

Original Research Article

Study of infective profile of patients with ear infections in lower Himalayan region

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ABSTRACT

Background: An ear infection is a bacterial, viral and fungal infection of the external or middle ear. The aim of the study was to study the infective profile of patients with ear infections in lower himalayan region.

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%), mould (10%), *Staphylococcus epidermidis* (06%), *Escherichia coli* (05%) and *Klebsiella pneumoniae* (05%).

Conclusions: Prevalence of ear infection is a major health problem in developing countries due to the poor living standard and hygienic conditions.

Keywords: Ear infection, Infective organisms, Ear swab, Aural discharge

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. Acute otitis media may result in persistent otitis media with effusion, which is now recognized as the leading cause of childhood hearing loss.¹ 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. Bacterial infection of the middle ear causes acute

otitis media, which often results in a small perforation through which purulent material discharges. These perforations heal spontaneously in a short time unless complicating factors coexist.² Although ear infection can be a self-limiting, if left untreated, it can cause serious complications such as recurrent acute otitis media, persistence of middle ear effusion, hearing impairment, mastoiditis, meningitis, chronic otitis media, brain abscess and sepsis. Most common organisms³ in infants and young children are *Streptococcus pneumoniae* (30%), *Haemophilus influenzae* (20%) and *Moraxella catarrhalis* (12%). Other organisms include *Streptococcus pyogenes*, *Staphylococcus aureus* and sometimes *Pseudomonas aeruginosa*. In about 18-20%, no growth is seen. Many of the strains of H. influenzae and *Moraxella catarrhalis* are β -lactamase producing.

METHODS

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 (six months). During this period 100 patients with ear infections/ear discharge were included in the study.

Study population

Study group include general population presenting in outpatient department of Regional Hospital Bilaspur Himachal Pradesh India 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.

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

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. Clinical examination of patient is done including general physical examination and systemic examination for assessing the general condition of participants. A thorough ENT examination is done including ear examination, throat examination, nasal examination. 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 or median. For categorical variables proportions were used. 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.

Table 1: Age wise frequency distribution of the patients presenting with ear discharge.

Age group (years)	Frequency	Percentage (%)
0-20	22	22
21-40	34	34
41-60	24	24
61-80	16	16
81-100	04	04
Total	100	100

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.

Table 2: Frequency distribution of the patients presenting with ear discharge according to diagnosis.

Diagnosis	Frequency	Percentage (%)
ASOM	46	46
CSOM	52	52
EAC furunculosis	02	02

Table 3: Frequency distribution of infective organisms in the patients presenting with ear discharge.

Infective organism	Frequency	Percentage
<i>Acinetobacter baumani</i>	01	01
<i>Burkholderia cepacia</i>	02	02
<i>Enterobacter cloacae</i>	01	01
<i>Escherichia coli</i>	05	05
<i>Klebsiella pneumoniae</i>	05	05
Mould	10	10
<i>Proteus mirabilis</i>	01	01
<i>Providentia rettgeri</i>	01	01
<i>Pseudomonas aeruginosa</i>	25	25
<i>Staphylococcus aureus</i>	35	35
<i>Staphylococcus epidermidis</i>	06	06
<i>Staphylococcus hemolyticus</i>	01	01
<i>Staphylococcus xylosus</i>	01	01
<i>Staphylococcus saprophyticus</i>	01	01
No growth seen	05	05

Forty-six (46%) patients were diagnosed as acute suppurative otitis media (ASOM), fifty-two (52%) patients were diagnosed as CSOM and two (02%) patients were diagnosed as external auditory canal furunculosis (EAC furunculosis).

Acinetobacter baumani 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 xylosus* in one (01%) patient and no growth seen in five (05%) patients.

Table 4: Frequency distribution of infective organisms on the basis of Gram staining in the patients presenting with ear discharge.

Gram positive organisms (%)	Gram negative organisms (%)
<i>Staphylococcus aureus</i> (35)	<i>Pseudomonas aeruginosa</i> (25)
<i>Staphylococcus epidermidis</i> (06)	<i>Klebsiella pneumoniae</i> (05)
<i>Staphylococcus hemolyticus</i> (01)	<i>Escherichia coli</i> (05)
<i>Staphylococcus saprophyticus</i> (01)	<i>Enterobacter cloacae</i> (01)
<i>Staphylococcus xylosus</i> (01)	<i>Burkholderia cepacia</i> (02)
	<i>Acinetobacter baumannii</i> (01)
	<i>Proteus mirabilis</i> (01)
	<i>Providentia rettgeri</i> (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.

