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Study of Bacteriological Profile And Antibiotic Sensitivity Pattern in Chronic Otitis Media- Mucosal Type in Tertiary Care Hospital.

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Abstract:
Background: *Chronic otitis media- mucosal type is a chronic inflammation of middle ear and mastoid cavity presenting with recurrent ear discharge through a tympanic perforation. In a discharging ear both topical and systemic therapy is employed to control the infection. Inadequate antibiotic treatment, misuse of antibiotic, improper choice of antibiotic and poor compliance of the patients have resulted in changes in susceptibility to antibiotics of the causative organisms and also development of resistance to commonly used antibiotics.*
Aim: *To identify bacteriological profile in chronically discharging ears and to analyse the antibiotic sensitivity pattern.*
Materials And Methods: *This study was a observational study. A total of 214 patient's ear discharge samples were analysed from Jan 2013 to Dec 2015.*
RESULTS: Positive cultures were seen in 192 cases and 22 showed no growth of organisms. In our study positive cultures were seen in 124 males (64.5%) and 68(35.5%) females.
Frequency of bacterial isolates: in pure cultures (176) were:-Pseudomonas: 84[47.7%]; Staph. aureus: 58[32.9%]; Proteus: 8[4%]; Klebsiella: 8[4%]; E. coli& CONS 5 each [2%]; 1 isolate showed MRSA and 1 non-fermentive species. Comparision was done between 2013, 2014 and 2015; the sensitivity pattern had changed over time. A decreasing trend is noted for pseudomonas, across spectrum of antibiotics ranging from Aminoglycosides, fluroquinolones to Cephalosporins. In contrast Staphylococcus exhibited decreased sensitivity towards conventional antibiotics but has still retained higher susceptibility to higher antibiotics like Piperacillin Tazobactum, Linezolid, Clindamycin and Vancomycin.
Conclusion: *No significant change of bacteriological profile noticed in our study but gave an insight into changing antibiotic profile over time. Comparison of results of our study with other studies showed varied susceptibility of the same organisms in different regions of South India. Hence there is a need to regularly analyse the sensitivity patterns of organisms and change antibiotic protocols as needed.*
Keywords: *Chronic otitis media, Bacteriology, Culture and Sensitivity, Antibiotics, Susceptibility*

I. Introduction

Chronic otitis media- mucosal type is a major health problem and occurs with high incidence and prevalence in both developed [1] and developing countries. It is one of the major and preventable causes of deafness in India. CSOM is a disease of middle ear cleft characterised by presence of persistent perforation of tympanic membrane with recurrent or persistent mucoid or muco-purulent discharge for at least 8weeks[1]

The common causative organisms in CSOM are Pseudomonas aeruginosa, Staphylococcus aureus, E.coli, Streptococcus pyogenes, Proteus, Klebsiella, Bacteroids, Peptostreptococcus or mixed organisms.

Inadequate antibiotic treatment, misuse of antibiotics, improper choice of antibiotics and poor compliance of the patient are related to prevailing severity of CSOM. Antibiogram of organisms causing CSOM has been reported to vary with time and geographical area. So, knowledge of local pattern of infection is essential to enable efficacious treatment of this condition and to provide guidelines for empirical antibiotic therapy.

Aim:

To study bacteriology profile and analyse pattern of their antibiotic susceptibility in chronically discharging ears.

II. Materials &Methods

This study was a cross sectional observational study in a tertiary care centre. Ear swab from chronically discharging ears were subjected to microbiological evaluation. A total of 214 patient's ear discharge reports were analysed from January 2013 to December 2015.

Patients attending ENT outpatient department with chronically discharging ear who has either already been treated outside or at our hospital with a course of oral or topical antibiotics and who persist to have ear discharge were included in the study.

The pus swabs were cultured on blood, chocolate and Mac Conkey agar and incubated at 37degree Celsius for 48hrs. Bacterial species then isolated were identified by morphology, culture characteristics and bio-chemical reactions as per standard techniques. Antimicrobial susceptibility tests were performed using Kirby-Bauer disc diffusion method on Mueller Hinton agar. Pseudomonas and Staphylococcus were isolated in majority of the samples, and hence following antibiotics were chosen for culture plates.

Antibiotics Used For Pseudomonas Aeruginosa:
Firstline: Ceftazidime, Cefipime, Imipenem, Piperacillin-Tazobactum, ciprofloxacin, Levofloxacin, Gentamicin, Amikacin, Aztreonam.
Second line: Meropenem, Tobramycin.

