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Aetiology of Chronic Suppurative Otitis Media in a Tertiary Care Centre

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ABSTRACT
Chronic suppurative otitis media (CSOM) is the result of initial episode of acute otitis media and is characterized by a persistent discharge from the middle ear through a tympanic perforation. It is an important cause of preventable hearing loss, particularly in the developing world. Different types of bacteria and fungi cause CSOM. A study was conducted in the department of microbiology, Government Medical college Trivandrum for a period of one year from aAugust 2015 to July 2016 to find out the causative agents of CSOM in patients attending the ENT Department of Government Medical college Hospital Trivandrum, Kerala, India. Out of the 341 samples collected from patients diagnosed with CSOM, 312 were culture positive (91.48%). Among the isolates, 64.74% were bacterial. 27.88% were fungal and the remaining 7.37% were sterile. The predominant species of bacteria isolated was Pseudomonas aeruginosa (60.89%). The other species -Staphylococcus aureus (24.25%), Klebsiella species (4.95%), Ecoli (4.8%), Proteus (4.8%)and Acinetobacter species (0.99%), Enterococci(0.49%).93.97% were monomicrobial and 6.03% were polymicrobial. Fungal isolates were 27.88%.The predominant species of fungi isolated was Aspergillusflavus (28.2%) followed by Aspergillus fumigatus (25.64%). Antibiotic sensitivity of the bacterial isolates were done by Kirby-Bauer disk diffusion method on Muller Hinton Agar. Antifungal susceptibility testing of the predominant isolates were done by Microbrothdillution method. Patients were treated with apporopriate Antibiotic and Antifungal agents based on the susceptibility testing. Most of the patients were completely cured.
Keywords: *chronic suppurative otitis media ,antimicrobial sensitivity testing.*

INTRODUCTION

CSOM is defined as a chronic infection of the mucosa lining of the middle ear cleft. Middle ear cleft includes the eustachean tube, middle ear cavity proper, aditus and mastoid air cells. The disease usually begins in childhood as a spontaneous tympanic perforation due to an acute infection of the middle ear known as acute otitis media (AOM) or as a sequel of less severe form of otitis media such as secretory otitis media. Generally, patients with tympanic perforation which continue to discharge mucoid material for periods from 6 weeks to 3 months despite medical treatmentare recognized as CSOM cases. The WHO definition require only 2 weeks of otorrhoea but otolaryngologists usually adopt a longer durationeg.more than 3 months of acute disease.

MATERIALS AND METHODS

Study design - Descriptive study.

Study setting -Department of Microbiology & ENT Govt. Medical College Trivandrum.

Study Population - Out patients of ENT Dept. Govt. Medical College Trivandrum.
Study duration - one year.

Collection of Samples

Ear discharge from patients were collected under aseptic precaution. Excess discharge was mopped and the external auditory canal cleaned using sterile normal saline the specimen was then collected using four sterile cotton swabs. One swab was subjected to direct microscope examination after adding 1 drop of 10% KOH wet mountpreparation and gram staining. Second swab was used for bacterial culture, third swab for fungal culture and fourth swab was inoculated into Robertson's cooked meat medium for anaerobic culture. All swabs were processed in the microbiology laboratory immediately after sample collection.

Culture

The culture media used for inoculation are Blood agar, Mac conkey agar, Mannitol salt agar, Sabouraud's Dextrose agar(2 tubes), Anaerobic blood agar, Robertsons cooked meat medium. All these media and one SDA tube were inoculated and kept at 37^0 C and the other SDA tube was incubated at room temperature.

The incubated plates were then examined at 24 and 48 hours. The specific identification of bacterial pathogen was done based on microscopic morphology, staining characteristics and biochemical reactions using standard laboratory procedures. Antibiotic sensitivity testing of the isolates were done on Mueller-Hinton agar by Kirby–bauer disk diffusion method. Reports of bacteriological examination were given after 48 hours of incubation.

