



## Aerobic Bacteriological Profile of External and Middle Ear Infections and Its Antibiotic Sensitivity Pattern in a Tertiary Care Centre

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**ABSTRACT:** Ear infection is a common problem for both children and adults especially in developing countries and ear discharge is one of the commonest symptoms of ear infection. Ear infection can be acute or chronic and includes otitis externa and otitis media. Development and spread of resistant bacteria due to indiscriminate use of antibiotics is a global public health threat. Hence current information on microbial resistance and prevalence of pathogenic bacteria needs to be available at national and local levels to guide rational use of existing antimicrobials in an Institutional level. We have conducted a hospital based cross sectional study in Government Medical College Kannur for a period of 12 months. We have collected ear swabs of Consecutive patients attending the department of ENT meeting the inclusion criteria. Ear swabs were taken under strict sterile precautions and were sent to Department of Microbiology for assessment of aerobic culture and corresponding antibiotic sensitivity. Patients were also given a proforma and data regarding variables like age, sex, socioeconomic status, and symptomatology were obtained. Patients also underwent hearing assessment with PTA. Data was entered into Microsoft Excel and data analysis was done. We have observed that 53.57% were men and 46.43% were females. Most of the patients belonged to lower socioeconomic status. The symptomatology with which patients presented includes ear discharge followed by hearing impairment(34.29%) followed by ear ache and ear fullness in 42% of patients. Most common ear involved was right ear(58.57%).

Majority of the patients were diagnosed with chronic otitis media-mucosal type followed by squamous type and otitis externa in only 6 patients. Patients with COM presented with medium sized central perforation(50%), followed by large sized central perforation(41.43%). The most common organism isolated in our study was

*Pseudomonas aeruginosa*(30.71%), followed by *Staphylococcus aureus*(26.43%), *Klebsiella*(26.43%) followed by *E.coli*(13.57%) and *Proteus*(2.86%). *Pseudomonas* was found to have high sensitivity to Piperacillin-Tazobactam(86.05%), Meropenem(83.72%), Cefaperazonesulbactam (81.4%) and Ceftazidime(79.07%). *Staphylococcus aureus* was found to have high sensitivity to commonly used topical antibiotics like Ofloxacin (83.78%) and Ciprofloxacin (78.38%). *Klebsiella* was found resistant to multiple antibiotics. *E coli* was found to have high sensitivity to topical antibiotics like Gentamycin (78.95%), Ciprofloxacin (73.68%), Ofloxacin (73.68%) and Chloramphenicol (63.16%). *Proteus* was found sensitive to Chloramphenicol (75%) among topical antibiotics and Piperacillin-Tazobactam (75%) among systemic antibiotics. We analysed the degree of hearing loss in patients with ear discharge and found out that sensorineural hearing loss was mostly seen in patients with *Proteus* infection(50%) followed by *E.Coli* infection(40%). Our study helped in finding out the current trend in aerobic bacterial infection and the updated version of antibiotic sensitivity to each organism. This has helped us in choosing appropriate drugs in managing patients with ear discharge so as to prevent further antibiotic resistance and to arrive at a Institutional antibiotic policy.

**KEYWORDS:** Chronic otitis media, Otitis externa, *Pseudomonas aeruginosa*, Ciprofloxacin.

### I. INTRODUCTION

Ear infection is a common problem for both children and adults especially in developing countries and ear discharge is one of the commonest symptoms of ear infection. Ear infection can be acute or chronic and includes otitis externa which is an infection of the external auditory canal and otitis



