



STUDY OF DRUG SENSITIVITY PROFILE OF PATIENTS WITH EAR INFECTIONS IN LOWER HIMALAYAN REGION.

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ABSTRACT

BACKGROUND: Ear infections are one of the major causes of antibiotic resistance as over the counter use of medications in patients with ear discharge.

AIM: To study the drug sensitivity profile of patients with ear infections in lower himalayan region.

MATERIAL AND METHODS: 100 patients with ear infections/ear discharge were included in the study. Aural discharge samples collected through a sterile culture sensitivity tube and sent to microbiological lab in the Regional Hospital Bilaspur (SRL Diagnostics)

RESULTS: Out of total 100 ears swab samples examined Staphylococcus Aureus(35%) was the commonest infecting organism followed by Pseudomonas Aeruginosa(25%). Gram positive organisms were found resistant to Benzyl Penicillin (93.18%), Erythromycin(81.81%), Ciprofloxacin / levofloxacin(83.72%) patients and sensitive to Tetracyclin(90.47%) patients, Gentamycin(93.18%) patients and Linezolid(97.36%) patients. Gram negative organisms were found sensitive to Pipracillin/Tazobactam(91.17%) patients, Cefoperazone (87.17%) patients and Amikacin(94.59%) patients.

CONCLUSION: Prevalence of ear infection is a major health problem in developing countries due to the poor living standard and hygienic conditions. Ear infections are one of the major causes of antibiotic resistance.

KEYWORDS : Ear Infection, Infective Organisms, Drug Sensitivity, Drug Resistance.

INTRODUCTION

An ear infection is a bacterial, viral and fungal infection of the external or middle ear. This infection causes inflammation which further leads to various symptoms such as ear ache, ear discharge decreased hearing itching and fever etc. Various types of ear infections are acute suppurative otitis media (ASOM), chronic suppurative otitis media (CSOM), otomycosis, otitis externa, external auditory canal furunculosis etc. An ear infection often begins with a cold, flu or allergic response. These cause inflammatory response and increase mucous productions in the mucosal lining and lead to the slow clearance of fluid by Eustachian tubes. Although ear infection can be a self-limiting, if left untreated, it can cause serious complications such as recurrent acute OM, persistence of middle ear effusion, hearing impairment, mastoiditis, meningitis, chronic OM, brain abscess and sepsis. Despite the natural protective mechanisms of the cerumen (wax) which has antibacterial properties, normal skin flora such as Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae and Escherichia coli can gain entry through perforated ear.

The study was conducted as a prospective study in the department of otorhinolaryngology and head and neck surgery, Regional Hospital Bilaspur, Himachal Pradesh, India from June 2019 to November 2019. During this period 100 patients with ear infections/ear discharge were included in the study.

STUDY POPULATION

Study group include general population presenting in out patient department of Regional Hospital Bilaspur fulfilling inclusion and exclusion criteria in both sexes as given below.

INCLUSION CRITERIA :

- Patients with complaints of unilateral or bilateral ear discharge.
- Patients giving consent for study.
- Patients below age 100 years.
- Patients above the age of 1 year.

EXCLUSION CRITERIA :

- Age > 100 years or < 1 year.
- Patients without ear discharge.
- Patients with outer ear defects such as complete stenosis or atresia of external auditory canal.

METHODOLOGY-

The enrolled patients are explained about the complete study procedure in their language.

1. Detailed history obtained from study participants regarding ear discharge, unilateral or bilateral involvement, duration of ear discharge, ear discharge, earache, decreased hearing, tinnitus, hearing loss, previous surgical procedures.
2. Clinical examination of patient is done including general physical examination and systemic examination for assessing the general condition of participants.
3. A thorough ENT examination is done including ear examination, throat examination, nasal examination.
4. Aural discharge samples collected through a sterile culture sensitivity tube and sent to microbiological lab in the Regional Hospital Bilaspur (SRL Diagnostics) and culture sensitivity reports collected from the patients during follow up visits.

STATISTICAL ANALYSIS

Data were entered in Microsoft Excel sheet. The continuous variables were presented using mean / median. For categorical variables proportions were used. Means were tested using student t test and proportions using chi square and z test. Level of significance was set at $p < 0.05$. The statistical analysis was done using Epi Info v7 software.

RESULTS

A total of 100 patients of either sex with complaint of ear discharge were included in the study and their demographic profile, clinical presentation studied followed by microbiological culture and sensitivity testing of ear discharge.

