



Microbiological profile of Chronic Otitis Media in a Tertiary Care Setup at Jammu, India.

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Introduction: Chronic Otitis Media (COM) is an important global public health problem leading to hearing impairment and long term effects on language, auditory and cognitive development. Intracranial as well as extracranial complications of COM are common conditions seen by otologists and paediatricians. The pattern of microbial flora has been changing over the years, given the advances in clinical pharmacology and availability of newer, broad spectrum antimicrobial drugs. Variations have been noticed in the predominant microbial pattern attributed to geographical differences, previous treatment history, indiscriminate and irrational use of antibiotics. The aim of this study was to elucidate the present day flora of micro-organisms in patients of COM in our setup and to enumerate anti-microbial sensitivity patterns, which are both essential for cost-effective treatment.

Methods: Swabs of unilateral or bilateral ear discharge of patients attending the ENT Out Patient Department were taken from 100 patients and sent for Gram-staining as well as culture and sensitivity testing. Bacterial isolate identification and antibiotic sensitivity testing was done as per standard protocols.

Result: *Pseudomonas aeruginosa* (36.36%) was the commonest aerobic isolate followed by *Staphylococcus aureus* (26.36%). *Peptostreptococcus* sp. (5.45%) was the only anaerobe isolated. Majority of aerobes were sensitive to Gentamycin (74.04%) and Piperacillin-Tazobactam (63.46%). *Aspergillus* sp. (5.45%) was the most common fungus isolated

Conclusion: The present study helped in understanding the bacteriological profile of the COM cases in our area. Empirical treatment may not be successful in all cases because of emergence of resistant organisms. Hence it is advisable to get an antibiogram before starting the treatment.

Keywords: Chronic otitis media, *Pseudomonas aeruginosa*, *Staphylococcus aureus*

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Chronic Otitis Media (COM) is a disease of varied etiology, well known for its persistence and recrudescence despite treatment.¹ It typically follows infections of the upper respiratory tract, usually bacterial and in some cases, secondary to viral infections or tuberculosis, which soon sets the stage for middle ear to be invaded by pyogenic organisms.² Earlier studies reported mixed infections with predominance of Gram-positive bacteria in COM, the commonest organism being *Staphylococcus aureus*, followed by *Streptococcus haemolyticus*^{3,4,5} Subsequent studies have shown the presence of poly-microbial flora with widespread presence of Gram-positive and Gram-negative organisms of varying population.⁶ Review of the studies of microorganisms implicated in COM, conducted in recent times, show that the most commonly isolated organism in children as well as adults is *Pseudomonas aeruginosa* amongst aerobes and *Bacteroides* sp. amongst anaerobes.⁷ Though fungal infection in COM was noted as early as 1960s, it has gained striking importance in the recent years as multitude of factors are working hand in hand resulting in an increased incidence of fungal involvement. Irrational & excessive use of broad spectrum antibiotics with or without steroids, increased use of cytotoxic chemotherapy, corticosteroids and immunosuppressants as well as increased incidence of diseases like diabetes, tuberculosis and AIDS, have upscaled the prevalence of fungal infections in otorhinolaryngology.^{8,9} In some cases of mucosal variety of COM with intractable otorrhoea that does not respond to topical/ systemic antimicrobials, the possibility of fungal infection superimposed over COM should be actively considered.¹⁰ Anaerobes are common in COM but their isolation may be difficult as they usually grow in mixed cultures along with facultative aerobes and are

fastidious in nature.¹¹ In mixed infections, especially with Gram-negative coliforms & *Proteus* sp., the metabolism of facultative species provides a suitable environment for anaerobes by lowering the Oxygen concentration and reducing the oxidation-reduction potential.¹² Their slow growth, poly-microbial nature & growing resistance to antimicrobials complicates the treatment of these infections.¹³ The identification of the predominant causative organism and the determination of its sensitivity to antibiotics serves as a critical guide in planning the treatment of a patient of COM. Each and every right choice of therapy means one more 'safe ear' and that ultimately transforms into a valuable health achievement in the long run. Indiscriminate use of antibiotics has precipitated the emergence of multiple resistant strains of bacteria. This calls for serious concern & increases the relevance of reappraisal of modern day flora in COM.¹⁴ The objective of this study was to determine the microbial diversity and generate antibiogram of bacterial isolates among the patients suffering from COM who attended ENT department of our hospital, a tertiary care center located in foothills of Himalayas.