media which is an infection of the middle ear. About 65-330 million people suffer from ear infection worldwide and 60% of them develop significant hearing impairment. This accounts for major health and economic problems especially in developing countries like India where resources for diagnosis and treatment are limited. Acute otitis externa also known as “swimmers’ ear” or tropical ear and involves rapid onset (<48hrs) of signs and symptoms of ear canal inflammation associated with exposure of ear canal to water or local trauma. Conditions such as congenitally narrow canal or canal narrowed by exostoses, skin conditions such as eczema, seborrhoea or psoriasis, trauma to ear with ear plugs, hearing aids, wax removal attempts, conditions such as immunocompromised state such as diabetes and HIV can predispose to malignant otitis externa. Chronic otitis externa represents a state of prolonged inflammation of the external auditory canal, although the causes of this inflammation maybe several mechanisms like allergen exposure, systemic disease, chronic infections and local factors. Early acute otitis externa present with pruritus, erythema with scanty clear discharge. In chronic otitis externa, ear canal is mildly to moderately erythematous with scant clear discharge.<sup>16</sup>

Acute suppurative otitis media is acute inflammation of middle ear by pyogenic organisms. Chronic otitis media is a chronic infection of the mucoperiosteal lining of the middle ear cleft involving Eustachian tube, tympanic cavity and mastoid air cells that may present with recurrent or persistent mucoid or mucopurulent ear discharge or otorrhoea through a tympanic membrane perforation of at least 6 weeks of duration. Chronic otitis media is a disease of multiple etiological factors which is well known for its persistence and recurrence in spite of treatment. It is a destructive and persistent disease and may lead to irreversible changes in the ear and may or may not be associated with serious extra cranial or intra cranial complications and involve considerable morbidity. It is well known that organisms potentially pathogenic to middle ear can be found in the external auditory canal and can cause the same.<sup>17</sup>

The aetiology and prevalence of ear infection differs with geographical areas and climatic conditions. However normal flora of the skin such as pseudomonas aeruginosa, staphylococcus aureus, Proteus mirabilis, Klebsiella pneumonia and E.coli that can easily enter through perforated tympanic membrane are reported as main agents of otitis media. Poly microbial nature of external auditory canal cause otitis by organisms like staphylococcus aureus and pseudomonas

aeruginosa being the commonest and by Pepto streptococcus, Bacteroides.

Ear infection can be self-limiting, but if left untreated it can cause serious complications such as recurrent otitis media, persistence of middle ear effusion, hearing impairment, mastoiditis, meningitis, brain abscess, middle ear atelectasis, adhesive otitis media, tympanosclerosis, ossicular erosion/fixation, petrous apicitis, chronic otomastoiditis, labyrinthitis and facial paralysis. Although the disease can affect all age groups, infants and young children are more commonly affected due to short Eustachian tube that allows easy entry of microorganisms to the nasopharynx.<sup>16</sup>

Development and spread of resistant bacteria due to over and indiscriminate use of antibiotics is a global public health threat. Due to limited laboratory diagnosis in developing countries, physicians often forced to prescribe broad spectrum antibiotics for most infections that lead to emergence of drug resistant bacterial strains. Hence current information on microbial resistance and prevalence of pathogenic bacteria needs to be available at national and local levels to guide rational use of existing antimicrobials in an Institutional level.

## II. MATERIALS AND METHODS

1. **Study Design:** Hospital based cross sectional study

2. **Study Setting:** a) Department of ENT b) Department of Microbiology Government Medical college, Kannur.

3. **Study Period:** 12 months

4. **Sample Size:** 140 cases.

5. **Sampling Method:** Consecutive sampling – Consecutive patients attending the outpatient and inpatient department of ENT meeting the inclusion criteria will be recruited for the study.

6. **Study Population:** Patients attending the outpatient department of ENT, who are clinically diagnosed with Otitis Media or otitis externa age group >18years and both sex and who fulfil the criteria of inclusion

**Inclusion criteria:**

All patients with ear discharge who are diagnosed as having otitis media or otitis externa who have not used topical/systemic antibiotics in the current episode of ear discharge.

**Exclusion Criteria:**

Any person not willing to be included in the study.

7. **Study variables:** Independent Variables - Age, Sex, Occupation, Socio-economic status.

