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BACTERIOLOGICAL PROFILE AND THEIR ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN CHILDREN OF OTITIS MEDIA WITH EAR DISCHARGE.

Microbiology

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ABSTRACT

Background-Otitis media (OM) is one of the most common childhood infections in pre-school aged children and a major cause of childhood morbidity. OM also represents the most frequent reason for antibiotic prescription in children. It is also the principal cause of childhood hearing loss in India. **Objectives-** We aimed to study the microbiological profile and their antimicrobial sensitivity pattern in children of otitis media with ear discharge in the tertiary care center in Lucknow and its application in the empirical treatment of otitis media. **Methods:** The study was conducted from September 2017 to September 2018 on 150 children attending the ENT OPD and Microbiology Department having ear discharge. Ear discharge samples were taken from 150 children (both male and female). Direct gram staining, KOH microscopy, and susceptibility testing were carried out. **Results:** Among 150 cases, 10 cases were found to be of ASOM, and 140 of CSOM**.** Predominant organisms were *Staphylococcus* species (22.67%), followed by *Pseudomonas aeruginosa* (22%), *Klebsiella pneumoniae* (10.7%), and *Escherichia coli* (10.7%). . Among *Staphylococcus aureus,*55% were Methicillin sensitive *Staphylococcus aureus* (MSSA) and 45% were Methicillin-resistant *Staphylococcus aureus* (MRSA). Only 1 *Streptococcus pneumonia*e was isolated among 10 ASOM cases. *Staphylococcus* species were found to be 100% sensitive to linezolid and vancomycin, 80% to amikacin and trimethoprim-sulfamethoxazole, 53% to erythromycin, and 46% to clindamycin and levofloxacin. 91% isolates of *Pseudomonas spp*. were susceptible to piperacillin-tazobactam, 80% to cefepime, amikacin, and tobramycin, and 72% to gentamicin. **Conclusion:** The study of microbial patterns and their antibiotic sensitivity determines the prevalent bacterial organisms causing otitis media in children in the local area and to start empirical treatment of otitis media and its complications for successful outcome, thus to prevent the emergence of resistant strains.

KEYWORDS

Antimicrobial susceptibility, Bacteriological profile, Otitis media

INTRODUCTION

Otitis media (OM) is one of the most common childhood infections in pre-school aged children [1] and a major cause of childhood morbidity [2-5]. OM also represents the most frequent reason why children have prescribed antibiotics or undergo surgery across the world [6, 7]. It is the principal cause of childhood hearing loss in India. It has been estimated recently that around 20,000 people die annually from complications associated with OM, with the highest mortality rates in children <5 years of age [4, 8]. Recurrent or chronic forms of the disease can lead to considerable hearing loss and negatively affect learning ability and scholastic achievement [9]. The development and spread of resistant bacteria due to the over and indiscriminate use of antibiotics is a global public health threat [10]. Due to the limited laboratory diagnosis in developing countries, physicians are often forced to syndromic diagnosis and prescription of broad-spectrum antibiotics for most infections that led to the emergence of drug-resistant bacterial strains [11].

MATERIALS and METHODS

The study was carried out on 150 patients attending the ENT OPD and Pediatrics OPD and Microbiology Department of King George Medical University, Lucknow having ear discharge with signs and symptoms of acute suppurative otitis media (ASOM) and chronic suppurative otitis media (CSOM). Children with Down's syndrome, cleft palate, systemic diseases like Juvenile Diabetes, and immunosuppressants were excluded from the study.

Two ear swabs were collected from patients with a discharge under aseptic precautions with the aid of an aural speculum, before the installation of any topical medication. The first swab was used to make a smear on a clean grease-free glass slide for bacterial differentiation by gram stain examination and direct microscopy of the specimen in KOH for fungal examination. The second swab was used for culture on 5% sheep blood agar, MacConkey agar (incubated for 24 hours at 37°C in CO2 desiccators) and two Sabouraud's dextrose agar (incubated for 28 days at 25°C and 37°C), and the isolates were identified by using colony morphology and standard biochemical tests. After identifying the isolate, their antibiotic sensitivity test was done on Muller Hilton Agar using the Kirby Bauer method. The plates were read out after overnight incubation, by measuring the zone of inhibition around the antibiotic disc as per Clinical Laboratory Research Institute (CLSI) standards 2017. Ethical clearance was obtained by the ethics committee. Ref. Code: 88th ECM II B-Thesis/P9.

