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Research Article

Evaluation of bacteriological profile and antibiotic susceptibility pattern of patients with otorrhea in a tertiary care teaching hospital

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ABSTRACT

Background: Otitis media is very common disease in developing country and if not treated properly can lead to hearing loss and serious neurological complications. Its bacteriology and antibiotic sensitivity varies in different population. Thus knowledge of the microbiological pattern with antibiotic susceptibility is important to deliver efficacious treatment of this disease. So, purpose of the present study was to determine the microbiological profile and antimicrobial susceptibility pattern of isolates from ear discharge in patients of otitis media.
Methods: This study was conducted in Department of Microbiology of our institute for duration of one year. A total of 100 patients' samples visiting ENT OPD were taken who complaining of ear discharge. Identification of organism was done by using standard biochemical reactions and antibiotic susceptibility testing done by using modified Kirby Bauer method as per CLSI guidelines.
Results: Majority of the patients were between 21-30 years of age group (28%). The most common organism isolated was *Pseudomonas aeruginosa* (25.88%), highly sensitive to aminoglycosides and β-lactam + β-lactamase inhibitor (100%) followed by *Staphylococcus aureus* (21.17%), highly sensitive to aminoglycosides (100%) and fluoroquinolones (72.22%).
Conclusions: Knowledge of the pathogenic agents responsible for otitis media and choice of effective antibiotics according to susceptibility pattern will guide the treatment. It also helps in reducing complications of the disease and decreasing emergence of resistance to antibiotics.

Keywords: Otitis media, Otorrhea, Antimicrobial susceptibility, *Pseudomonas aeruginosa, Staphylococcus aureus*

INTRODUCTION

Otitis media is inflammation of middle ear that may presents as otorrhea with tympanic membrane perforation. Clinically, it is classified as acute, sub-acute and chronic depending on duration.[1] It is the commonest problem to come across in otorhinolaryngeal OPD.

Acute otitis media incidence rate is 10.85 % (709 million cases each year), with 51 % of these occurring in under-five years of age, while chronic suppurative otitis media incidence rate is 4.76 % (31million cases), with 22.6 % of cases occurring annually in under-five years of age. Each year 21 thousand people die due to complications of otitis media.[2] It affects all age group but most common age groups involve infants and children. Anatomically, the children's Eustachian tube is shorter, horizontal with a more flaccid cartilage which can easily impair its opening. So, ascending infection via oropharyngeal route is very common.[3] Otitis media can be due to multiple aetiology like nasopharyngeal infections, sinusitis or oropharyngeal infections. The commonly occurring

symptoms are ear discharge, deafness, itching, pain and sometimes fever. Also , this clinical condition is very known for its recurrence and complications.[4] Infection can also spread from middle-ear to neighbouring structures such as mastoid air cells, facial nerve, labyrinth, lateral sinus, meninges and brain that leads to mastoid abscess, facial nerve paralysis, neuronal deafness, lateral sinus thrombosis, meningitis and intracranial abscess. Out of all these complications, hearing loss is most common and preventable. While in children otitis media can lead failure to development of communication, language development and cognitive development.[5] It is very important for clinician to know about bacteriology and its sensitivity pattern for management of otitis media, as antimicrobial resistance profile of bacteria varies among population in different geographical area due to local antimicrobial prescribing practices and prevalence of resistant bacterial strains.[6] So, aim of this study was to know bacteria and its antimicrobial susceptibility pattern in patients of otitis media.

METHODS

This study was conducted in the Department of Microbiology of in tertiary care teaching hospital for one year. A total of 100 patients, from age groups of 0 to 70 years and of either gender, who complained of ear discharge, were included in the study. Informed consent was taken from all patients before recruiting in the study. After thorough clinical examination clinician collected discharge material with clean sterile swab stick. Whenever possible, two samples were collected. First sample of ear swab was for gram staining and second for culture. Each material was inoculated on to nutrient agar, MacConkey agar and blood agar. After overnight incubation, bacterial species isolated were identified by morphology, growth characteristics and bio-chemical reactions according to the standard conventional techniques. After identifying the isolate, their antibiotic sensitivity test was done on Muller Hilton agar by Kirby Bauer disc diffusion method according to CLSI recommendations.[7,8]

RESULTS

A total of 100 were enrolled in a study over a period of one year, out of which, there were 62 females and 38 males. Out of 100 samples processed, 82 (82%) samples showed growth of microorganisms. No growth was reported in 18 (18%) samples. Out of total 82 positive specimens, 85 organisms were isolated. 79 (96.6%) samples had single organism isolated on culture study, while three patients had mixed growth (3.40%). Most common age group involved was 21-30 years. Age wise distribution of samples is shown in Table 1.