8. **Data Collection Tools:** Sterile cotton ear swab; Semi-structured proforma



**9. Collection of samples:** Ear discharge is collected under strict aseptic precautions in clinically diagnosed cases of Otitis Media and otitis externa (fulfilling the inclusion criteria). Under microscope, excess discharge is sucked out from the external acoustic canal. Then with a sterile cotton twin swab (sterilized cotton twin swabs provided by department of Microbiology at out-patient department of ENT), specimen is collected and sent to department of Microbiology, immediately by the principal investigator under aseptic

### III. RESULTS

The total number of study population included 140 patients with ear discharge. In our study, 75 patients (53.57%) were men and 65 patients (46.43%) were females. Out of the 140 patients, majority was in the age group 18-30, and mean age was 51 years. Most of the patients belonged to lower socioeconomic status (47.86%).

Observing the symptomatology with which patients presented along with ear discharge, 48 patients had hearing impairment (34.29%), 42 had ear ache (30%) and 42 had ear fullness (30%) in and ear itching in 30 patients (21.43%). Most common ear involved was right ear (58.57%).

We observed in the history of past illness, 70 (50%) patients had Diabetes Mellitus, 29 (20.71%) had history of recurrent upper respiratory tract infection followed by tuberculosis in 15 (10.71%) patients.

21 (15%) patients gave a history of ear surgery in past.

Most of the patients who presented with ear discharge has been diagnosed with chronic suppurative otitis media-mucosal disease (95%) followed by 2 (1.43%) patients with Chronic otitis media-squamosal type and 6 (4.29%) patients with otitis externa.

The most common organism isolated in our study was *Pseudomonas aeruginosa* in 43 patients (30.71%), followed by *Staphylococcus aureus* in 37 patients (26.43%), *Klebsiella* in 37 patients (26.43%) followed by *E. coli* in 19 patients (13.57%) and *Proteus* in 4 patients (2.86%).

Antibiotic sensitivity pattern of all the five organisms isolated were assessed and tabulated. The most common topical and systemic antibiotics used in our institution were assessed for sensitivity which includes Amoxicillin clavulanate, Cefotaxime, Piperacillin-tazobactam, Ceftazidime, Cefepime-sulbactam, Ciprofloxacin, Ofloxacin, Gentamycin, Azithromycin, Clindamycin, Linezolid, Meropenem, Chloramphenicol,

precautions. Antibiotic Susceptibility: Susceptibility of bacterial isolates to the commonly used antibiotics is done by Kirby-Bauer disc diffusion method, which shall be carried out in the department of Microbiology.

**10. Data Analysis:** The data collected will be entered into Microsoft Excel and analysed using Statistical Package for Social Sciences software (SPSS) (version 16.0, SPSS, Inc, Chicago, IL, USA).

Tetracycline, Cotrimoxazole.

The most common isolated organism was *Pseudomonas* and was fortunately found to have high sensitivity to Piperacillin-Tazobactam (86.05%), Meropenem (83.72%), Cefepime-sulbactam (81.4%) and Ceftazidime (79.07%) and found to have relatively lower sensitivity to commonly used topical antibiotics like Ciprofloxacin (67.44%), Chloramphenicol (55.81%) and Gentamycin (53.49%).

The second most commonly isolated organism, *Staphylococcus aureus* was found to have high sensitivity to commonly used topical antibiotic Ofloxacin (83.78%) and Ciprofloxacin (78.38%). Systemic antibiotics including Linezolid (86.49%) and Meropenem (89.19%) also showed high sensitivity. Tetracycline (67.57%) and Cotrimoxazole (75.68%) also showed high sensitivity.

*Klebsiella* and *Staphylococcus aureus* were isolated in equal numbers and were found to be resistant to multiple antibiotics. Piperacillin-tazobactam (64.86%) and meropenem (75.68%) were the only antibiotics found to have high sensitivity and it was found relatively resistant to multiple topical antibiotics.

