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Aerobic Bacteriological Study of Chronic Suppurative Otitis Media with Reference to MRSA and ESBL

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Abstract

Background: Chronic suppurative otitis media (CSOM) is a disease of multiple etiology and is well known for its persistence and recurrence in spite of treatment. Aerobic bacteria either in single or mixed culture and also resistant strains like MRSA (Methicillin Resistant Staphylococcus aureus) and ESBL(Extended spectrum β-lactamase) producers are responsible for most of CSOM cases. Indiscriminate use of antibiotics leads to resistance and poor follow up have resulted in persistent low grade infection, refractoriness to treatment, complications of CSOM and postoperative complications. Hence knowledge of microbacteria and sensitivity pattern is necessary in all CSOM cases for better outcome. **Objectives :** To isolate and identify the aerobic bacterial flora of CSOM and to study the antibiotic sensitivity pattern of isolates with special reference to MRSA and ESBL production and follow up of patients after antibiotics susceptibility testing and to record the response to therapy. **Methodology:** Two ear swabs collected from each patient studied with gram stain, culture and morphology of colony and identification of organism by standard methods. Antibiotic susceptibility done in all cases.MRSA and ESBL production detected by using standard methods.**Results :**Ninety nine CSOM patients and their isolates were studied for a period of one year. Majority of patients were in the age group of 11-20years,56.4% were males and 43.4% were females. Total number of gram negative (41.4%) isolates were more than gram positive (31.3%) bacteria. *S.aureus* (29.3%) was the common organism isolated followed *by P.aeruginosa* and *S.aureus* + *P aeruginosa* (21.4%) was the common mixed isolate. Among

S.aureus, MRSA isolated in 51.7% and among gram negative bacteria 31.7% ESBL producers were isolated.*S.aureus* was sensitive to Gentamicin (72.4%), Amoxyclav (66.5%) and Ciprofloxacin(44.8%). *P.aeruginosa* and other gram negative bacteria were sensitive to Amikacin(70-100%),Cefotaxime(50-100%), Amoxyclav (50-100%) and Levofloxacin(68-100%). Sensitivity pattern of mixed cultures was varied. MRSA showed moderately sensitivity to Gentamicin,Ciprofloxacin and Amoxyclav and resistant to Ampicillin,Erythromycin and Ceftazidime. Amomg ESBL producers were sensitive to Amikacin and Levofloxacin, but resistant to Erythromycin and Cefotaxime. Combinations of MRSA + ESBL isolates were resistant to all drugs.Only ESBL isolates shows resistant to third generation Cephalosporins. **Conclusion :**Commonest isolate of CSOM was *S.aureus* followed by *P.aeruginosa*. Among *S.aureus* 50% of them were MRS A and mixed isolates were also seen significantly So isolation of bacteria and study of sensitivity pattern is necessary in all the CSOM cases for better patient out come in both pre and postsurgical cases and also in preventing drug resistance.
***Keywords*:** Aerobic bacteria; Antibiotic Sensitivity; MRSA, ESBL and CSOM.

Introduction

Chronic suppurative otitis media (CSOM) is one of the commonest ear diseases in which there is a chronic inflammation of middle ear and mastoid, and in which the infection is present beyond six weeks because of non- intact tympanic membrane. It is a disease of multiple etiologies and is well known for its persistence and recurrence inspite of treatment. Its importance lies in its refractoriness to treatment and chronicity, leading to complications[1,2,3]. Incidence of CSOM is increasing during the past 10-20 years. The disease prevalence depends on race and socioeconomic factors like poor living conditions, overcrowding, poor hygiene and nutrition[1,4,5,6].CSOM was found to be the single major cause for conductive deafness (66-3%) and it is also responsible for 1.5% of speech disorders[5].