Material & Methods: This hospital-based, cross-sectional prospective study was conducted for a period of one year in a tertiary care state hospital of Jammu (J&K) in India. The study was approved by our Institutional Ethical Committee and the written informed consent (signed by patient or parent/guardian) and an assent in case of children above 7 years of age was obtained at enrollment. A total of 100 consecutive patients with a clinical history of COM, who presented to the department of ENT, SMGS Hospital, Jammu were included in the study. The study group included all active cases of COM with no prior history of antimicrobial treatment or with

history of prior topical medication but failure to achieve a dry ear. Patients with ear trauma, road traffic accidents with otorrhoea, eustachian tube defects, aural polyps or with systemic diseases like diabetes mellitus, were excluded. Ear discharge was collected with the help of three sterile non-absorbing cotton tipped swabs through a sterilized ear speculum, taking care not to touch the skin of the external auditory canal. One of the swabs was used for aerobic culture and was plated on 5% sheep blood agar (SBA), MacConkey's agar and chocolate agar. Second swab used for anaerobic culture was inoculated in Robertson's cooked meat broth and incubated at 37°C for 72 h. On 3rd day, sub-cultures from RCM were made on 5% SBA and Neomycin BA (Neomycin at a working concentration of 70 µg/ml). A Metronidazole disc (5 µg) was placed at the junction of secondary and tertiary streaking area, opposite to primary well of inoculation. The anaerobic jars were closed and incubated at 37°C for 72h and thereafter, examined for the zone of inhibition around the metronidazole disk. An aerotolerance test on CA was set up to rule out facultative anaerobes. A third swab was used for mycological culture and was inoculated on two slants of Sabouraud Dextrose Agar with chloramphenicol (0.05%) and were then incubated at 28°C and 37°C. The slants were later examined for

gross and the microscopic morphology of the fungi. The media plates were incubated at 37°C for 48 h. Organisms were identified using standard procedures. Antimicrobial sensitivity testing for aerobic isolates was carried out by Kirby Bauer disc diffusion method on Muller Hinton agar. Results were interpreted in accordance with standard operating procedures. All dehydrated media, reagents and antibiotic discs were procured from Hi-media Laboratories Pvt. Ltd., Mumbai, India.

Results:

The mean age of the patients was 26.88 years and the peak incidence of COM was observed in age group between 11 year and 20 years. The swabs obtained from 115 (85 u/l + 15 b/l COM) ears and processed revealed microbial growth in 97(84.35%) while 18(15.65%) samples showed no growth. In 67 (69.07%) samples mono-microbial growth was seen whereas 30(30.93%) samples showed poly-microbial growth. Table 1 shows the age and gender-wise distribution of COM cases.

Table 1. Age and Gender-wise distribution of subjects (n=100)

Age group (in years)	Male (n = 65)		Female (n = 35)	
	No.	%	No.	%
<10	12	18.46	4	11.43
11-20	17	26.15	12	34.29
21-30	8	12.31	6	17.14
31-40	16	24.62	9	25.71
41-50	8	12.31	4	11.43
51-60	3	4.61	-	-

>60	1	1.54	-	-
Total	65	100	35	100

Males (65 %) were more commonly affected than females (35%) and the sex ratio male : female was 1.8:1. Aerobic flora was seen in 96 (98.97%) samples (whether in mixed cultures or as pure isolates) in which 104 aerobic isolates were grown, 6 (6.19%) cases showed

anaerobic flora and 16 (16.49%) cases had fungal etiology. Table 2 and Table 3 depict the characterization of aerobic, anaerobic, and fungal isolates among COM patients respectively.

Table 2. Bacteriological profile of culture positive sample

Organism isolated	No. of isolates	%
Aerobic		
1. <i>Pseudomonas</i> sp.	40	36.36
2. <i>Staphylococcus aureus</i> *	29	26.36
3. <i>Acinetobacter</i> sp.	13	11.82
4. <i>Proteus</i> sp.	12	10.91
5. β haemolytic <i>Streptococci</i> (Group A)	04	3.64
6. <i>Enterobacter</i> sp.	02	1.82
7. <i>Klebsiella</i> sp.	02	1.82
8. <i>Citrobacter koseri</i>	02	1.82
Anaerobic		
9. <i>Peptostreptococci</i> sp.	06	5.45
Total	110	100

Table 3. Fungal isolates obtained from culture positive samples

Organism	No. of isolates	%
1. <i>Aspergillus</i> sp.	10	62.5
2. <i>Candida</i> sp.	4	25
3. <i>Penicillium</i> sp.	2	12.5
Total	16	100

Morphological pattern revealed a predominance of rods (50.43%). *Pseudomonas aeruginosa* was the commonest aerobic isolate (36.36%) whereas *Peptostreptococcus* sp. was the only anaerobe isolated (5.45%). Unilateral COM (85%) was more common as compared to bilateral COM.