*E. coli* was found to have high sensitivity to topical antibiotics like Gentamycin (78.95%), Ciprofloxacin (73.68%), Ofloxacin (73.68%) and Chloramphenicol (63.16%). Sensitivity of *E. coli* to systemic antibiotics was found to be high which includes Piperacillin-tazobactam (94.74%) and Meropenem (89.47%).

*Proteus* was found to have high sensitivity to Chloramphenicol (75%) among topical antibiotics and Piperacillin-Tazobactam (75%) among systemic antibiotics.

### IV. DISCUSSION

We did a Hospital based Cross sectional study describing the aerobic bacteriological profile of ear discharge in patient presenting to the department of Otorhinolaryngology. We collected the ear swabs from patients satisfying our inclusion



criteria, samples were collected under strict aseptic precautions and were sent to the department of Microbiology for bacterial culture and sensitivity testing. Patients were given a proforma containing the basic sociodemographic questions, symptomatology and were assessed clinically to determine the degree of hearing loss. Extensive literature review was done and we selected few studies for comparison and assessment.

Prakash et al.<sup>1</sup> carried out a study in tertiary hospital in Chennai and found out that out of 80 patients with unilateral or bilateral ear discharge, most common organism isolated was *Staphylococcus aureus* (41.25%). Second common was *Pseudomonas aeruginosa* (37.5%). In our study the most common organism was *Pseudomonas aeruginosa* followed by *Staphylococcus aureus*. In the study by Prakash et al, *Pseudomonas sp* showed 88% susceptibility to Gentamycin, 60-68% to Cephalosporins and 60-63% to Fluoroquinolones. 18 percent of Methicillin resistant *Staphylococcus aureus* was highly sensitive to Amikacin, Chloramphenicol, Piperacillin. In our study *Pseudomonas* species was found sensitive to Gentamycin in 67.44%, to Cefotaxime in 65.12%, to Ceftazidime in 79.07%, to Cefaperazone-sulbactam in 81.04% and to fluoroquinolones in 67.44% similar to study by Prakash et al. Among staphylococcus isolated in our study 78.38% were found sensitive to Chloramphenicol, 83.78% to Ofloxacin and 70.27% to Gentamycin.

Shilpa et al.<sup>2</sup> conducted a bacteriological study of acute otitis externa in patients attending a tertiary care hospital in Northern Karnataka and found out that 88 out of 103 samples were positive for bacterial growth by culture, the most common bacterial isolate was *Staphylococcus aureus* 26 (46%), followed by *Klebsiella pneumoniae* 15 (26.7%) similar to our study in which the most common organism is staphylococcus aureus among patients with otitis externa. In their study *Staphylococcus aureus* showed 0% sensitivity to Ampicillin followed by 26.9% to Erythromycin, 30% to Ciprofloxacin and maximum sensitivity i.e. 92.3% to Gentamycin and our study showed *Staphylococcus* isolates were 0% sensitivity to Azithromycin, only 50% sensitivity to Ciprofloxacin, 50% to Gentamycin and only 17% to Amoxicillin clavulanate. Our study hence showed higher resistance to Gentamycin in *Staphylococcus* infection.

Yousuf et al.<sup>3</sup> conducted a study out of 125 patients, most common organism isolated was *Staphylococcus aureus* (48%), 8 percent were methicillin resistant, second most common