Hearing loss associated with CSOM leads on to educational backwardness in children that is well recognized by Otologists, Paediatricians and Educators. Development of speech, language and learning skills are severely hampered in these children making it difficult for them to achieve full academic potentials outdoor activities are also hampered[7]. Aetiology of chronic suppurative otitis media is complex. Aerobic bacteria, anaerobic bacteria and fungus are the etiological agents responsible for CSOM. Aerobes are responsible for 71% of isolates. Mixed infections of aerobes, anaerobes and fungi are also seen[8,9].

Indiscriminate, haphazard and half hearted use of antibiotics and poor follow up of the patients have resulted in persistent low grade infection and development of bacterial resistance[10,11]. The study of microorganisms commonly associated with CSOM and their in vitro antibiotic sensitivity pattern is very pertinent for the clinician to plan a general outline of treatment for the patient with a chronically discharging ear.

Identification and detection of MRSA and ESBL producers is also important before treatment of CSOM cases. As cases with these infections are resistant to routine Beta-lactum antibiotics and Penicillin. Knowledge of local microorganism pattern and their antibiotic sensitivity pattern is essential for effective low cost treatment[12].

Changing flora of CSOM and emergence of strains resistant to the commonly employed antibiotics stimulated the study. The present work deals with the aerobic bacteriological study of CSOM to identify and categorize various organisms isolated and to evaluate their sensitivity pattern and to assess whether there has been any change in the causative organisms identified by the previous studies.

Materials and Methods[13,14,15]

All clinically diagnosed new cases of CSOM (tubo-tympanic type) of all age groups and both sexes attending ENT out patient department were included.

Collection of sample:

Ear discharge was collected under aseptic precaution in clinically diagnosed cases of CSOMattending ENT Outpatient department. Excess discharge was mopped out from external auditory canal and it was cleaned with 70% alcohol first and was allowed to act for 30-40sec to achieve sterile area. Then with the two sterile swabs, specimens were collected. One was for Gram staining and other one was for aerobic culture. Both the swabs were processed immediately in the laboratory.

Fallow up of patients;

Out of 99 cases, fallow up done for 86 cases on 10^{th} day & 1 month. Antibiotics were given depending on sensitivity pattern. Otoscopy& audiometry done during fallow up.Tympanoplasty advised if ear is dry. If persisting discharge is present antibiotics are changed after culture & sensitivity. Out of 86 cases 74 become dry after treatment12 patients had persisting discharge. 43 patients were advised tympanoplasty& for 25 surgery not advised.6 patients had complications

Results

Ninety nine (99) clinically diagnosed cases of Chronic suppurative otitis media attending ENT Outpatient Department, were studied in the Department of Microbiology . Maximum number of cases falls in the age group 11-20 years (31%) and 0-10 years (21%), male to female ratio 1.2 : 1.0. Males (56.6%) predominately affected than female (43.4%). The side of involvement showed right ear was predominant (40.4%) compared to left ear (36.4%).Most of the cases 44 (44.4%) were observed during the month of November-February, 39(39.4%) were observed during July-October. Single organism was isolated in 72 cases (72.7%) of the total cases studied. While 14(14.2%) of the cases yielded mixed growth, in 13(13.1%) of the cases the cultures remained sterile.

Staphylococcus aureus was the commonest organism isolated. Table 1 shows that *S. aureus* was isolated in 29 cases accounting for 29.3% of the total cases studied. The second commonest organism was *Pseudomonas aeruginosa* 25(25.3%) followed by *Proteus mirabilis* 5(5.1%) and *Klebsiellapnuemoniae*4(4.1%) *Proteus vulgaris*, *Enterococcus faecalis*, *Acinetobacter spp*. and *Citrobacterfreundii* isolated in 2(2%) of cases each.*Klebsiellaoxytoca* was isolated in one case. No growth was observed in 13 cases.

S.aureus was associated with *P.aeruginosa* in 3(21.4%) cases. *S.aureus* associated and *C.freundii* in 2(14.3%) and *P.aeruginosa* associated with *P.vulgaris* isolated in 2 cases each.