Majority of study population had mucosal variety of COM (67.38%). Antimicrobial sensitivity testing was carried out for bacterial isolates. Results of antimicrobial sensitivity testing are depicted in Table 4.

Table 4: Antibiotic sensitivity pattern of aerobic bacterial isolates in COM

Isolate s	No. of Isolates	01 Pencillin G	02 Ampicillin / Amoxicillin	08 Amoxicillin/clavulanate	09 Piperacillin-Tazobactam	15 Ceftazidime	17 Cefotaxime / Ceftriaxone	19 Cefepime	27 Cefoperazone-Sulbactam	29 Imipenem / Meropenem	31 Amikacin	32 Gentamycin	33 Netilmicin	34 Tobramycin	36 Ciprofloxacin / Levofloxacin	42 Cotrimoxazole	43 Vancomycin	45 Clindamycin / Lincomycin	46 Colistin	47 Polymyxin B	49 Erythromycin / Azithromycin	52 Linezolid	53 Chloramphenicol	55 Tetracycline / Doxycycline	56 Oxacillin
<i>P. aeruginosa</i>	40				34(85%)	24(60%)			34(85%)	8(20%)	25(62.5%)	29(72.5%)		29(72.5%)	24(60%)				32(80%)	15(37.5%)					
<i>Acinetobacter sp.</i>	13			2(15.39%)	13(100%)	2(15.39%)	6(46.15%)		4(30.7%)	2(15.39%)	9(69.23%)	9(69.23%)		9(69.23%)	2(15.39%)					2(15.39%)				4(30.77%)	
<i>Proteus sp.</i>	12		6(50%)		11(91.67%)		6(50%)			4(33.33%)	8(66.67%)	12(100%)	4(33.33%)	6(50%)	4(33.33%)										
<i>BHS (Group A)</i>	4(100%)	4(100%)														4(100%)	4(100%)	4(100%)							
<i>Staph. Aureus</i>	29				4(19.05%)						4(19.05%)	21(72.41%)			14(48.28%)	8(38.10%)	29(100%)	10(47.62%)			6(28.57%)	3(14.29%)	9(42.86%)	10(47.62%)	27(93.10%)
<i>Enterobacter sp.</i>	2				2(100%)		2(100%)				2(100%)	2(100%)		2(100%)	2(100%)	2(100%)									
<i>Citrobacter koseri</i>	2							2(100%)			2(100%)	2(100%)		2(100%)	2(100%)	2(100%)			2(100%)						
<i>Klebsiella sp.</i>	2				2(100%)		2(100%)				2(100%)	2(100%)		2(100%)											
Total	104	4(3.85%)	6(5.77%)	2(1.92%)	66(63.46%)	26(25%)	16(15.38%)	2(1.92%)	38(36.54%)	14(13.46%)	52(50%)	77(74.04%)	4(3.85%)	50(48%)	48(46.15%)	16(15.38%)	33(31.73%)	14(13.46%)	34(32.69%)	17(16.35%)	6(5.77%)	3(2.89%)	9(8.65%)	14(13.46%)	27(25.96%)

**Staph aureus* included 8 strains of MRSA

(36.54%), Vancomycin (26.92%) and Ceftazidime (25%).

The antibiogram revealed that a maximum number of isolates were susceptible to Gentamycin (74.04%), followed by Piperacillin-Tazobactam (63.46%), Amikacin (50%), Ciprofloxacin/Levofloxacin (46.15%), Tobramycin (43.27%), Cefoperazone-Sulbactam

Discussion:

COM and its complications are among the most common conditions seen by otologists. Poorly treated or untreated COM can lead to many complications like mastoiditis, meningitis and brain abscess. Hence, early diagnosis of the causative organism is a priority for proper management of COM cases. Treatment needs to be instituted at the earliest to avoid such complications. The initial treatment of this condition is medical wherein antimicrobial therapy is directed at eradicating pathogenic aerobic and anaerobic organisms followed by surgical management as and when required. The antimicrobial therapy is usually started empirically prior to results of microbiological culture. Selection of any antibiotic is influenced by its efficacy, resistance of bacteria, safety, risk of toxicity and cost. Knowledge of the local microorganism pattern and their antibiotic sensitivity is therefore essential for effective and cost-saving treatment. Microbiology cultures yield multiple organisms and these vary depending on climate, patient population and whether antibiotics have or have not been recently used.