organism was *Pseudomonas aeruginosa* (16%) again contrary to our study which showed *Pseudomonas* to be the most common organism isolated followed by *Staphylococcus* and *Klebsiella*. In their study among *Staphylococcus aureus* 72 percentage of isolates were sensitive to Gentamycin, 55 percentage to Ciprofloxacin and 36% to Cephalosporins and In our study among *Staphylococcus aureus* isolates 70.27% were sensitive to Gentamycin, 78.38% to Ciprofloxacin and 56.76% to Cefotaxime similar to study conducted by Yousuf et al. In their study among *Pseudomonas aeruginosa* 72% isolates were sensitive to Piperacillin/Tazobactam, 48% to Ciprofloxacin and 32% to Ceftazidime/Ceftriaxone. Of the three antibiotics commonly available as topical eardrops, Ciprofloxacin and Gentamycin has the highest susceptibility rate similar to our study. In our study among isolates of *Pseudomonas* 86.05% were sensitive to Piperacillin/Tazobactam, 67.44% sensitive to Ciprofloxacin and 79.07% sensitive to Ceftazidime. Our study showed *Pseudomonas* to have better sensitivity to Piperacillin/Tazobactam, Ciprofloxacin and Ceftazidime.

Rakhee T et al.<sup>4</sup> conducted a study in discharging ear in a tertiary care hospital in Andhra Pradesh, out of 71 patients most common organism isolated was *Pseudomonas aeruginosa* and *Staphylococcus aureus* followed by coagulase negative *Staphylococci*, *Klebsiella*, *Proteus* and *E. coli*. In their study among topical antibiotics Ciprofloxacin was sensitive in 91.52% and Gentamycin in 89.6%. *Pseudomonas* showed high sensitivity to Ciprofloxacin (92.3%), Gentamycin (84.61%) and Piperacillin (88.46%) in their study. Our study showed similar sensitivity pattern in *Pseudomonas* for Piperacillin-Tazobactam (86.05%) and lesser sensitivity to Ciprofloxacin (67.44%) and Gentamycin (53.49%). In their study *Staphylococcus aureus* was sensitive to Gentamycin in 90.47%, to Ciprofloxacin in 90.47%, to Clindamycin in 85.7% and to Ofloxacin in 71.42%. Among *Staphylococcus* isolated in our study Gentamycin was sensitive in 70.27%, Ciprofloxacin to 78.38%, Clindamycin to 45.95% and Ofloxacin to 83.28% similar to their study. In their study among majority of Coagulase positive *Staphylococcus aureus* isolated were resistant to ampicillin (66.66%) and penicillin (76.19%) similarly in our study resistance was found to Amoxicillin clavulanate in 75.68%.

Yeli et al.<sup>5</sup> did a study in 2013 on Bacterial isolates and their antibiotic susceptibility in chronic discharging ears in UAE population and found out that from a sample size of 105 patients, a



total of 102 microbial isolates were obtained comprising 14 Gram +ve, 85 Gram -ve and 3 fungi. The predominant organisms were *Pseudomonas aeruginosa* (65.7%) followed by *Staphylococcus aureus* (8.5%) in accordance with our study.

Malkappa et al.<sup>6</sup> studied on aerobic bacterial isolates and their antibiotic susceptibility pattern in Chronic suppurative otitis media in Andhra Pradesh, India on 130 cases in 2010-11 and it showed predominance of Gram negative bacilli (69.84%). In their study the highest incidence (45.24%) was that of *Pseudomonas aeruginosa* and *Staphylococcus aureus* (22.22%) followed by others like *Klebsiella*, *Escherichia coli* and *Proteus* spp. This study was in tandem with our study in case of predominance of organisms isolated. Antibiotic sensitivity was also similar to our study. In their study *Pseudomonas* showed lowest resistance to Cefaperazone (24%), Cefotaxime (45%), Ciprofloxacin (21%) and Gentamycin (35%). In our study resistance of *Pseudomonas* to Cefaperazone was 13.95% and Cefotaxime was 18.60% , to Ciprofloxacin was 32.56% and to Gentamycin was 39.53% similar to study by Malkappa et al.

