Original Research Article

A Hospital Based Observational Study to Evaluate the Microbiological Profile Among Patients with Ear Discharge

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Received: 06-01-2021 / Revised: 23-02-2021 / Accepted: 05-04-2021

Abstract

Background: Ear infections that can be separated by otitis media (OM) and otitis externa, are a major public health problem in developing countries associated with a high disease burden and economic impact on patients, families and health care systems. The purpose of this study was designed to elucidate the microbiology of otorhinological diseases by identifying all subspecies at the level of species. **Materials & Methods:** This is a hospital based prospective study done on 100 clinically suspected cases of otological infections at Department of Microbiology, SMS Medical College, Jaipur, Rajasthan. Children less than 18 years of age with CSOM, active discharge at the time of examination and cases of middle ear discharge for more than three months were included in the study. Ear discharge sample was collected under aseptic precautions on a sterilized swab stick with the aid of aural speculum, prior to instillation of any topical antibiotics. Samples were kept in Amies transport media to maintain the viability of microorganisms until the specimen is processed. Bacterial isolates were characterized based on colony appearance, gram reaction, culture characteristics, and biochemical tests as described by Cheesbrough. **Results:** Among the 100 enrolled cases, the age group of patients ranged from less than 10 yrs to 85 years. Around 60% cases were classified into otitis media and 40% into otitis externa. The most common type of otological infection was otitis externa and unsafe type of CSOM (34%), followed by safe CSOM (20%). Among the aerobic culture positive samples, 50% showed growth of P. aeruginosa, 31% S. aureus, 5% E. coli, 5% Enterobacter cloacae, 4% fungal isolates, 2% P. mirabilis and less no. of P. vulgaris & Enterococcus sp. **Conclusion:** We concluded that *Pseudomonas species* is the most common etiologic agent of CSOM followed by *Staphylococcus aureus.*

Keywords: Ear, Infection, Aerobic Culture, Bacteria, Otitis Media.

Introduction

The ear is an important sensory organ. It is worthy to note that ear infections are a quite common problem worldwide. Ear infection is an inflammation of the ear and ear discharge is one of the commonest symptoms of ear infection[1].About 65-330 million people suffer from ear infection worldwide and 60% of them had severe hearing impairment[2]. Otitis media is an inflammatory disease of the mucosal lining of the middle ear[3].Ear infections that can be separated by otitis media (OM) and otitis externa, are a major public health problem in developing countries associated with a high disease burden and economic impact on patients, families and health care systems. It is one of the most common childhood diseases that leads to repeated visits to the outpatient department (OPD) in both developed and developing countries even if it may affect adults as well[4].The sources of infection in otitis media depend largely on the way in which the infection reaches the middle ear. Ear infections are mainly bacterial. Bacterial infections of the middle ear usually occur in the upper respiratory tract, and bacteria enter the ear through a auditory tube (Eustachian), which is the main entrance to the ear[3,5,6].According to Senturia, et al., The acute stage of otitis media is considered to be the first 3 weeks of inflammation, an incurable 3- month phase, following the onset of inflammation and the most severe stage is said to be between 3 weeks and 3 months[7].

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Most common organisms associated are Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae, Escherichia coli, Aspergillus sp and Candida albicans[8].The rate of complications have become less common, since the introduction of antibiotics. However, due to irrational and increased use of wide-spectrum antibiotics, the resistance in the bacterial isolates has emerged. Therefore, microscopic examination of stained smears, culture and sensitivity will help in appropriate management of otitis media and its complications and thus emergence of resistant bacterial strains can be prevented[9].The purpose of this study was designed to elucidate the microbiology of otorhinological diseases by identifying all subspecies at the level of species.

Materials & Methods

This is a hospital based prospective study done on 100 clinically suspected cases of otological infections at Department of Microbiology, SMS Medical College, Jaipur, Rajasthan. Children less than 18 years of age with CSOM, active discharge at the time of examination and cases of middle ear discharge for more than three months were included in the study. Adult patients (>18 years), conditions which mimic CSOM like otitis externa, acute suppurative otitis media (ASOM), children with recent ear surgery or an in-situ grommet or tympanostomy tube, mastoid surgery in the preceding 12 months and obstructed middle ear (eg. Polyp) were excluded from the study.