High prevalence of culture positive cases of COM (84.35%) was seen in the present study. We found that the COM was more prevalent in second decade of life and accounted for 29% of the cases. This finding corroborates well with the observations made by other researchers.¹⁵⁻¹⁷ High-prevalence of COM in children may be attributed to the fact that they are more prone to upper respiratory tract infections (URTIs). Furthermore, cold weather pre-disposes children to URTI.¹⁸ Poor hygiene and unorthodox approach to treatment like use of unconventional ear drops and concoctions such as oil and honey into the middle-ear may initiate the proliferation of

opportunistic pathogens leading to blockage of eustachian tube (ET).¹⁹

Among the culture positive cases in our study, a predominance of pure/mono-microbial isolates 67 (69.07%) as compared to mixed/poly-microbial culture patterns 30 (30.93%) was observed. A trend of pure cultures can be attributed to easy availability and use of broad spectrum antibiotics in recent times.²⁰ *Pseudomonas aeruginosa* (36.36%) was the commonest aerobic isolate followed by *Staphylococcus aureus* (26.36%). However, *Peptostreptococcus* sp. (5.45%) was the only anaerobe isolated in the whole study, probable reason being that most of our patients had already received treatment in the form of topical/systemic antibiotics with failure to achieve a dry ear. It is therefore possible that by the time these patients were seen, most of the anaerobes had been eliminated by antibiotic therapy. Another reason could be the differences in the geographic locations and lab methodologies.^{13,21,22}

The antibiogram revealed in our study suggests sensitivity of maximum bacterial isolates to Gentamycin 77 (74.4%) followed by Piperacillin-Tazobactam 66 (63.46%), Amikacin 52 (50%), Tobramycin 50 (48.08%), Ciprofloxacin/Levofloxacin 48 (46.15%), Cefoperazone- Sulbactam 38 (36.54%), Colistin 34 (32.69%) Vancomycin 33 (31.73%) and Ceftazidime 26 (25%).

An overall decreased susceptibility to Ciprofloxacin was observed in our study which could be ascribed to injudicious use, inappropriate dosage, easy accessibility, development of enzymatic resistance by organisms especially *Pseudomonas* sp. and *Staphylococcus aureus*.²³ Resistance could also be attributed to chromosomal mutation producing DNA-gyrase with reduced affinity for Ciprofloxacin or due

to reduced permeability of bacterial membranes to these drugs. Since the drug resistant mutants are not easily selected, the resistance develops gradually.²⁴

Individually, *Pseudomonas* sp. was most sensitive to Cefoperazone-sulbactam and Piperacillin-Tazobactam 34 (85% to either combination) followed by Colistin 32 (80%), Gentamycin 29 (72.5%); Tobramycin 29 (72.5%); Amikacin 25 (62.5%); Ceftazidime 24 (60%); Ciprofloxacin/Levofloxacin 24 (60%) with lesser susceptibility to Polymixin B 15 (37.5%) and Imipenem/Meropenem 8 (20%). Pajor et al 2006 and Mirza et al 2008 also observed maximal sensitivity of *Pseudomonas* sp. to Piperacillin-Tazobactam whereas Vijaya D 2000 and Chakraborty 2005 observed Amikacin as maximally effective (68%, 53% respectively).

Staphylococcus aureus was maximally sensitive to Vancomycin 29 (100%) followed by Oxacillin (93.10%), Gentamycin (71.43%), Clindamycin/Lincomycin (47.62%), Tetracycline/Doxycycline (47.62%), Ciprofloxacin/Levofloxacin (42.86%) and Chloramphenicol (42.86%) in the present study. Out of 29 isolates of *Staphylococcus aureus*, 8 were Methicillin resistant *Staphylococcus aureus* (MRSA). Maximal susceptibility to Vancomycin was also observed by Gul H.C et al while high susceptibility to Gentamycin was also reported by Chandrashekhar et al 2004 & Vijay D et al 2003, in accordance with the present study. Hegde M.C et al 2005 reported Cefotaxime to be most effective while Wariso B.A et al reported highest susceptibility to Ceftriaxone and Cloxacillin.