Prakash et al.<sup>7</sup> commented on Microbiology of Chronic Suppurative Otitis Media in a Tertiary Care Setup of Uttarakhand State, India in 2012 on 204 cases that the most common organisms isolated were *Staphylococcus aureus* (48.69%) and *Pseudomonas aeruginosa* (19.89%) among the 191 aerobic isolates. The mean age of the patients was 25.6 and the peak incidence of CSOM was observed in age group between 0 year and 20 years (51%) in their study. The mean age of patients in our study was 51, minimum age being 18 and maximum age being 90. Their study showed females (53.92%) were more commonly affected than males (46.08%) and the sex ratio female:male was 1.2:1. In our study to the contrary there was a male preponderance and male to female ratio was 1.1:1. As our study involved random selection of cases the predominance of male patients over female may be only an incidental finding.

Afolabi et al.<sup>8</sup> conducted a study on Pattern of bacterial isolates in the middle ear discharge of patients with Chronic suppurative otitis media in a tertiary hospital in North central Nigeria and it has shown that from a total of 134 cases, the gram stain showed predominantly gram negative organisms (71.6%) while Gram positive is about 27.6% and about 0.7 % were contaminants containing fungal and Gram negative agents. *Pseudomonas aeruginosa* was the commonest middle ear pathogenic organism (31.3%) followed

by *Klebsiella*Spp (23.9%) isolated in their study in accordance with our study. Their study showed high sensitivity to Ciprofloxacin i.e. 88% in *Pseudomonas* species, while our study showed sensitivity of Ciprofloxacin to *Pseudomonas* to be 67.44%. In their study Ciprofloxacin was found to be sensitive in 87% of *Staphylococcus aureus*, 66% of *Klebsiella*, 66.6% of *E. coli* and 50% of *Proteus* . Our study showed Ciprofloxacin to be sensitive in 78.38% of *Staphylococcus*, 40.54% of *Klebsiella*, 73.68% of *E. coli* and 50% of *Proteus* isolated in agreement with study conducted by Afolabi et al.

Parveen et al.<sup>9</sup> did a study on Aerobic bacteriology of Chronic Suppurative Otitis Media (CSOM) in Bhakar Medical College, R.R Dist, Andhra Pradesh in 2011 on 100 cases suggested that the most common etiological agent for CSOM were aerobic organisms like *Pseudomonas aeruginosa* (29.72%) followed by *Staphylococcus aureus* and *E. coli*. (21.62%) in tandem to our study.

Nazir et al.<sup>10</sup> studied on Aerobic bacteriology of chronic suppurative otitis media: a hospital based study in SMHS Hospital, Kashmir in 2013 on 154 cases and revealed that the most frequent aerobic organism isolated was *Pseudomonas aeruginosa* (38.23%) followed by *Staphylococcus aureus* (35.29%) and *Proteus* species (9.80%) in accordance with our study.

Tanmoy et al.<sup>11</sup> did a study on The Bacteriological Profile of Chronic Suppurative Otitis Media in Agartala and showed that out of 97 patients, aural swabs were collected from 100 ears and bacteria could be isolated in 53 cases and 47 swabs were culture negative. A significant observation in their study is that 75 patients out of the 97 patients, who presented with CSOM, were below age of 30 years in accordance with our study. In their study *Pseudomonas* 20 (37.73%) was the commonest bacteria isolated followed by *Escherichia coli* 11 (20.75%) and *Staphylococcus aureus* 11 (20.75%) followed by *Proteus* species 9 (16.98%) and last by *Klebsiella* species 2 (3.77%). Similarly in our study *Pseudomonas* was the most common isolate. On the contrary to their study we obtained higher isolates of *Klebsiella*.