Out of 29 *Staphylococcus aureus* isolated 12(41.1%) are MRSA and 17(58.6%) were MSSA and out of 41 gram negative single isolates 14(34.1%) are ESBL producers and 27(65.9%) are non- ESBL producers.

As Table no. 2.shows sensitivity pattern of MRSA producers ,Beta lactamase producing *S.aureus* was sensitive to Gentamicin (41.7%) and Amoxyclav (41.7%) but resistant to Ampicillin, Erythromycin and Ceftazadim. For Ciprofloxacine resistance was (83.5%.).Among ESBL Producers *P. aeruginosa* was common in 10(74.1%) followed by *P.vulgaris,C.freundii, K.oxytoca* and *P.mirabilis* in 1 case each.Antibiotic sensitivity pattern shown in following tables

Table – 1 : The individual organisms isolated in the present study and their percentage

Sl. No.	Organisms	No. of organisms (n=99)	Percentage(%) (n=99)
1	*Staphylococcus aureus*	29	29.3%
2	*Pseudomonas aeruginosa*	25	25.3%
3	*Proteus mirabilis*	5	5.1%
4	*Klebsiella pneumonia*	4	4.1%
5	*Proteus vulgaris*	2	2.1%
6	*Enterococcus faecalis*	2	2.1%
7	*Acinetobacter spp.*	2	2.1%
8	*Citrobacterfreundii*	2	2.1%
9	*Klebsiellaoxytoca*	1	1%
10	Mixed infections	14	14.1%
11	No growth	13	13.1%
	Total	**99**	**100%**

Discussion

The higher prevalence of CSOM was in the age group 11-20 years fallowed by 0-10 years which is in co-relation with study by Vijay D[16] & others and Sinha & others[11], Guptha, Vineeta& others[12].This implies a fact that CSOM is still a significant health problem in

pediatric age group. Males were affected 52(60.5%) than females 54(39.5%) which is co-related with other works like Gulati & others (61%&39%)[10]. Vijay D & others (62.8%&37.2%)[16]. Incidence of CSOM was maximally seen during Nov-Feb (44.4%) fallowed by July- Oct (39.4%) which is co-related with studies like Wakode PT[17]&Maji PK[4]. Right ear affected (40.4%) commonly than left ear (36.4%) which is co-related with studies by Rakshak&others. In present study 86 (86%) were positive and 13(13%) were negative for culture, which is co-related with other studies like Vijay D & others (94.7%&5.28%)[16], Sinha & others (90.2%&9.8%)[11], Ansari & others (80.5%&19.5%)[18]. Negative cultures can be attributed to non-bacterial growth, Anaerobic growth & prior antibiotic therapy Monomicrobiol etiology 72(72.7%) &polymicrobiol etiology 14(14.2%) was observed which is co-related with other workers like Sinha & others (70.7%&19.6%)[11], Vijay D & others 57.8% & 36.9%[16]. In the present study commonest isolate was *S aureus*29(29.3%) followed by *P.aeruginosa* 25(25.3%), *Proteus*species7(7.1%), *Klebseilla spp*5(5.1%), *C freundii,E faecalis,Acinato spp*2(2%) each which was co-related with other studies like Vijay D[16]Asiri & others[18],Guptha V & others[12] but studies by Gulati & others[10],Maji PK & others[4], Kulkarni RD & others[9] Sinha A others[11] showed *P.aeruginosa* as major isolate. Increased frequency of *S.aureus* due to their ubiquitous nature & high carriage of resistant strains in the external auditory canal & upper respiratory tract *S.aureus* was more sensitive to Gentamicine(72%) fallowed by Amoxyclav(66.6%). *P aeruginosa* sensitive to Amikacin(72%) &Cefatoxime(56%) followed by Levofloxacin & Ciprofloxacin. Other sensitivity to *S.aureus*&Gentamicin(86%), Amikacin(100%) &Cefatoxime (85.4%) Vijay D. Others showed Amikacin (66.6%) & Ciprofloxacin (55.9%) sensitivity *S.aureus*&