Identification of Fungi

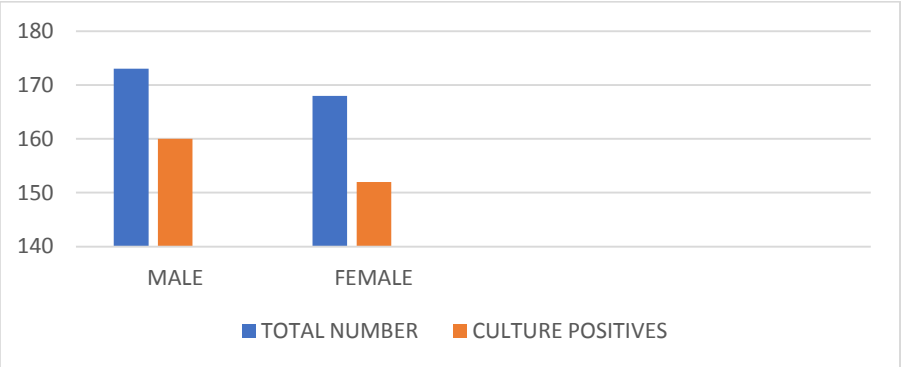
SDA tubes were examined daily for fungal growth if any for 4 weeks before giving a negative culture report. Fungal growth obtained on SDA was examined for rate of growth, colony morphology, pigmentation obverse and reverse etc.
Fungal growth was taken by bent wire and teased with teasing needles and observed under microscope after adding 1 drop of lactophenol cotton blue. A slide culture was done for identification of the species of filamentous fungi.

RESULTS

A total of 341 samples were collected from patients with CSOM out of which 322 samples were culture positive (91.48%) and 29 samples were culture negative (8.52%).

Table 1. Sample Analysis Based On Gender

Sex	Total Number Of Samples Collected	Percentage	Culture Positive Isolates	Percentage
Male	173	50.7%	160	51.28%
Female	168	49.26%	152	48.71%
Total	341	100%	312	100%



Culture positivity was 51.28% in samples collected from males and 48.71% in females

Table 2. Age and Sex Distribution

Age group	No.of female	No.of male	Total
12 – 20	26	17	43
21 – 30	69	73	142
31 – 40	54	64	118
40- 50	19	19	38
Total	168	173	341

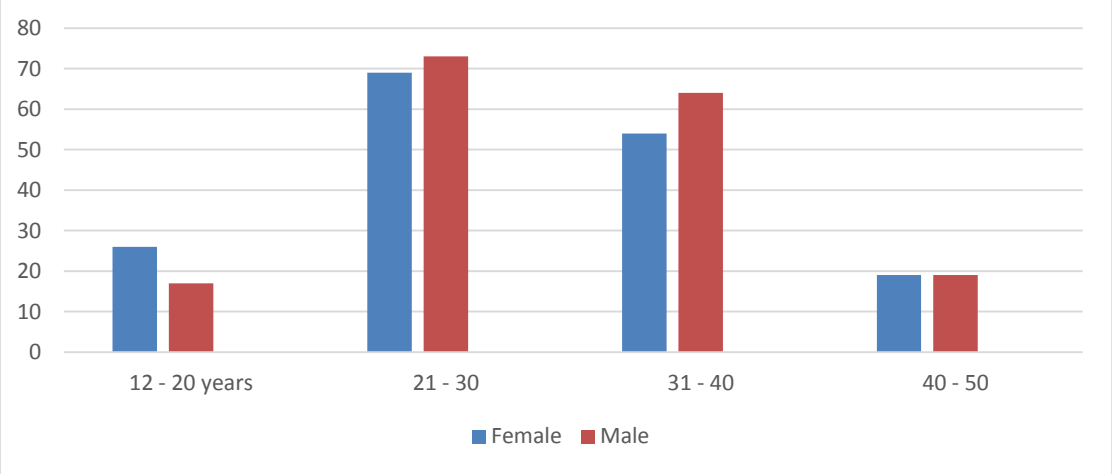
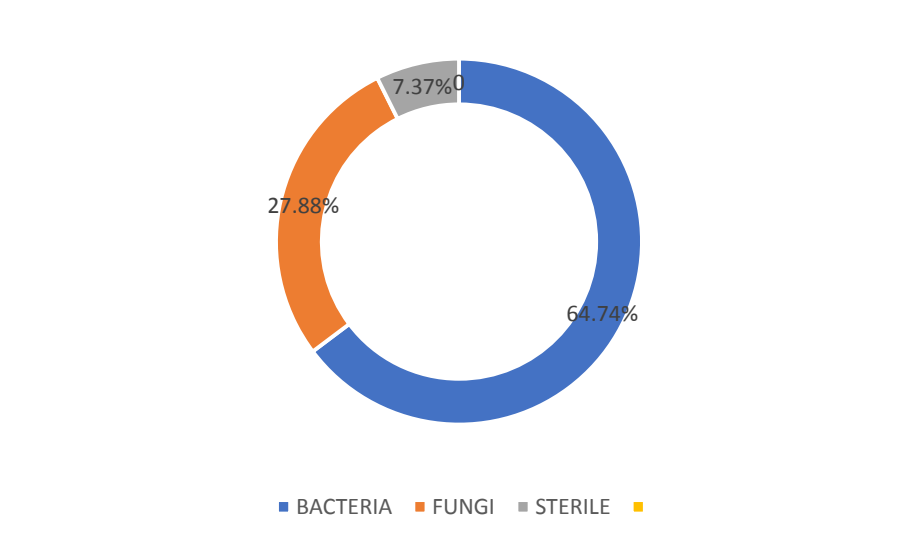