The occurrence of Gram Negative Organisms (GNB) was higher than Gram positive (GPC) with GNB isolation rate was 63.52% (54/85) and of GPC was 36.47% (31/85). Most common isolate was *Pseudomonas aeruginosa* (25.88%) followed by *Staphylococcus aureus* (21.17%). Details of isolates are shown in Table 2.

Table 1: Age wise distribution of patients.

Age (years)	Patients in each group	Growth observed	Sterile on culture
0-10	4	2	2
11-20	22	20	2
21-30	28	24	4
31-40	15	12	3
41-50	16	13	3
51-60	8	6	2
61-70	4	4	0
>71	3	1	2
Total	100 (100%)	82 (82%)	18 (18%)

Table 2: Bacteriology of positive ear discharge samples.

Organism	Number of isolates (n=85)	Percentage
Gram negative organisms		
Pseudomonas aeruginosa	22	25.88%
Klebsiella sp.	14	16.47%
Escherichia coli	7	8.23%
Proteus sp.	5	5.88%
Providencia Sp.	3	3.52%
Acinetobacter sp.	3	3.52%
Gram positive organisms		
Staphylococcus aureus	18	21.17%
Coagulase negative *Staphylococci*	13	15.29%

While looking for Antibiotic sensitivity, in isolated cases of Pseudomonas all were sensitive to piperacillin-tazobactam, chloramphenicol, amikacin and imipenem group of drugs. Most commonly used drug against Pseudomonas i.e. ceftazidime showed sensitivity of 90.90% (Figure 1).

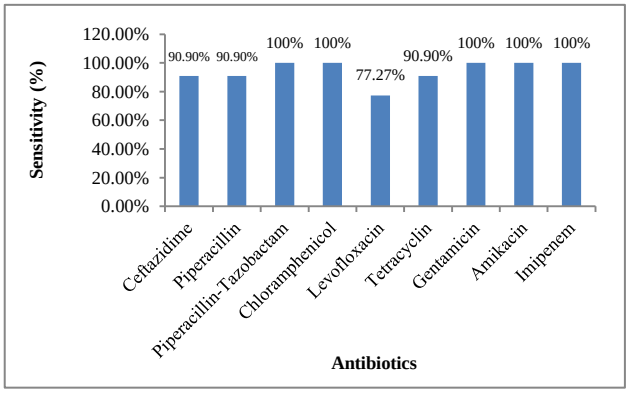

Figure 1: Sensitivity pattern amongst *Pseudomonas aeruginosa*.

As shown in Table 3, *Enterobacteriaceae* was most sensitive to β-lactam + β-lactamase inhibitor, chloramphenicol, aminoglycosides and imipenem. Commonest used tropical drug for otitis media i.e. Ciprofloxacin was least sensitive one. *Acinetobacter baumanii* 100% sensitive to ampicillin-sulbactam, cefoperazone-sulbactam, amikacin and imipenem.

Table 3: Antibiotic sensitivity pattern in Gram negative bacilli.

Antibiotics	*Klebsiella pneumoniae*	*Proteus mirabilis*	*Providencia sp.*	*Escherichia coli*	*Acinetobacter baumanii*
Ceftriaxone	10 (71.42%)	6 (85.71%)	3 (100%)	3 (60%)	2 (66.66%)
Cefoperazone	10 (71.42%)	6 (85.71%)	3 (100%)	3 (60%)	2 (66.66%)
Cefepime	13 (92.85%)	7 (100%)	3 (100%)	5 (100%)	2 (66.66%)
Ampicillin-Sulbactam	14 (100%)	7 (100%)	3 (100%)	5 (100%)	3 (100%)
Cefoperazone-Sulbactam	14 (100%)	7 (100%)	3 (100%)	5 (100%)	3 (100%)
Chloramphenicol	14 (100%)	7 (100%)	3 (100%)	5 (100%)	3 (100%)
Ciprofloxacin	8 (57.14%)	4 (57.14%)	2 (66.66%)	4 (80%)	2 (66.66%)
Levofloxacin	10 (71.42%)	6 (85.71%)	2 (66.66%)	4 (80%)	2 (66.66%)
Tetracycline	14 (100%)	4 (57.14%)	2 (66.66%)	3 (60%)	2 (66.66%)
Cotrimoxazole	8 (57.14%)	4 (57.14%)	2 (66.66%)	4 (80%)	2 (66.66%)
Gentamicin	14 (100%)	7 (100%)	3 (100%)	5 (100%)	3 (75%)
Amikacin	14 (100%)	7 (100%)	3 (100%)	5 (100%)	3 (100%)
Imipenem	14 (100%)	7 (100%)	3 (100%)	5 (100%)	3 (100%)

Following *Pseudomonas aeruginosa*, second most common isolate was *staphylococcus aureus* (21.17%). In GPC Coagulase Negative Staphylococci (CONS) were also isolated. Sensitivity pattern of both isolates are shown in Figure 2.