Dinesh et al.<sup>12</sup> conducted a study in Pimpri, Pune and found that most common organism isolated was *Staphylococcus aureus* (35.15%) , second most common organism was *Pseudomonas aeruginosa* contrary to our study in which *Pseudomonas* was the most common organism followed by *Staphylococcus aureus* and *Klebsiella*. In their study, for *Staphylococcus aureus* 100% sensitivity was found to linezolid and 86.27% of the isolates were sensitive to



clindamycin while least sensitivity was found to ampicillin. In our study high sensitivity was seen in Linezolid (86.5%) and lesser sensitivity to Clindamycin (45.9%) for *Staphylococcus aureus*. They have found that *Pseudomonas aeruginosa* showed highest sensitivity to Imipenem (88.57%) followed by Piperacillin –Tazobactam (85.71%) followed by Ceftazidime and Cefepime (82.86%). *Pseudomonas* was least sensitive to Ciprofloxacin (68.57%) in their study. Similarly our study showed high sensitivity to Piperacillin – Tazobactam (86.05%) and Cephalosporins(>80%) and lesser sensitivity to Fluoroquinolones(67.44%).

In their study *Proteus* spp. showed highest sensitivity to Imipenem, Piperacillin-Tazobactam (84.37% each), followed by Piperacillin, Amikacin and Ciprofloxacin (78.12% each), moderate sensitivity was found in Co-trimoxazole (46.87%) and Tetracycline (40.63%). And in our study, *Proteus* showed higher sensitivity only to Piperacillin-Tazobactam (75%) and Chloramphenicol (75%) and lower sensitivity to Fluoroquinolones (50%), Cotrimoxazole(25%) and Tetracycline(50%).

Smitha et al.<sup>13</sup> conducted a study of aerobic bacteriological profile of Chronic suppurative otitis media in a tertiary care hospital, South India and found out that out of 520 samples collected, 474 samples showed growth. Their study showed age group of the patients ranged from 6 months to 80 years, with highest prevalence seen in 0-20 years which is in agreement with our study. Out of 520 cases in their study, 275 males and 245 females were affected again in accordance with our study showing male preponderance. *Staphylococcus aureus* was the predominant isolate followed by *Pseudomonas* species in their study but our study showed *Pseudomonas* as the predominant organism. *Pseudomonas* species was seen highly sensitive to Aminoglycoside and Imipenem followed by Piperacillin and are least sensitive to Ciprofloxacin and Cephalosporins in their study and our study showed *Pseudomonas* to have high sensitivity to Piperacillin Tazobactam, Meropenem and Cephalosporins and lesser sensitive to Aminoglycosides and Fluoroquinolones. *Staphylococcus aureus* isolates were found to be 100% sensitive to Linezolid followed by Aminoglycosides, Levofloxacin, Co-trimoxazole and Clindamycin in their study, while sensitivity to antibiotics in our study was similar as Linezolid showed high sensitivity. In our study *Staphylococcus* showed maximum sensitivity to Meropenem.

Sriram et al.<sup>14</sup> conducted a study Bacteriological profile and their antibiotic

susceptibility pattern in Chronic suppurative otitis media (TTD) in a tertiary care hospital and found out that *Pseudomonas* species was the most predominant organism, which was seen in 19 patients (38%) followed by *Escherichia coli* (22%), *Staphylococcus aureus* (18%), *Klebsiella* species (10%). *Pseudomonas aeruginosa* showed sensitivity of 100% to Piperacillin -Tazobactam, 57.9% to Gentamycin, 52.6% to Pefloxacin. Our study showed sensitivity to Piperacillin and Tazobactam in 86.05%, sensitivity to Gentamycin in 53.45%, sensitivity to Ciprofloxacin in 67.44% similar to their study.

*E. coli* showed sensitivity of 72.7% for Piperacillin -Tazobactam in their study and in our study sensitivity of Piperacillin-Tazobactam to *E. coli* was 94.74%.

*Staphylococcus aureus* showed a sensitivity of 77.8% for Piperacillin tazobactam in their study which was comparatively lower in our study. *Klebsiella* species showed a sensitivity of 80% to Piperacillin-tazobactam in their study and our study showed 64.86% of *Klebsiella* to be sensitive to Piperacillin-Tazobactam.