Twenty two (22%) patients were aged 0-20 years. Thirty four (34%) patients were in the age group 21-40 years, twenty four (24%) patients were in the age group 41-60 years, Sixteen (16%) patients were in the age group 61-80 years and four (4%) patients were in the age group 81-100 years. Thirty six (36%) patients were male adults, fifty one (51%) patients were female adults, seven (07%) patients were male child, six (06%) patients were female child.

Forty six (46%) patients were diagnosed as acute suppurative otitis media (ASOM), fifty two (52%) patients were diagnosed as chronic suppurative otitis media (CSOM) and two (02%)

patients were diagnosed as external auditory canal furunculosis (EAC furunculosis).

Table 1: Frequency distribution of infective organisms on the basis of gram staining in the patients presenting with ear discharge.

Gram positive organisms	Gram negative organisms
Staphylococcus aureus (35%)	Pseudomonas aeruginosa (25%)
Staphylococcus epidermidis (06%)	Klebsiella pneumoniae (05%)
Staphylococcus hemolyticus (01%)	Escherichia coli (05%)
Staphylococcus saprophyticus(01%)	Enterobacter cloacae(01%)
Staphylococcus xylosum (01%)	Burkholderia cepacia(02%)
	Acinetobacter baumannii(01%)
	Proteus mirabilis(01%)
	Providentia rettgeri(01%)
Total : 44 (44%)	Total : 41 (41%)

Fungal (mould) : 10 (10%)
No growth seen : 05 (05%)

Gram positive organisms are detected in forty four (44%), Gram negative organisms detected in forty one (41%), fungal infection detected in ten (10%) and no organism detected in five (5%) of the aural swab samples. Acinetobacter baumannii was present in one (01%) patient, Burkholderia cepacia in two (02%) patients, Enterobacter cloacae was present in one (01%) patient, Escherichia coli in five (05%) patients, Klebsiella pneumoniae in five (05%) patients, Mould in ten (10 %) patients, Proteus mirabilis in one (01%) patient, Providentia rettgeri in one (01%) patient, Pseudomonas aeruginosa in twenty five (25%) patients, Staphylococcus aureus in thirty five (35%) patients, Staphylococcus epidermidis in six (06%) patients, staphylococcus hemolyticus in one (01%) patient, Staphylococcus saprophyticus in one (01%) patient, Staphylococcus xylosum in one (01%) patient and no growth seen in five (05%) patients.

Table 2: Drug sensitivity profile of gram positive organisms in the patients presenting with ear discharge.

Name of drug	penicillin/ampicillin	Tetracycline	Erythromycin	Gentamicin	Clindamycin	Tmp/smx	Amoxyclav	Ciprofloxacin/levofloxacin	linezolid
Sensitive/tested	03 /44	38 /42	08 /44	41 /44	15 /43	22 /44	0	07 /43	37 /38
Resistant/tested	41 /44	04 /42	36 /44	01 /44	28 /43	22 /44	03 /03	36 /43	01 /38
Intermediate	0	0	0	02 /44	0	0	0	0	0

Above table 5 shows drug sensitivity profile of gram positive organisms in the patients presenting with ear discharge. Benzyl penicillin was found to be sensitive in 03/44 (6.81%) patients and resistant in 41/44 (93.18%) patients. Tetracycline was found to be sensitive in 38/42 (90.47%) patients and resistant in 04/42 (9.52%) patients. Erythromycin was found to be sensitive in 08/44 (18.18%) patients and resistant in 36/44 (81.81%) patients. Gentamicin was found to be sensitive in 41/44 (93.18%) patients, resistant in 1/44 (2.27%) patients and intermediate sensitive in 2/44 (4.54%) patients. Clindamycin was found to be sensitive in 15/43 (34.88%) patients and resistant in 28/43(65.11%) patients. Trimethoprim /Sulphamethoxazole was found to be sensitive in 22/44 (50%) patients and resistant in 22/44 (50%) patients. Amoxyclav was found to be resistant in all three (100%) patients tested. Ciprofloxacin /levofloxacin was found to be sensitive in 07/43 (16.27%) patients and resistant in 36/43 (83.72%) patients. Linezolid was found to be sensitive in 37/38 (97.36%) patients and resistant in 01/38 (2.63%) patients.

Table 3: Drug sensitivity profile of gram negative organisms in the patients presenting with ear discharge.