Table 3. Profile of Isolates

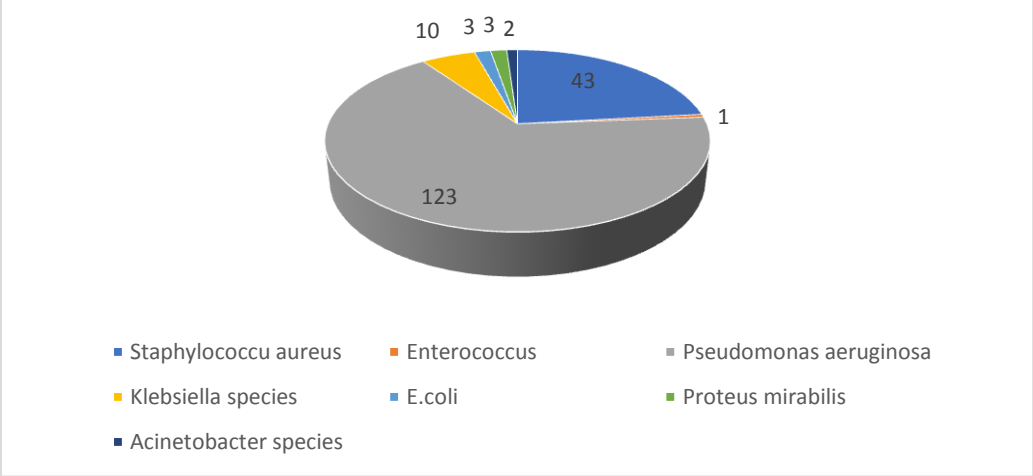
Percentage	Number Of Isolates	Percentage
Bacteria	202	64.74%
Fungi	87	27.88%
Sterile	23	7.37%
Total	312	100%



Out of 322 isolates 64.74% were bacterial, 27.88% were fungal and remaining 7.37% were sterile. When the cultures are examined 93.97% were monomicrobial and 6.03% were polymicrobial.

Table 4. Profile Of Bacterial Isolates

Bacteria Isolated	Number Of Isolates	Percentage
Gram positive isolates		
Staphylococcus aureus	49	24.25%
Enterococcus species	1	0.49%
Gram negative isolates		
Pseudomonas aeruginosa	123	60.89%
Klebsiella species	10	4.95%
E.coli	3	1.48%
Proteus mirabilis	3	1.48%
Acinetobacter species	2	0.99%



When the bacterial isolates are analyzed, gram positive organisms account for 25% and gram negative bacteria accounts for 75%.The gram positive bacteria isolated are *Staphylococcus aureus* and *Enterococci* (0.75%).

The gram negative bacterial isolates are *Pseudomonas aeruginosa* (60.89%),*Klebsiella* species (4.95%) *E.coli* (1.48%), *Proteus mirabilis* (1.48%), *Acinetobacter* species (0.99%).

Table 5. Profile of Isolates

Fungus	No: of isolates	Percentage
Apergillusflavus	22	28.2%
Aspergillus fumigatus	20	25.64%
Candida species	19	24.35%
Aspergillusniger	14	17.94%
Aspergillusterreus	2	2.56%
*Rhizopus*species	1	1.28%

The predominant species of fungal isolates are *Aspergillusflavus*(28.2%),*Aspergillusfumigatus* (25.6%).Next to *Aspergillus*is *Candida* species (24.35%) based on the germ tube test and production of chlamydospores on corn meal agar. *Candida* species were differentiated into *Candida albicans* (10.,52%) and non albicans (89.47%).