Antibiotics Used For Staphylococcus Aureus:
First line: Penicillin, Cefoxitin, Erythromycin, Clindamycin, Cotrimoxazole, Doxycycline, Ciprofloxacin, Gentamicin, Linezolid.
Second line: Vancomycin, Chloramphenicol, Tertracycline, Moxifloxacin, Rifampicin.
Pseudomonas and Staphylococcus antibiotic sensitivity was compared for three consecutive years i.e., 2013, 2014 and 2015 and pattern was analysed.

III. Results

Total of 214 patients were included in the study. Age ranged from 1year to 72yrs. Positive cultures were seen in 192 cases and 22 showed no growth of organisms. In our study positive cultures were seen in 124 males (64.5%) and 68(35.5%) females.

Frequency Of Bacterial Isolates: In Pure Cultures (176) Were:-
Pseudomonas: 84[47.7%] , Staph. aureus: 58[32.9%]
Proteus: 8[4%] , Klebsiella: 8[4%] E. coli& CONS 5 each [2%], 1 isolate showed MRSA and 1 non-fermentive species.

Antibiotic sensitivity testing carried out for these pure cultures on Pseudomonas showed sensitivity to Cefaperazone (89.4%, 18.1%, and 34.2%), Piperacillin (86.8%, 18.1%, and 0%), Gentamicin 84.2%, 45.4%, 57.1%) Amikacin (84.2%, 36.3%, 57.1%) Ceftriaxone 50%, 36.3%, 34.2%) Ofloxacin (50%, 9.09%, 42.8%), Ciprofloxacin (47.3%, 27.2%, 32.2%) Cotrimoxazole (47.3%, 27.2%, 0%), Erythromycin (42.1%, 0%, 0%) and Ampicillin, Amoxicillin (<20%) in 2013, 2014 and 2015 respectively. Pseudomonas was sensitive for Ceftazidime in 18.1% and 45.7% in 2014 and 2015 respectively. (Table No 1)

Antibiogram for Staphylococcus showed sensitivity to Amikacin (90.3%.25%, 0%) Cefaperazone (83.8%,0%,0%), Piperacillin Tazobactum (83.8%,0%,0%), Gentamicin (83.8%,37.5%,52.6%), Ofloxacin (80.6%,62.5%0%),Erythromycin (67.7%,37.5%47,3%), Ciprofloxacin (67.7%,0%,5.2%),Ceftriaxone (58.06%,0%,0%,),Cotrimoxazole (54.8%,62.5%,36.8%),Amoxycillin with clavalunic acid (16.1%,12.5%10.5%) in 2013, 2014 and 2015 respectively. Doxycycline (12.5%, 0%), Linezolid (25%, 73.6%), Clindamycin 37.5%, 63.1%) and Vancomycin (50%, 52.6%) for 2014 and 2015 respectively, and were not used in culture plates in the year 2013. (Table No 2) Highest sensitivity of pseudomonas was towards Gentamicin followed by Amikacin. Highest sensitivity of staph aureus was towards Linezolid followed by Clindamycin and highest resistance to penicillin followed by ciprofloxacin.

Antibiotic	Sensitivity		
	2013 N=38	2014 N=11	2015 N=35
Cefaperazone	34(89.4%)	02(18.1%)	12(34.2%)
Piperacillin	33(86.8%)	02(18.1%)	0(0%)
Gentamicin	32(84.2%)	05(45.4%)	20(57.1%)
Amikacin	32(84.2%)	04(36.3%)	20(57.1%)
Ceftriaxone	19(50.0%)	04(36.3%)	12(34.2%)
Ofloxacin	19(50.0%)	01(9.09%)	15(42.8%)
Ciprofloxacin	18(47.3%)	03(27.2%)	10(32.2%)
Cotrimoxazole	18(47.3%)	03(27.2%)	0(0%)
Erythromycin	16(42.1%)	0(0%)	0(0%)
Amoxiclav	07(18.4%)	03(27.2%)	05(16.1%)
Ampicillin	05(13.1%)	0(0%)	0(0%)
Ceftazidime	0(0%)	02(18.1%)	16(45.7%)
Levofloxacin	0(0%)	0(0%)	14(40.0%)

