be the most common fungal pathogen isolated.

Thus poor hygiene and improper treatment with appropriate antibiotics is the common cause for CSOM. Public awareness and proper treatment will reduce incidence of CSOM. Performing culture and sensitivity before giving antibiotics is better to rule out polymicrobial and treat the same.

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