DISCUSSION

Ear infection is a more frequent treatable health care problem worldwide, yet if left untreated, it can cause a serious complication such as a speech development disorder, hearing loss, distress in patients and their family quality of life, and economic burden on the health care system. Dilshad et al studied the bacteriological profile and its antibiotic susceptibility pattern of ear infection in patients attending tertiary care hospital and the antimicrobial resistance pattern of the above isolates.⁴ Ear swabs were collected and immediately processed. A total of 80 patients' prescription was collected over a period of 7 months comprising 42 males and 38 females. Out of

these, CSOM was the most common disease and maximum number of cases was from the age group 21 to 30 years 22 cases (27.5%). Out of total 80 specimens 11 shows no growth of organism while 69 specimens show growth of one or two organisms. Out of 69 growths, 58 shows single isolate and 11 shows two isolates. *Pseudomonas*, *Proteus*, *Acinetobacter*, *Klebsiella* and *Enterobacter* species were the most common Gram-negative bacteria isolated followed by *Staphylococcus aureus* and coagulase negative *Staphylococcus aureus* Gram positive bacteria. The occurrence of Gram-negative organisms was higher than for Gram positive with Gram negative 58/91 (63.73%), Gram positive 25/91 (27.47%) and fungi 8/91 (8.80%). These results were slightly in contrast to our study as in our study group participants ear infection was slightly more in females (57%) than males (43%). Maximum number of cases (34%) in our study was in the age group 21 to 40 years which were in line to the results of above study. Our study also differs from above study in respect to gram staining of organisms from above study as gram positive organisms (44%) were more common than gram-negative (41%). Hailu et al studied bacterial etiologic agents and their antimicrobial susceptibility patterns among patients of all age groups referred to Bahir Dar Regional Health Research Laboratory Center.⁵ Retrospective data recorded on culture and antimicrobial susceptibility profile were retrieved for analysis. Pus swabs from discharging ears collected and processed for aerobic bacteria culture and susceptibility testing. Of the total 368 pus swab samples processed, 296 (80.4%) were culture positive. Of which, 289 (97.6%) were bacteria and 7 (2.4%) were yeast cells. The proportion of ear infection was higher in males (92.7%) than females (65%) ($p=0.014$). The frequency of ear infection below 21 years of age was 65.2%. The predominant isolate was *Pseudomonas aeruginosa* (29.7%) followed by *Staphylococcus aureus* (26.3%) and *Proteus* spp. (21.9%). Above results were slightly different from our study as *Staphylococcus aureus* (35%) was more common than *Pseudomonas aeruginosa* (25%) followed by fungal infection (10%) in our study. Rakhee et al while studying aerobic microbiological or bacteriological profile of ear discharge and variations in sensitivity pattern to treat the patients efficiently, a total of 71 patients who had discharging ear infection were included in this study.⁶ The most common microorganisms isolated were *Pseudomonas aeruginosa* and *Staphylococcus aureus* followed by coagulase-negative *Staphylococci*, *Klebsiella* spp, *Proteus* spp and *Escherichia coli*. The results of the above study were in line to our study as *Staphylococcus aureus* and *Pseudomonas aeruginosa* were also the commonest organisms detected in our study. Denboba et al studied the antibiotic susceptibility profiles of bacteria isolated from patient ear discharges suspected of otitis media.⁷ A retrospective analysis was performed using culture and antibiotic susceptibility test results of 1225 patients who visited Dessie Regional Health Research Laboratory from 2001 to 2011. Results showed a strong association ($p<0.001$) between age and the risk of acquiring middle

ear infection. The predominant bacterial isolates were *Proteus spp.* (28.8%), *Staphylococcus aureus* (23.7%), and *Pseudomonas spp.* (17.2%). Results of our study are slightly in contrast to the above study as *Staphylococcus aureus* (35%) and *Pseudomonas aeruginosa* (25%) were the commonest organisms detected while *Proteus mirabilis* (1%) was less commonly detected.

Muluye et al conducted a study to determine the bacterial isolates and their drug susceptibility patterns from patients who had ear infection.⁸ A retrospective study was conducted from September, 2009 to August, 2012 at Gondar University Hospital, Northwest Ethiopia. A total of 228 ear discharge samples were tested for bacterial isolation and 204 (89.5%) cases were found to have bacterial isolates. From the total bacterial isolates, 115 (56.4%) were gram negative bacteria and the predominant isolate was *proteus species* (27.5%). Of individuals who had ear infection, 185 (90.7%) had single bacterial infection while 19 (9.3%) had mixed infections. Under five children were more affected by ear infection. The prevalence of ear infection was significantly high in males (63.7 vs 36.3%) ($p=0.017$). Of all bacterial isolates, 192 (94.1%) had multiple antibiotic resistant pattern. Non-lactose fermenter Gram negative rods (46.0%), *Klebsiella species* (47.7%) and *Pseudomonas species* (48.5%) were resistant against the commonly used antibiotics. The results of the above study were slightly in contrast to our study as Gram positive organisms (44%) were more common than Gram negative organisms (41%) in it and 21-40 years age group has more incidence of ear infections. The prevalence of ear infection was more common in females (57%) than males (43%) in our study which was in contrast to above study. Increased antimicrobial resistance is one of the greatest global public health challenges, which have been accelerated by over prescription of antibiotics worldwide. Infection with antibiotic-resistant bacteria may cause severe illness, increased mortality rates, and an increased risk of complications and admission to hospital and longer stay. In light of above facts, this study revealed that *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, *Klebsiella pneumoniae* and *Escherichia coli* were the most prevalent multi-antibiotic-resistant pathogenic bacteria isolated from suspected patients ear discharges in the study population of lower himalayan region.

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%), *Kebsiella pneumoniae* (5%), *Escherichia coli* (5%).

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Ethical approval: The study was approved by the Institutional Ethics Committee

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