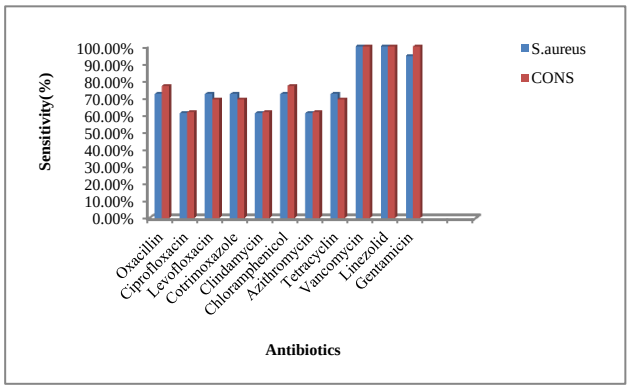

Figure 2: Sensitivity pattern of gram positive organisms.

As shown in chart *S. aureus* was 100% sensitive to vancomycin, linezolid & aminoglycosides (100%) group of drugs. Fluoroquinolones which are known for tropical use showed 72.22% and 69.23% sensitivity for *S. aureus* and CONS respectively. β-lactams were least sensitive.

DISCUSSION

Otitis media is commonest disease to come across in day to day practice. Although, it is not fatal disease but well known for chronicity because of low socio economic status with poor affordability, neglecting the discharging ear, inadequate and improper treatment. Chronicity can lead to hearing loss, facial paralysis and many neurological complications.[5] Hence, early diagnosis and effective treatment is necessary to avoid complications. Aural toilet and effective antibiotic regimen are mainstay for management of otitis media. Antibiotics are usually started on the basis of its efficacy, resistance pattern, cost and side effects. Therefore, it is very important to know local prevalence of microorganism and its antibiotic sensitivity for effective treatment. In our study occurrence of disease was 82%. Similar finding are observed in study by B. L. Chaudhary et al.[9] who reported it 80%. In present study, females and 21-30 years of age group were most commonly affected. Similar observations found by Raakhee T et al.[10] This finding can be rationalize with the finding that young adults are the main workers who all time remain in field and humid atmosphere where excessive sweating keeps moisture maintained, which is favourable condition and provide nidus for bacteria as well as for fungus to set an infection. In this study most common isolated organism was *Pseudomonas aeruginosa* (25.88%) followed by *Staphylococcus aureus* (21.17%). Similar findings have been observed by other investigators.[11,12] Also, gram negative bacteria were isolated more than gram positive. This indicates may be route of infection would not be nasopharynx as it does not harbour this flora. Moreover organism like *Pseudomonas* to be highest suggests that it can be from environment or through a route of external auditory canal.[13] CONS isolation rate was 15.29%. Although, CONS are generally considered as non-pathogenic or skin contaminants. In current study, *Pseudomonas* showed high sensitivity to piperacillin-tazobactam, chloramphenicol, amikacin and carbapenem

group of drugs. Most commonly used drug against *Pseudomonas* i.e. ceftazidime showed sensitivity of 90.90% and they were least sensitive to fluoroquinolones. Study by Aparna Chavan et al.[11] reported aminoglycosides to be most effective. While Raakhee T et al.[10] reported high fluoroquinolones antibacterial activity against *Pseudomonas*.

Staphylococcus aureus was sensitive to highly sensitive to vancomycin, linezolid and gentamicin (100%), followed by cotrimoxazole (72.22%) and levofloxacin (72.22%). Majority of them were resistant to ampicillin and amoxicillin (61%). These results are in accordance with study by Raghu Kumar et al.[13] Study by Raakhee T et al.[10] also showed high sensitivity for gentamicin and least sensitivity for β-lactams. This finding suggests highly resistance to the most commonly used drugs like β-lactams. There can be two possibilities for this. One is that this can be an actual resistance and it needs to change antibiotics from β-lactams to fluoroquinolones or aminoglycosides for empirical use. Second possibility is that usually culture comes when no results observed from commonly used drugs like β-lactams so on culture study it shows high resistance pattern.

CONCLUSION

There may be a variation in causative agents of otitis media and their susceptibility pattern due to fact that bacterial aetiology varies in population and geographical area. In current study we found *pseudomonas* and *staphylococcus aureus* as the most common infecting agents. However, Gram negative infections were common than Gram positive organism. For Gram negative bacteria β-lactam + β-lactamase inhibitor, chloramphenicol, aminoglycosides appears to be first line of treatment. For Gram positive bacteria aminoglycosides found to be effective one. Organisms are progressively becoming resistant to commonly used drugs like fluoroquinolones. So, it is necessary for clinician to know about local bacteriology and its sensitivity to avoid chronicity and complications. It is always advisable to test culture and sensitivity, whenever facilities are available, for better management of otitis media. Patients should be advised to take the complete antibiotic treatment course to avoid development of resistance. In such situation, periodic evaluations of microbial pattern will help to find out new emerging resistant strains.

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