Methods

Ear discharge sample was collected under aseptic precautions on a sterilized swab stick with the aid of aural speculum, prior to instillation of any topical antibiotics. Samples were kept in Amies transport media to maintain the viability of microorganisms until the

specimen is processed. Excess discharge was mopped out from the external auditory canal and was cleaned with 70% alcohol first. Then with the two sterile swabs specimen was collected prior to the instillation of any topical medication. One swab was used for Gram staining and another one was used for culture. Both the swabs are processed immediately in the laboratory. Gram's staining was done for the specimen and was examined under oil immersion objective to note the various morphological types of bacteria, candida, their number, Gram reaction, presence or absence of inflammatory cells and also to note the numbers of squamous epithelial cells in the sample. The second swab was inoculated immediately on 5% sheep blood agar (BA), MacConkey's agar (MA) and chocolate agar (CA). Preliminary identification of all positive cultures was done based on observation of growth on primary culture media and examination of Gram-staining reaction under microscope.

Characterization of Isolated Bacteria

Bacterial isolates were characterized based on colony appearance, gram reaction, culture characteristics, and biochemical tests as described by Cheesbrough. Biochemical tests carried out include catalase,urease,coagulase,oxidase,carbohydrate fermentation, motility,gas production,H_2S production, citrate utilization, and Indole test. Satellitism test and XV factor tests was done for identification of *H. influenza.* Identification of *S. pneumonae* and *Entrococcus spp* was done using Optochin disc test[10].Identification of MRSA was done using cefoxitin disc diffusion method and MLSBi was identified by performing the D test. *Staphylococcus aureus* isolates showing circular zones of inhibition with diameter of ≤13mm for ERY and ≥21mm for CLN without a D-shaped zone along the ERY were interpreted as negative for inducible resistance (D-test negative). *S. aureus* isolates with same inhibitory diameters as above with a D-shaped zone around the CLN were interpreted as positive for inducible resistance (D-test positive)[11].

Statistical Analysis

Data obtained from the study was analyzed by descriptive statistical analysis methods, Frequency distribution, Chi square/Fischer exact test, Significant p value<0.05.

Results

Among the 100 enrolled cases, the age group of patients ranged from less than 10 yrs to 85 years. The most affected age group was 10-20 years with 35% cases while less than 10% cases were seen at the extremes of age (table 1).

Table 1: Distribution of patients according to age groups

Age (yrs)	No. of patients (N=100)
<10 yrs	15 (15%)
10-20 yrs	35 (35%)
20-30 yrs	24 (24%)
30-40 yrs	10 (10%)
40-50 yrs	6 (6%)
50-60 yrs	4 (4%)
60-70 yrs	4 (4%)
>70 yrs	2 (2%)

In our study group, 62% of the population that presented with otological symptoms were males and 38% were females, with a male: female ratio of 1.63:1 (Figure 1).

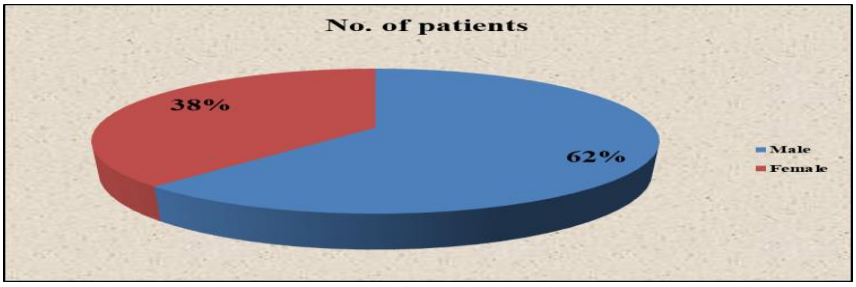

Fig 1: Distribution of patients according to sex

Unilateral ear involvement was seen in 88% cases (48% right ear and 40% left ear), while 12% had bilateral ears involved. (Table 2)

Table 2: Distribution of patients according to site

Site	No. of patients	Percentage
Right	48	48%
Left	40	40%
Bilateral	12	12%
Total	100%	100%

Most common presenting complaint was ear discharge which was seen in all the cases, followed by ear pain in 70%, feeling of fullness in 44%, decreased hearing in 42% and tinnitus in 41%. Dizziness, fever and headache was seen in 10-15% cases. (Table 3)

Table 3: Distribution of patients according to chief complain

Symptoms	No. of patients (N=100)	Percentage
Ear discharge	100	100%
Ear pain	70	70%
Feeling of fullness	44	44%
Decrease hearing	42	42%
Tinnitus	41	41%
Dizziness	15	15%
Headache	10	10%
Fever	10	10%

Around 60% cases were classified into otitis media and 40% into otitis externa. The most common type of otological infection was otitis externa and unsafe type of CSOM (34%), followed by safe CSOM (20%). Acute suppurative otitis media (5%) was less common (table 4).