Only one isolate of *Rhizopus* was also obtained in the study(1.28%).Antifungal susceptibility testing of the predominant isolates were done by microbroth dilution method. Aspergillus species showed 100% sensitivity to Amphotericin B and Itraconazole and all the strains were reisistant to Fluconazole.

Table 6. Antibiotic Sensitivity Pattern Of Staphylococcus Aureus (Total Isolates 49)

Antibiotc	Sensitive	Percentage	Resistant	Percentage
Penicillin	8	16.3%	41	83.7%
Gentamicin	23	46.9%	26	53%
Erythromycin	6	12.24%	43	87.75%
Amikacin	49	100%	0	0%
Cefoxitin	49	100%	0	0%
Vancomycin	49	100%	0	0%

Antibiotic sensitivity pattern of *Enterococcus* species (total isolate 1)

Antibiotic	Sensitive	Percentage	Resistant	Percentage
Ampicillin	1	100%	0	0%
Gentamicin	1	100%	0	0%
Vancomycin	1	100%	0	0%
Linezolid	1	100%	0	0%

Antibiotic sensitivity pattern of *Pseudomonas aeruginosa* (total isolates 123)

Antibiotic	Sensitive	Percentage	Resistant	Percentage
Gentamicin	62	50.4%	61	49.59%
Amikacin	78	63.4%	45	36.58%
Ciprofloxacin	47	38.2%	76	61.78%
Ceftazidime	112	91%	11	9%
Piperacillin+ tazobactam	112	91%	11	9%
Imipenem	118	95.9%	5	4.06%

Antibiotic sensitivity pattern of other gram negative bacilli

Isolates	Ampicillin	Gentamicin	Ceph 1st	Ciprofloxacin	Amikacin	Ceftriaxone	Piptaz	Cefoperazone +sulbactam
*Klebsiella*species(10)	0	3(30%)	2(20%)	6(60%)	9(90%)	6(60%)	10(100%)	10(100%)
E.coli(3)	0	2(66.6%)	2(66.6%)	3(100%)	3(100%)	3(100%)	3(100%)	3(100%)
Proteus mirabilis (3)	1(33.33%)	2(66.6%	2(66.6%)	2(66.6%)	3(100%)	3(100%)	3(100%)	3(100%)
Acinetobacter species(2)	0	1(50%)	0	1(50%)	1(50%)	1(50%)	1(50%)	1(50%)

DISCUSSION

The present study was done to know the spectrum of bacterial and fungal etiological agents of CSOM with antibiotic sensitivity profile of the bacterial isolate. The results were compared and correlated with similar studies conducted by other researchers. In the present study it was found that males were affected slightly more than females. Prior studies conducted by different groups also have the same conclusion of male predominance. Negative culture accounts for 8.52% in our study. This may be attributed to prior antibiotic therapy. In the present study CSOM was most prevalent in the age group 21- 30 years. This correlates with studies conducted by Erkan Mustaya et al and Gulathi et al. This is consistent with studies by Ballaet al and Saurab et al. Pseudomonas was the most common organism that cause CSOM in our study. Among the fungal isolates, Aspergillus species accounts for the majority of infections (74.34%) followed by Candida species (24.35%). Similar observations reported by Loy et al and Asok et al in Singapore and North India respectively. Gulathi et al in 1997 also observed the same in their studies. Fungal aetiology accounted for 7% of cases in a study done in Nigeria in 1983. In our study it is significantly higher (27.88%) than the results of many other reported studies. We could not isolate any anaerobic bacteria in the entire study. This may be due to the environment of the middle ear cavity in CSOM which has impeded air circulation by the presence of a perforation.

CONCLUSION

In the present study majority of CSOM infections (93.97%) are monomicrobial and only 6.03% are polymicrobial. Most of them are caused by bacteria. Among the bacterial isolates predominant species isolated are *Pseudomonas aeruginosa* (60.89%) followed by *Staphylococcus aureus* (24.25%). Fungal pathogens contribute 27.88%. Among the fungi, *Aspergillus* species are the predominant species isolated in this study (74.34%). Antibiotic sensitivity testing of the bacterial isolates and antifungal susceptibility testing of fungal isolates helped the clinicians in the selection of appropriate drugs in the management of cases ofCSOM. Most of the patients were completely cured.

Being a disease associated with significant morbidity if untreated, CSOM requires diligent laboratory evaluation with comprehensive antimicrobial sensitivity testing. When treated with appropriate antibiotics and antifungal drugs, the complication rates are significantly less.

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