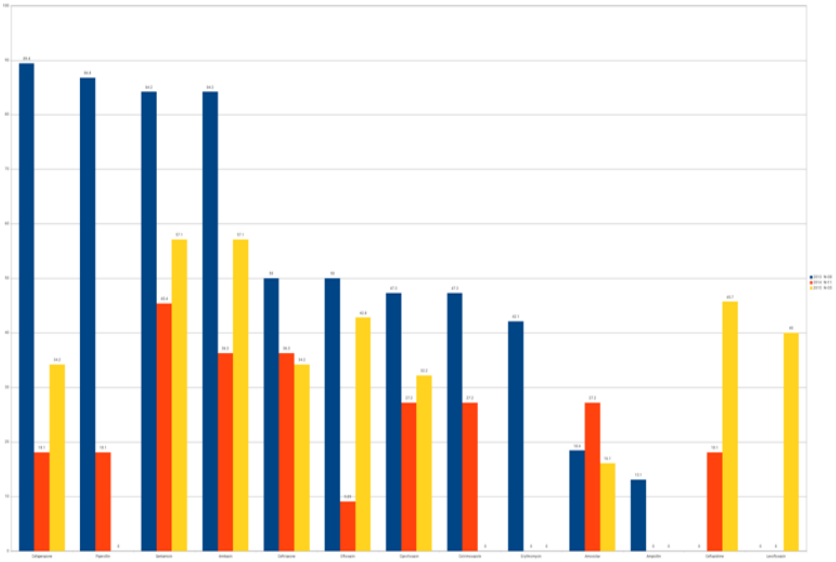
Table 1: Antibiogram of pseudomonas

Table 2: Antibiogram of Staph.aureus

Antibiotic	Sensitivity	
	2013 N=31	2014 N=8
Amikacin	28(90.3%)	02(25.0%)
Cefaperazone	26(83.8%)	00(0%)
Piperacillin	26(83.8%)	00(0%)
Gentamicin	26(83.8%)	03(37.5%)
Ofloxacin	25(80.6%)	05(62.5%)
Erythromycin	21(67.7%)	03(37.5%)
Ciprofloxacin	21(67.7%)	00(0%)
Ceftriaxone	18(58.06%)	00(0%)
Cotrimoxazole	17(54.8%)	05(62.5%)
Amoxiclav	05(16.1%)	01(12.5%)
Ampicillin	04(12.9%)	00(0%)
Doxycycline	00 (0%)	00(0%)
Penicillin	00 (0%)	01(12.5%)
Linezolid	00(0%)	02(25.0%)
Clindamycin	00 (0%)	03(37.5%)
Vancomycin	00 (0%)	04(50.0%)

Fig 1. Showing the trend of Antibiotic sensitivity pattern against Pseudomonas aeruginosa

Fig 2. Showing the trend of Antibiotic sensitivity pattern against Staphylococcus aureus



IV. Discussion

Chronic otitis media- mucosal type is a chronic inflammation of middle ear and mastoid cavity which presents with recurrent ear discharge through a tympanic perforation. Through the perforation bacteria gain entry into middle ear, infection of middle ear mucosa subsequently results in ear discharge.

Untreated cases of CSOM can result in a broad range of complications like persistent otorrhea through a tympanic perforation, with conductive hearing loss of varying severity, mastoiditis, labyrinthitis, meningitis and facial nerve paralysis [2]. The disease is notorious for causing irreversible destruction of middle ear structures and also very serious intracranial complications. Hence treatment needs to be instituted early and effectively to avoid such complications.

Pseudomonas is a non-fermenting gram negative bacillus which is a water bacterium [2]. Staph is universally harboured within human nares and pseudomonas is known to reside in the moist environment of ear canal. The proximity of these bacteria reflects likelihood of their eventual presence in middle ear.

Both gram positive and negative organisms are responsible for infection of middle ear. It is common in infants and children especially among low socio-economic society. Poor living conditions, overcrowding, poor hygiene and nutrition have been suggested as a basis for widespread prevalence of CSOM in developing countries.

In CSOM, intense secretory IgA and IgG coating of bacteria is common but when pseudomonas is the causative agent of infection, no bacterial coating is seen and hence difficult to eradicate.[9]

In a discharging ear both topical and systemic therapy is employed to control the infection and choice of systemic therapy depends on organism isolated in culture.[3]

In a study conducted at west Godavari region, Andhra Pradesh [2]; most common isolate was pseudomonas & staph followed by CONS, Klebsiella. Pseudomonas showed highest sensitivity to ciprofloxacin followed by Gentamicin, Imipenem, Piperacillin, & Amikacin. Staph showed highest sensitivity to ciprofloxacin and Gentamicin followed by Clindamycin, Cephalexin & Ofloxacin.