Results

The tests were performed on a total of 150 patients comprising 44 (29.3%) female and 106 (70.7%) males, out of which 105 (70.7%) were from rural and 45 (30.0%) from the urban citation. The monomicrobial bacterial isolate was seen in 125 (83.3%) cases. Mixed growth was observed in 11 cases. The 14 (9.33%) cases were found sterile. Out of 150 patients enrolled in the study, 140 (93.3%) were found to be suffering from Chronic Suppurative Otitis media (CSOM). Only 10 (6.7%) suffered from Acute Suppurative Otitis media (ASOM). It showed the predominance of *Staphylococcus aureus* (22.67%), followed by *Pseudomonas aeruginosa* (22%), *Klebsiella pneumoniae* (10.7%), and *Escherichia coli* (10.7%). Among *Staphylococcus aureus,* Methicillin sensitive *Staphylococcus aureus* (MSSA) was 55% and Methicillin-resistant *Staphylococcus aureus* (MRSA) was 45%. Only 1 *Streptococcus pneumonia*e was isolated among 10 ASOM cases.

For MRSA most sensitive drugs were linezolid and vancomycin100.0%), followed by COT (80.0%), AK (70.0%), GEN, and CD (60.0%) while most resistant drugs were P, CX (100.0%) followed by LE & E (50.0%) (Fig -1).

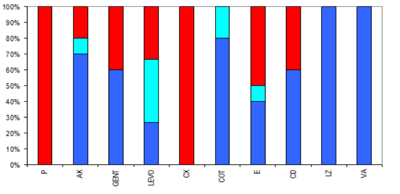

Fig 1- Antibiotic Susceptibility pattern of MRSA.

Note: COT: cotrimoxazole, AK: amikacin, GEN: gentamicin, CD: clindamycin, P: penicillin, LE: levofloxacin, E: erythromycin, CX:

cefoxitin, LZ;linezolid, VA: vancomycin

For *Pseudomonas* spp. among cases, most sensitive drugs was PIT (91.7%) and CPM (80.6%) and AK (77.8%) and TOB (77.8%), CIP(61.1%) , IPM (61.1%), MRP (72.2%) , GENT(72.2%) and CAZ is 55.6% sensitive(Fig-2).

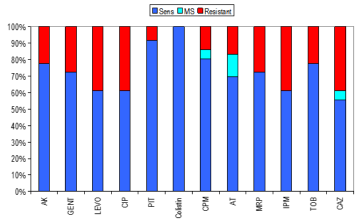

Fig2 – Antibiotic susceptibility pattern of *Pseudomonas* species

Note: PIT: piperacillin-tazobactam, CPM: cefepime, AK: amikacin, TOB: Tobramycin, CIP: ciprofloxacin, IPM: Imipenem, MRP: meropenem, CAZ: ceftazidime.

The other gram-negative (*Escherichia coli, Klebsiella pneumoniae,* and *Proteus mirabilis*) bacteria were 70% to 80% sensitive with ciprofloxacin, aminoglycosides, and levofloxacin.

DISCUSSION

Otitis media (OM) is one of the most common childhood infections in children and a major cause of childhood morbidity. OM also represents the most frequent reason why children have prescribed antibiotics or undergo surgery across the world. It is the principal cause of childhood hearing loss in India. The bacteriological profile of otitis media and their antimicrobial susceptibility pattern is beneficial in the treatment and prevention of their complications.

Young children of 1-5yrs age especially may be more prone to otitis media due to anatomical predisposition; shorter, flexible, and horizontal eustachian tube, which allows nasopharyngeal pathogens to easily enter the middle ear. Nasopharyngeal dimensions are smaller in children suffering from repeated attacks of OM [12, 13]. The eustachian tube matures by 7 years of age; this may explain the relative decline in the incidence of OM after this age. Immaturity of the immune system may also be a contributing factor to OM. The abundance of lymphoid tissue in children may also obstruct the Eustachian tube [14].

Age (years)	Number	Percentage %
1-5 yrs	68	45.3
6-10 yrs	61	40.7
10-12 yrs	21	14.0

In our study among CSOM cases, *Staphylococcus aureus* (22.67%) and *Pseudomonas spp (22%)* were most commonly isolated. Other isolates were *Escherichia coli* (10.71%), *Klebsiella pneumoniae* (10.71%), and *Proteus mirabilis* (8.57%). The least common organisms found were *C. albicans* and *Enterobacter aerogenes* followed by *Acinetobacter baumannii*, *Citrobacter spp,* and *Enterococcus faecalis i*n CSOM cases. In a study done by Gaur RS et al. (2017) [15] in CMC, Vellore, Tamil Nadu, India major micro-organisms isolated were *Pseudomonas aeruginosa* (30.96%), followed by *Staphylococcus aureus* (29.676%) in CSOM cases In a similar study done by Wasihun et al. (2015)[16] Northern Ethiopia common isolates were found *Staphylococcus aureus (*28%), *Proteus mirabilis (*24%*), Pseudomonas aeruginosa (*16 %), *Klebsiella spp*.