As far as *Proteus* sp. is concerned, it was found to be most susceptible to Gentamycin 12 (100%) followed by Piperacillin-Tazobactam 11 (91.67%). However Wariso B.A et al reported maximum sensitivity to Ceftriaxone in contrast to 50% sensitivity reported in

our study. Decreased sensitivity to Ceftriaxone may be partially explained by the indiscriminate use of this drug in our setup & as also the inadequate dosage prescriptions, thereby paving the way for resistance. Beta-haemolytic *Streptococci* (Group A) in our study was found to be 100% susceptible to Penicillin G, Cotrimoxazole, Vancomycin, as well as Clindamycin/Lincomycin (4 isolates i.e.100% sensitive to all these). Kumar H et al also reported a 100% susceptibility to Cotrimoxazole whereas Chakraborty et al reported maximal sensitivity to Gentamycin (100%). *Acinetobacter* sp. was found maximally susceptible to Piperacillin-Tazobactam 13 (100%) followed by Amikacin 9 (69.23%), Gentamycin 9 (69.23%), Tobramycin 9 (69.23%), Ceftriaxone 6 (46.15%) whereas reverse was observed by Vijaya D et al with reported maximal sensitivity to Ceftriaxone and Gentamycin. *Enterobacter* sp. showed equal susceptibility to Piperacillin-Tazobactam; Ceftriaxone; Amikacin; Gentamycin; Tobramycin; Ciprofloxacin and Cotrimoxazole (2 isolates i.e.100% each). Similar results were observed by Vijaya D et al. *Citrobacter koseri* was equally susceptible to Amikacin, Gentamycin, Tobramycin, Cotrimoxazole, Colistin, Ciprofloxacin (2 isolates i.e. 100% sensitive). Similarly high susceptibility was observed to Amikacin by Kumar H et al 2011 & Vijaya D et al *Klebsiella* sp. isolates were sensitive to Ceftriaxone; Amikacin; Gentamycin; Tobramycin and Piperacillin-Tazobactam, 100% each in the present study. High susceptibility was also noticed by Vijaya D et al to Amikacin, Gentamycin and Ceftriaxone. Kumar H et al also reported a high sensitivity to Piperacillin-Tazobactam and Amikacin. Contrary to our observation Osazuwa reported a maximal susceptibility to Ofloxacin.

Anaerobes i.e. *Peptostreptococcus* sp. 6 (100%) in our study were fully susceptible to Metronidazole, as also

observed by Beena A *et al* In our study out of 6 isolates of *Peptostreptococcus* sp. 5 were observed as mixed infections with aerobes like *Pseudomonas* sp.(3) and *Proteus* sp.(2). Single case showed *Peptostreptococcus* sp.as the only bacterial isolate; however was seen in association with fungal isolate (*Penicillium* sp.).

Among the fungal cultures, the present study observed *Aspergillus* sp. as the predominant isolate 10 (62.5%) followed by *Candida* sp. 4 (25%) and *Penicillium* sp. 2(12.5%). Predominance of *Aspergillus* sp. was in contrast to the results of Mohan *et al.*, and Kumar *et al*, who observed *Candida* sp. as the most prevalent fungal isolate (60% each). The difference in the corresponding figures could be due to the difference in the patient population studied and geographical variations. *Aspergillus* sp. is an opportunistic filamentous fungus which easily proliferates in cases of COM as soon as the middle ear mucosa is invaded and rendered more susceptible by bacteria. *Aspergillus* sp., especially *A. niger*, grows on cerumen, epithelial scales and detritus deep in the external canal. The resulting accumulation of these inflammatory materials along with fungal debris act as a predisposing factor for further bacterial colonization. No primary cases of fungal otitis media were reported in our study.

Mixed culture of fungi mainly with aerobes (15.46%) were obtained, most frequent being *Staphylococcus aureus* with *Aspergillus* sp. A higher incidence of fungal positives among males, especially in their 2nd and 5th decades of age was reported in our study. This could probably be due to their more exposed ways of living including swimming in open water bodies like ponds etc. Invasion of fungus appears to be secondary to COM. Chronicity of discharge plays an important role in causation of fungal otitis media. The antibiotic

drops, apart from moist and alkaline medium of discharge, appear to be mainly responsible for fungal growth and when steroids are added, the incidence of fungal growth is further increased. Local antibiotic drops should be added with antifungal agents right at the beginning.³⁴ In the present study, out of 12 patients positive for fungi, only 4 patients were unaware of the nature of ear drops used and out of the remaining 8, six had a history of instillation of antibacterial ear drops along with topical steroids.