Table 4: Characterization of different types of otological infections

Otological infections		No. of patients	Percentage
Otitis externa		40	40%
Otitis into	Unsafe CSOM	34	34%
	Safe CSOM	20	20%
	ASOM	5	5%
	Otomycosis	1	1%
Total		100%	100%

On direct microscopy, Gram positive cocci were seen in 68% followed by Gram negative bacilli and Gram-negative coccobacilli in 62% and 14% respectively. Among the aerobic culture positive samples, 50% showed growth of P.aeruginosa, 31% S.aureus, 5% E. coli, 5% Enterobacter cloacae, 4% fungal isolates, 2% P. mirabilis and less no. of P. vulgaris & Enterococcus sp. (Table 5).

Table 5: Microbial profile of organisms isolated

Organism	Frequency (N=100)	Percentage
Psuedomonas sp.	50	50%
Staphylococcus	31	31%
E. coli	5	5%
Enterobacter Cloacae	5	5%
P. mirabilis	2	2%
Enterobacter aerogenes	1	1%
P. vulgaris	1	1%
Enterococcus sp.	1	1%
Fungal isolates	4	4%

Discussion

Ear infections are a commonly encountered entity in routine clinical practice. These infections arise from the external auditory meatus as in otitis externa (OE) or in middle ear causing acute/chronic suppurative otitis media (ASOM/CSOM). Chronic suppurative otitis media is one of the most common chronic diseases of ear and one of the major causes of deafness in India[12].Childhood phenomenon and people tend to tolerate the disease and live with its complications into adult life. Children constitute the most vulnerable group on account of their frequent exposure to upper respiratory tract infections. CSOM is a major cause of preventable hearing loss in developing countries. In children this may affect speech, psychological adaptability, cognitive development etc[13].Our study showed that the most affected age group was 10-20 years with 35% cases while less than 10% cases were seen at the extremes of age. Similar age pattern has been reported by Mansoor et al[14] , and Poorey et al[15]. In contrast, Sandhu D et al[16] showed the increased prevalence of CSOM in 51-60 yrs of age groups.There was predominance of otological infections in male patients with a male:female ratio of 1.63:1. This is in accordance with studies done by Arti Agrawal et al[9] and Shrestha BL et al[17].This may be a reflection of the overall male predominance of childhood infections due to anatomic, behavioral, and differences in personal habits between males and females[18].On the contrary, a study from Uttarakhand showed female preponderance with male:female ratio of 1:1.2[19].Around 60% cases were classified into otitis media and 40% into otitis externa. The most common type of otological infection was otitis externa and unsafe type of CSOM (34%), followed by safe CSOM (20%). Acute suppurative otitis media (5%) was less common in our study, which was similar result founded by Sandhu D et al[16].High rates of chronic otitis media are attributed to overcrowding and poor hygiene, poor nutrition, passive smoking, high level of nasopharyngeal colonization with pathogenic bacteria and inadequate or unavailable healthcare[20].On direct microscopy, Gram positive cocci were seen in 68% followed by Gram negative bacilli and Gram-negative coccobacilli in 62% and 14% respectively. Among the aerobic culture positive samples, 50% showed growth of P.aeruginosa, 31% S.aureus, 5% E. coli, 5% Enterobacter cloacae, 4% fungal isolates, 2% P. mirabilis and less no. of P. vulgaris & Enterococcus sp. A study done by Sandhu D et al[16]founded that the most common aerobic bacterial isolate in our study was P.aeruginosa (49.6%) and S.aureus (37%) followed by Klebsiella oxytoca (4.7%).Study found S. aureus as the most common (31%) isolate which correlates with study by Prakash, et al[21] Other studies shows P. aeruginosa as the most common isolate in CSOM followed by S. aureus[22,23]Gulati et al. reported the most common isolate as Klebsiella spp[24]This shows that depending upon the climatic conditions, antibiotic usage & geographical factors the bacterial spectrum in CSOM varies with time as well as from place to place.

Pseudomonas is the predominant cause of CSOM in tropical region and does not usually inhabit the upper respiratory tract. It's presence in the middle ear cannot be ascribed to an invasion through Eustachian tube (ET) and it should be considered as a secondary invader gaining access to the middle ear through defect in TM[25].Hailu et al (2016)[26]founded out 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 %).

Conclusion

We concluded that Pseudomonas species is the most common etiologic agent of CSOM followed by Staphylococcus aureus. Proper selection of traditional topical / systemic antimicrobials and a dry ear sensitivity report is an effective treatment for CSOM to prevent drug resistance, unwanted antibiotic administration, and complications.

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Conflict of Interest: Nil
Source of support:Nil