A similar study conducted at Vellore, Tamil Nadu [3] showed highest isolates to be pseudomonas (30%) followed by staph. Drug susceptibility showed pseudomonas susceptibility to Piperacillin mostly followed by Ceftazidime & Amikacin. Ciprofloxacin & Gentamicin – 62.5% each. Staph aureus showed maximum susceptibility to Oxacillin followed by erythromycin.

In a study conducted at coastal Andhra [4], majority of isolates were Staph. Aureus (40%) followed by pseudomonas (34%) & Klebsiella (18%). highest sensitivity of Staphylococcus was to Netilmycin (97%) followed by Amoxiclav (91%), Ampicillin+sulbactum (88%) and ciprofloxacin (88%). Pseudomonas showed highest sensitivity to Amikacin (96.5%) followed by Gentamicin (93%), Ceftriaxone (93%) and Ofloxacin (89%).

Another study conducted at Nellore, Andhra Pradesh [5] showed most common isolate to be Pseudomonas (40%) followed by Staph. aureus (31%) & E.coli (12%). Pseudomonas showed increased susceptibility to Amikacin followed by Amoxiclav & Gentamicin. Staph showed high susceptibility to amoxiclav followed by ciprofloxacin.

Globally a change has been noticed in susceptibility of pseudomonas aeruginosa towards quinolones in the last few decades [3]. One study carried out in turkey revealed only 6% of pseudomonas isolates to be resistant to ciprofloxacin, where as in South Korea a study carried out in 2004 ciprofloxacin resistance was noted in 100% of isolates[3].A study done in Singapore, has shown significantly higher percentage of Pseudomonas. aeruginosa isolates susceptible to Gentamicin. [3]

In our study the distribution of bacteriological profile was similar for the all three years, but the sensitivity pattern had changed over time. A decreasing trend is noted for pseudomonas, across spectrum of antibiotics ranging from Aminoglycosides, fluroquinolones to Cephalosporins. In contrast Staphylococcus exhibited decreased sensitivity towards conventional antibiotics but has still retained higher susceptibility to anti-staphylococcus antibiotics like Piperacillin Tazobactum, Linezolid, Clindamycin and Vancomycin. Sensitivity of pseudomonas remained similar to previous with Gentamicin taking a higher role followed by Amikacin (Fig 1) but sensitivity of staph aureus had drastically reduced for Amikacin & Gentamicin with sensitivity to Linezolid taking the highest frequency. Sensitivity to ciprofloxacin overtime had further decreased. (Fig 2)

When separately analysed, pseudomonas showed highest sensitivity to Gentamicin followed by Amikacin & Ciprofloxacin, whereas resistance was highest to amoxiclav followed by ciprofloxacin; Staph. aureus showed highest sensitivity to Linezolid followed by Clindamycin & Vancomycin and highest resistance to penicillin followed by ciprofloxacin.

This study shows that the sensitivity and resistance pattern of bacterial isolates have changed overtime.

When various studies conducted in south India were analysed, it showed varied pattern of frequency bacterial isolates and varied sensitivity pattern. This shows a geographical variation in susceptibility of the organisms and could be due to varied living conditions and practise of different empirical antibiotic therapies and practise of prescribing higher antibiotics even at primary health centres.

Our study gives an insight into the changing antibiotic profile over time and over places. Hence there is a need to regular analysis of the sensitivity patterns of organisms and changing antibiotic protocols as needed to prevent development of resistance by organisms to commonly used medications.

Three randomised controlled trials showed significantly more cessation of otorrhea with topical therapy and these studies suggest that patients receiving topical antibiotics are more than 4 times as likely to develop a dry ear as those receiving systemic therapy. [6,7,8] Gentamicin as a topical medication is shown to cause ototoxicity but it can be recommended for usage to a limited period of 5-7 days with regular monitoring of hearing (after 5/7days) & vestibular function(daily) [10].

Ciprofloxacin is known to be good topical antibiotic with better action and lesser side-effects hence its use should be carefully tailored to avoid development of resistance.

V. Conclusion

Pseudomonas aeruginosa and staphylococcus aureus are the most common bacterial isolates in our study. Over the time antibiotic sensitivity pattern of pseudomonas remained similar but sensitivity pattern of

Staph. aureus had changed. Also, resistance to ciprofloxacin had increased for both psedumonas and staphylococcus , but more for Staph. Aureus.

Our results showed that sensitivity pattern of bacteriological isolates had changed over the year and also comparison of results of our study with other studies showed varied susceptibility of the same organisms in different regions of south India.

Hence a regular time to time study of the pattern of susceptibility is needed to device empirical antibiotic protocols.

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