Table – 02 : Sensitivity pattern of MRSA

Total *S.aureus*	MRSA isolated	Ampicillin		Erythromycin		Gentamicin		Amoxyclav		Amikacin		Ceftazidime	
		S	R	S	R	S	R	S	R	S	R	S	R
29	12 (41.1%)	1 (8.3%)	11 (91.6%)	1 (8.3%)	11 (91.6%)	5 (41.7%)	7 (58.3%)	5 (41.7%)	7 (58.3%)	2 (16.6%)	10 (83.3%)	0%	12 (100%)

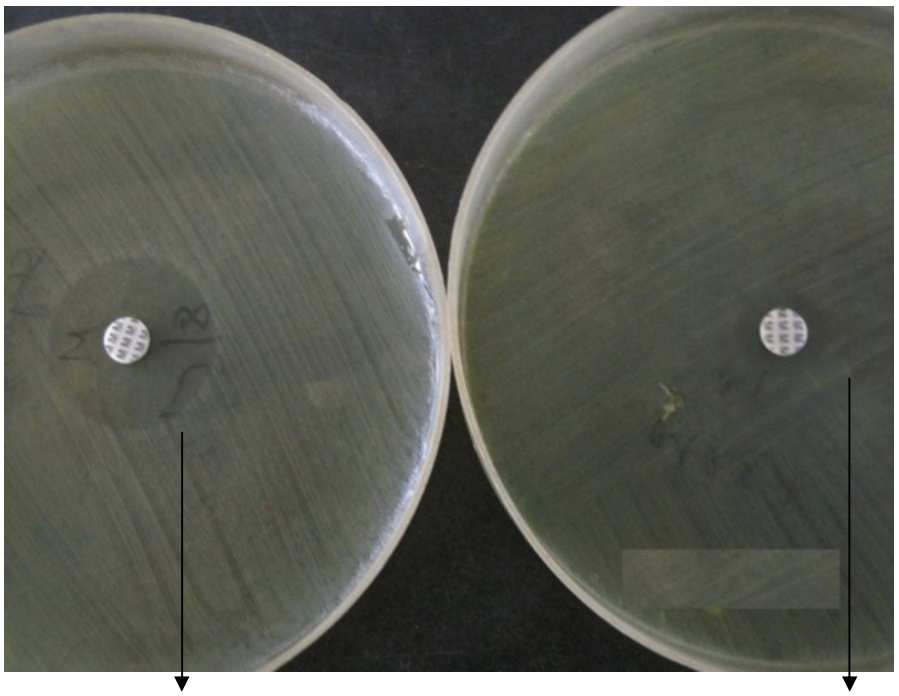
MRSA- Methicillin Resistant *Staphylococcus Aureus*

Table – 03 : Sensitivity pattern of ESBL Producers

Total Gram negative isolation	ESBL Producers	Erythromycin		Amoxyclav		Ciprofloxacin		Amikacin		Cefotaxime		Levofloxacin	
		S	R	S	R	S	R	S	R	S	R	S	R
41	14 (31.7%)	0%	14 (100%)	5 (35.7%)	9 (64.3%)	5 (35.7%)	9 (64.3%)	11 (78.6%)	3 (21.4%)	2 (14.3%)	12 (85.7%)	10 (71.4%)	4 (28.6%)