Name of drug	Pipracillin / Tazobactam	Cefoperazone	Amikacin	Gentamicin	Imipenem	Cefepime	Ciprofloxacin	Levofloxacin
Sensitive/tested	31 /34	34 /39	35 /37	37 /40	33 /37	29 /31	30 /41	15 /24
Resistant/tested	02 / 34	03 /39	02 /37	03 /40	03 /37	01 / 31	09 /41	06 /24
Intermediate	01 / 34	02 / 39	0	0	01 / 37	01 /31	02 /41	03 /24

Above table 3 shows drug sensitivity profile of gram negative organisms in the patients presenting with ear discharge. Pipracillin/Tazobactam was found to be sensitive in 31/34 (91.17%) patients, resistant in 02/34 (5.88%) patients and intermediate sensitive in 01/34 (2.94%) patients. Cefoperazone was found to be sensitive in 34/39 (87.17%) patients, resistant in 03/39 (7.69%) patients and intermediate sensitive in 02/39 (5.12%) patients. Amikacin was found sensitive in 35/37 (94.59%) patients and resistant in 02/37(5.40%) patients. Gentamicin was found to be sensitive in 37/40 (92.50%) patients and resistant in 03/40 (7.50%) patients. Imipenem was found to be sensitive in 33/37 (89.18%) patients, resistant in 03/37(8.10%) patients and intermediate in 01/37 (2.70%) patients. Cefepime was found to be sensitive in 29/31 (93.54%) patients, resistant in 01/31 (3.22%) patients and intermediate sensitive in 01/31 (3.22%) patients. Ciprofloxacin was found to be sensitive in 30/41 (73.17%) patients, resistant in 09/41 (21.95%) patients and intermediate sensitive in 02/41 (4.87%)

sensitive in 38/42 (90.47%) patients and resistant in 04/42 (9.52%) patients. Erythromycin was found to be sensitive in 08/44 (18.18%) patients and resistant in 36/44 (81.81%) patients. Gentamicin was found to be sensitive in 41/44 (93.18%) patients, resistant in 1/44 (2.27%) patients and intermediate sensitive in 2/44 (4.54%) patients. Clindamycin was found to be sensitive in 15/43 (34.88%) patients and resistant in 28/43(65.11%) patients. Trimethoprim /Sulphamethoxazole was found to be sensitive in 22/44 (50%) patients and resistant in 22/44 (50%) patients. Amoxyclav was found to be resistant in all three (100%) patients tested. Ciprofloxacin /levofloxacin was found to be sensitive in 07/43 (16.27%) patients and resistant in 36/43 (83.72%) patients. Linezolid was found to be sensitive in 37/38 (97.36%) patients and resistant in 01/38 (2.63%) patients. Above results were similar to Dilshad A et al⁵ which studied the bacteriological profile and its antibiotic susceptibility pattern of ear infection in patients attending tertiary care hospital & the antimicrobial resistance pattern and shows that Gram positive bacteria shows >90% sensitivity to Cephalexin, Linezolid, Gentamicin & Tetracycline. >80% sensitivity Cloxacillin, Cefotaxime, Linco mycin, Co-trimoxazole, Tetracycline & Amoxyclav. Hailu D et al⁶ in a similar study observed that high level of antimicrobial resistance rates were observed for amoxicillin/clavulanic acid, ampicillin and penicillin whereas ciprofloxacin, ceftriaxone, chloramphenicol, cotrimoxazole, gentamicin and amikacin were found effective against the isolated bacteria. Aerobic bacterial otitis media linked with high levels of resistance against amoxicillin/clavulanic acid and amp

DISCUSSION

Antibiotic resistance is rising to dangerously high levels in all parts of the world. New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases. Ear infections are one of the major causes of antibiotic resistance as over the counter use of medications in patients with ear discharge is prevalent in the area of study. In our study Gram positive organisms (44%) were found resistant to Benzyl Penicillin in 41/44 (93.18%) and sensitive only in 03/44 (6.81%). Tetracycline was found to be

icillin is major health problem in the study area. Moreover, considerable level of oxacillin resistant *S. aureus* suggests the diffusion of methicillin resistant *S. aureus* in the community. Above results were in line to results observed in our study.

We observed the drug sensitivity profile of gram negative organisms in the patients presenting with ear discharge as Pipracillin/Tazobactam was found to be sensitive in 31/34 (91.17%) patients, resistant in 02/34 (5.88%) patients and intermediate sensitive in 01/34 (2.94%) patients. Cefepime was found to be sensitive in 34/39 (87.17%) patients, resistant in 03/39 (7.69%) patients and intermediate sensitive in 02/39 (5.12%) patients. Amikacin was found sensitive in 35/37 (94.59%) patients and resistant in 02/37 (5.40%) patients. Gentamicin was found to be sensitive in 37/40 (92.50%) patients and resistant in 03/40 (7.50%) patients. Imipenem was found to be sensitive in 33/37 (89.18%) patients, resistant in 03/37 (8.10%) patients and intermediate in 01/37 (2.70%) patients. Cefepime was found to be sensitive in 29/31 (93.54%) patients, resistant in 01/31 (3.22%) patients and intermediate sensitive in 01/31 (3.22%) patients. Ciprofloxacin was found to be sensitive in 30/41 (73.17%) patients, resistant in 09/41 (21.95%) patients and intermediate sensitive in 02/41 (4.87%) patients. Levofloxacin was found to be sensitive in 15/24 (62.50%) patients, resistant in 06/24 (25.00%) patients and intermediate sensitive in 03/24 (12.50%) patients. Above results were found to be in contrast with Rakhee T et al⁷ which shows that among the commonly used antibiotics, Ciprofloxacin appear to be first line antibiotic (91.52% sensitive) to treat CSOM followed by Gentamicin (89.6% sensitive). However, the action of Chloramphenicol was low (59.53% sensitive).