Among *Staphylococcus aureus,* Methicillin sensitive *Staphylococcus aureus* (MSSA) was 55% and Methicillin-resistant *Staphylococcus aureus* (MRSA) was 45%. In contrast to our study 80%, MSSA and 20% MRSA isolates were reported in a study done by Gaur RS et al (2017)[15] in CMC Vellore and Agrawal A et al. (2013) from Agra.[17]

In our study for *Staphylococcus aureus*, antibiotic susceptibility patterns were different for both MRSA and MSSA.

MRSA isolates were 100% sensitive to linezolid and vancomycin, 80% to amikacin and trimethoprim-sulfamethoxazole, 53% to erythromycin, and 46% to clindamycin and levofloxacin. In contrast to this, a study was done by Shah PJ et al. (2017) from Shimla, India found that MRSA isolates were 19% susceptible to clindamycin, 10% susceptible to gentamicin, and 55% susceptible to amikacin. 100% isolates were resistant to erythromycin and ciprofloxacin. [18]

In this study, MSSA isolates were 100% susceptible to linezolid and vancomycin. 95% of isolates were susceptible to amikacin, gentamicin, and clindamycin, followed by erythromycin (45%) and levofloxacin (50%). In contrast, a study was done by Shah PJ et al. (2017)[18] in India showed that 51 % of MSSA isolates were susceptible to ciprofloxacin, 57% to erythromycin, 69% to gentamicin, and 85% to clindamycin. Similar susceptibility patterns have been observed in a study done by Gaur RS et al. in 2017[15] in India which shows that 43% of *S. aureus* were susceptible to erythromycin. Another study was done by Agrawal A et al. in 2013 from Agra also found high susceptibility for amikacin (89%) and levofloxacin (85%) in *Staphylococcus aureus* isolates. The susceptibility pattern of levofloxacin was 85%, in contrast to our study where levofloxacin was only 46% susceptible.

In this study, MRSA isolates were more resistant to antimicrobials as compared to MSSA isolates. MRSA isolates are mostly nosocomial however in the 1990's community-acquired MRSA (CA-MRSA) emerged. Since then it has been increasingly reported to cause soft tissue and otolaryngologic infections. In 2002, Hwang et al reported a>8.5% increase in CA-MRSA incidence in otologic infections in Taiwan. **[19]**

In this study, 91% isolates of *Pseudomonas spp*. were susceptible to piperacillin-tazobactam, 80% to cefepime, amikacin, and tobramycin, 72% to gentamicin. Ciprofloxacin and levofloxacin were susceptible to 60% isolates. Imipenem and ceftazidime were susceptible to 61% and 56% isolates respectively. Similarly, Study done by Gaur RS et al. (2017)[15] in India showed 63% of isolates were sensitive to ciprofloxacin, tobramycin, gentamicin, and aztreonam, while nearly 80% of isolates were susceptible to ceftazidime and amikacin. Globally, a change has been noticed in the susceptibility of *Pseudomonas aeruginosa* towards quinolones in the last few decades. In contrast, a study carried out by Altuntas A, Aslan A, et al. in 1996 [20]in Turkey revealed only 6% of *Pseudomonas aeruginosa* isolates were resistant to ciprofloxacin, whereas a study done by Jang CH, et al. in 2004 [21] in South Korea reported ciprofloxacin-resistant in 100% isolates. A study done by Loy AH, Tan AL, et al.[22] in Singapore, has shown a significantly higher percentage of *Pseudomonas aeruginosa* isolates susceptible to gentamicin when compared to this study.

CONCLUSION

Prevalence of OM is high in rural areas of our state and is commonly found in the younger age group (less than 12 years). *Staphylococcus aureus* was the most common isolate followed by *Pseudomonas spp*. *Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Acinetobacter baumannii, Enterococcus* spp, and *Candida albicans* were other isolates. *Staphylococcus aureus* was susceptible to cefoxitin in 55% of isolates (MSSA). *Staphylococcus aureus* was 100% resistant to penicillin and only 63% susceptible to levofloxacin. *Pseudomonas aeruginosa* isolates showed good susceptibility to piperacillin-tazobactam, amikacin. Ciprofloxacin was susceptible in 62% of isolates. Looking at our results, there are differences in organisms isolated from different regions and they have different susceptibility patterns as well. The occurrence of MRSA is increasing with the change in the susceptibility pattern among isolates. This suggests the growing misuse of antibiotics along with other factors is leading to a change in the susceptibility pattern. Early diagnosis of OM and its appropriate management can reduce the incidence of complications.

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