Conclusion:

The results of our study support the involvement of diverse microbial flora in COM and also stress upon the fact that culture and sensitivity of the ear discharge should be performed routinely as part of management of COM.

Pseudomonas sp. and *Staphylococcus aureus* were found to be the common cause of COM in our study. These organisms are found to be less susceptible to the routinely used drugs like ciprofloxacin and cephalosporins. Also the resistance pattern of the microorganisms usually keeps changing. Hence, routine use of topical antibiotics for any case of COM as empirical therapy must be reviewed and judicious use of antibiotics is recommended. Appropriate antimicrobial drugs should be prescribed after proper diagnosis of the causative organism and its antimicrobial susceptibility pattern. The patients should also be advised to take the drugs for the complete prescribed duration without stopping in the middle. This will not only help in minimizing the complications, but also help in preventing the emergence of resistant strains.

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Anaerobic		
18. <i>Peptostreptococci</i> sp.	06	5.45
Total	110	100

*29 strains of *Staphylococcus aureus* included 8 (27.59%) strains of MRSA.

Table 3. Fungal isolates obtained from culture positive samples

Organism	No. of isolates	%
4. <i>Aspergillus</i> sp.	10	62.5
5. <i>Candida</i> sp.	4	25
6. <i>Penicillium</i> sp.	2	12.5
Total	16	100

Table 4: Antibiotic sensitivity pattern of aerobic bacterial isolates in COM

Isolate s	No. of Isolates	01 Pencillin G	02 Ampicillin / Amoxicillin	08 Amoxicillin/clavulanate	09 Piperacillin-Tazobactam	15 Cefazidime	17 Cefotaxime / Ceftriaxone	19 Cefepime	27 Cefoperazone-Sulbactam	29 Imipenem / Meropenem	31 Amikacin	32 Gentamycin	33 Netilmicin	34 Tobramycin	36 Ciprofloxacin / Levofloxacin	42 Cotrimoxazole	43 Vancomycin	45 Clindamycin / Lincomycin	46 Colistin	47 Polymyxin B	49 Erythromycin / Azithromycin	52 Linezolid
<i>osa</i>	40				34(85%)	24(60%)			34(85%)	8(20%)	25(62.5%)	29(72.5%)		29(72.5%)	24(60%)				32(80%)	15(37.5%)		
<i>cter sp.</i>	13			2(15.39%)	13(100%)	2(15.39%)	6(46.15%)		4(30.77%)	2(15.39%)	9(69.23%)	9(69.23%)		9(69.23%)	2(15.39%)					2(15.39%)		
.	12		6(50%)		11(91.67%)		6(50%)			4(33.33%)	8(66.67%)	12(100%)	4(33.33%)	6(50%)	4(33.33%)							
<i>p A)</i>	4(100%)	4(100%)														4(100%)	4(100%)	4(100%)				
<i>eus</i>	29				4(19.05%)						4(19.05%)	21(72.41%)			14(48.28%)	8(38.10%)	29(100%)	10(47.62%)			6(28.57%)	3(14.29%)
<i>ter sp.</i>	2				2(100%)		2(100%)				2(100%)	2(100%)		2(100%)	2(100%)	2(100%)						
<i>r koseri</i>	2							2(100%)			2(100%)	2(100%)		2(100%)	2(100%)	2(100%)			2(100%)			
<i>sp.</i>	2				2(100%)		2(100%)				2(100%)	2(100%)		2(100%)								
	104	4(3.85%)	6(5.77%)	2(1.92%)	66(63.46%)	26(25%)	16(15.38%)	2(1.92%)	38(36.54%)	14(13.46%)	52(50%)	77(74.04%)	4(3.85%)	50(48.08%)	48(46.15%)	16(15.38%)	33(31.73%)	14(13.46%)	34(32.69%)	17(16.35%)	6(5.77%)	3(2.89%)

**Staph aureus* included 8 strains of MRSA

Table 5: Culture pattern of the ears observed

Culture pattern	Mucosal Variety		Squamosal Variety		Total	
	No.	%	No.	%	No.	%
Monomicrobial	46	69.70	21	67.75	67	70.10
Polymicrobial	20	30.30	10	32.25	30	29.90
Total	66	100	31	100	97	100