## V. CONCLUSION

We have conducted this study considering the present scenario wherein antibiotic resistance is on a rise. The inappropriate use and prescription of antibiotics result in development of resistance to the commonly used antibiotics.

In our study we found that 53.57% of patients presenting with ear discharge were men and 46.43% were females which could be an incidental finding as gender predisposition was not mentioned in any literature review. Out of the 140 patients, majority was in the age group 18-30, and mean age was 51 years. Most of the patients belonged to lower socioeconomic status. The symptomatology with which patients presented includes in the descending order - ear discharge (100%) followed by hearing impairment in 34.29% followed by ear ache and ear fullness in 42% of patients and the least symptom was ear itching in 30%. Most common ear involved was right ear (58.57%). Majority of the patients were diagnosed with chronic otitis media-mucosal type followed by squamousal type and otitis externa in only 6 patients.

The most common organism isolated in our study was *Pseudomonas aeruginosa* (30.71%), followed by *Staphylococcus aureus* (26.43%), *Klebsiella* (26.43%), *E. coli* (13.57%) and *Proteus* (2.86%).

The most common isolated organism was *Pseudomonas* and was fortunately found to have



high sensitivity to Piperacillin Tazobactam (86.05%), Meropenem (83.72%), Cefaperazonesulbactam (81.4%) and Ceftazidime (79.07%). Pseudomonas was found to have relatively lower sensitivity to commonly used topical antibiotics like Ciprofloxacin (67.44%), Chloramphenicol (55.81%) and Gentamycin (53.49%). Comparing to other organisms Pseudomonas showed least resistance to Amoxicillin-clavulanate in our study.

The second most commonly isolated organism, Staphylococcus aureus was found to have high sensitivity to commonly used topical antibiotic like Ofloxacin (83.78%) and Ciprofloxacin (78.38%). Tetracycline (67.57%) and Cotrimoxazole (75.68%) showed similar sensitivity. Systemic antibiotics including Linezolid (86.49%) and Meropenem (89.19%) also showed high sensitivity. Staphylococcus aureus was found highly resistant to Amoxicillin clavulanate.

Klebsiella and Staphylococcus aureus (26.43%) were equally isolated from the study sample and was found resistant to multiple antibiotics. Piperacillin-tazobactam (64.86%) and Meropenem (75.68%) were the only antibiotics found to have high sensitivity to Klebsiella and it was found relatively resistant to multiple topical antibiotics like Ciprofloxacin (51.35%), Ofloxacin (48.65%), Chloramphenicol (51.35%) and Cotrimoxazole (49.95%).

E. Coli was found to have high sensitivity to topical antibiotics which includes Gentamycin (78.95%), Ciprofloxacin (73.68%), Ofloxacin (73.68%) and Chloramphenicol (63.16%). Sensitivity to systemic antibiotics in E. Coli infection was found to be high which included Piperacillin-tazobactam (94.74%) and Meropenem (89.47%). E. coli similar to other organisms was found to have high resistance to Amoxicillin clavulanate.

Proteus was found to be equally resistant to Amoxicillin clavulanate and Cefotaxime (75%).

Proteus was found to have high sensitivity to Chloramphenicol (75%) among topical antibiotics and Piperacillin-Tazobactam (75%) among systemic antibiotics.

Knowledge of the pathogens and antibiotic sensitivity pattern responsible for ear discharge and choosing suitable antibiotics according to susceptibility tests is of utmost importance in guiding the management of the disease and helps to reduce intracranial and extra cranial complications that may occur in Chronic otitis media.

It is the duty of the prescribing physician to advise patients regarding completion of

prescribed duration of antibiotics without interruption of the course. This will not only help in minimising the complications, but also help in preventing the emergence of resistant strains.

#### DECLARATIONS

FUNDING - NIL

CONFLICT OF INTEREST – NIL

ETHICAL APPROVAL – The study was conducted in accordance with the ethical standards of Institutional and /or National research committee.

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