Staphylococcus aureus (35%) was the most common organism detected in our study and its drug sensitivity profile as Benzyl penicillin was found to be sensitive in 02/35 (5.71%) patients and resistant in 33/35 (94.28%) patients. Tetracycline was found to be sensitive in 31/34 (91.17%) patients and resistant in 03/34 (8.82%) patients. Erythromycin was found to be sensitive in 06/35 (17.14%) patients and resistant in 29/35 (82.85%) patients. Gentamicin was found to be sensitive in 32/35 (91.42%) patients, resistant in 01/35 (2.85%) patients and intermediate sensitive in 02/35 (5.71%) patients. Clindamycin was found to be sensitive in 13/34 (38.23%) patients and resistant in 21/34 (61.76%) patients. Trimethoprim/sulphamethoxazole was found to be sensitive in 19/35 (54.28%) patients and resistant in 16/35 (45.71%) patients. Amoxiclav was found to be resistant in all three patients. Ciprofloxacin/Levofloxacin was found to be sensitive in 04/34 (11.76%) patients and resistant in 30/34 (88.23%) patients. Linezolid was found to be sensitive in 29/30 (96.66%) patients and resistant in 01/30 (3.33%) patients. *Pseudomonas aeruginosa* (25%) was the second most common organism detected in our study and drug sensitivity profile of *pseudomonas aeruginosa* in the patients shows Pipracillin/Tazobactam was sensitive in 19/20 (95%) patients and intermediate sensitive in 01/20 (5%) patients. Cefoparazone was found to be sensitive in 20/23 (86.95%) patients, resistant in 01/23 (4.34%) patients and intermediate sensitive in 02/23 (8.69%) patients. Amikacin was found to be sensitive in 22/24 (91.66%) patients and resistant in 02/24 (8.33%) patients. Gentamicin was found to be sensitive in 22/25 (88%) patients and resistant in 03/25 (12%) patients. Imipenem was found to be sensitive in 21/23 (91.30%) patients and resistant in 02/23 (8.69%) patients. Cefepime was found to be sensitive in 23/24 (95.83%) patients, intermediate sensitive in 01/24 (4.16%) patients and resistant was found in none of the patients. Ciprofloxacin was found to be sensitive in 19/25 (76%) patients, resistant in 05/25 (20%) patients and intermediate sensitive in 01/25 (4%) patients. Levofloxacin was found to be sensitive in 13/20 (65%) patients, resistant in 05/20 (25%) patients and intermediate sensitive in 02/20 (10%)

patients.

Other organisms commonly found in our study were *Staphylococcus epidermidis*, *Klebsiella pneumoniae* and *Escherichia coli* and they were mostly resistant to Benzyl penicillin, Erythromycin, Clindamycin, Ciprofloxacin/ Levofloxacin and Trimethoprim/ Sulphamethoxazole. Tetracycline, Gentamicin, Linezolid, Amikacin, Pipracillin/ Tazobactam, Cefoparazone, Imipenem and Cefepime were the antibiotics that were found sensitive in most of the samples tested.

CONCLUSION

To conclude, ear infection is a major health problem in developing countries and *Staphylococcus Aureus* (35%) was the commonest infective organism detected in the study participants followed *Pseudomonas Aeruginosa* (25%), *Staphylococcus epidermidis* (6%), *Klebsiella Pneumoniae* (5%), *Escherichia Coli* (5%). Infective organisms were mostly resistant to Benzyl penicillin, Erythromycin, Clindamycin, Ciprofloxacin/Levofloxacin and Trimethoprim/ Sulphamethoxazole. Tetracycline, Gentamicin, Linezolid, Amikacin, Pipracillin/Tazobactam, Cefoparazone, Imipenem and Cefepime were the antibiotics that were found sensitive in most of the samples tested.

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