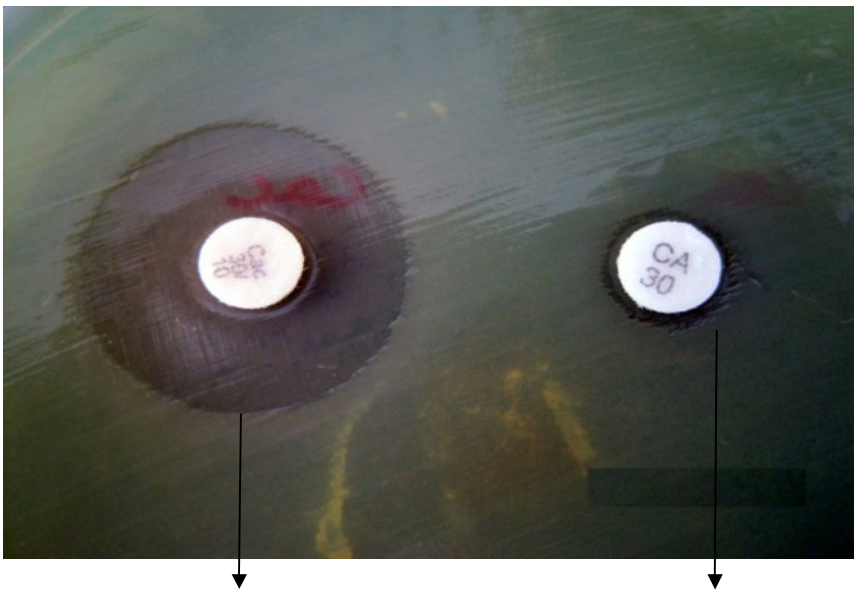
ESBL-Extended Spectrum β-Lactamase.

Fig,1 Disc diffusion susceptibility test(DDT) for Methacillin Resistant strain of *S.aureus*



Methicillin Sensitivity Methicillin Resistant

Fig.2 Potentiated Disc Diffusion Susceptibility Test for ESBL producers



Ceftazidimedisc(30mcg) **Zone of inhibition towards the Disc containing clavulanicacid(20/10mcg)**

Amikacin(68%),Ciprofloxacin(45.5%) sensitivity of *P.aeruginosa*Mixed cultures of *S.aureus+P.aerugonosa* was common 3(21.4%) followed by *S.aureus+C.freundii&P.aeruginosa+P vulgaris2*(14.3%) cases which is co-related with VijayD[16]& others also *S.aureus+P.aeruginosa* was commonly isolated. MRSA group comprises 12(14%) in *S.aureus*& ESBL producers 14(31.7%) which was compared with Choi& others[19] showed MRSA in 28%of CSOM cases,Park BC in 45.9%of cases MRSA was susceptibility to Gentamicin&Amoxyclav and resistant to Ampicillin, Erythromycin &Ceftazadime compared with Baha& others[20] ESBL producers showed sensitivity to Amikacin (78.6%)&Levofloxacin (71.4%).Resistant to Erythromycin &Cefotoxime compared with Varsha& others[21].Who isolated ESBL producers in urine,pus& sputum same observed with other(24%).Studies by Mathuretal&Tankiwal 48%.Sensitivity of ESBL producers in urine,pus & sputum(68%) observed byVarshaG & others[21] showed resistance to Amikacin(24%), Gentamicin(75%), Ciprofloxacin(65%), Cefotoxime(90%) Amoxyclav(69%).

Conclusion & Summary

In summary it can be concluded that variety of bacteria are responsible for CSOM withpredominance of *S.aureus* fallowed by *P.aeruginosa* and 50% of *S.aureus* were MRSA.Mixed isolates also found significantly. Antibiotic sensitivity showed susceptibility of single isolates to newer antibioticslike Amikacin,Cefatoxime&Levofloxacin.Moderate susciptility to Ciprofloxacin, Amoxiclav& Gentamicin and most of them were resistant to Ampicillin &Erytromycin.Among mixed isolates *S aureus+Paeruginosa* was more common mixed isolate showed varying sensitivity pattern.ESBL producers constitute34% and showed sensivity to Amikacin,Levofloxacin& resistant to Cefatoxime,Ciprofloxacin, amoxyclav& Erythromycin.Most of MRSA were resistant to most of drugs.Hence it is necessary to know the causative agent and drug sensitivity pattern for better treatment where antibiotics were commonly abused.This will enhance better treatment and reduce the burden of the infection on the patient and in long term,it may reduce the cost of treatment.Proper selection of antibiotics also helps in preventing drug resistance and also clearing of infection.Hence isolation of bacteria & sensitivity study is important for all CSOM cases.

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