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Original Research Article

A prospective study on microbiological profile and antimicrobial resistance pattern in chronic suppurative otitis media at a rural centre

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ABSTRACT

Background: Over and injudicious prescription of antibiotics over the years has resulted in change in microbial flora in chronic suppurative otitis media (CSOM). More over the incidence of multidrug resistance in bacteria is increasing alarmingly. This study was done to know the microbial pattern in CSOM in the current scenario. This study also aims to know the microbial resistance pattern and the drug sensitivity, also how to tackle the growing multidrug resistance in current practice.
Methods: Sterile swab was collected from 100 patients who attended Outpatient Department of our hospital during 1 year period, sent for culture sensitivity. Details like age distribution, sex distribution, microbial pattern, MDR susceptibility pattern were evaluated.
Results: Males were commonly affected. Most common age group was in the 5th decade followed by 4th decade. Staphylococcus aureus was the most common pathogen followed by *Pseudomonas*. All the multi drug resistant (MDR) strains were *Pseudomonas*, and were sensitive to only higher antibiotic like Piperaziccilin Tazobactam (PTZ), Imipenem (IMP) with 2 of them only intermediate sensitivity to IMP.
Conclusions: Staph aureus and *Pseudomonas* are the most common pathogen in CSOM. Incidence of MDR is on the rise even to higher line drugs. Hence pus culture and sensitivity should be made mandatory in every case of CSOM before starting higher antibiotics or putting patient on long term treatment. This will prevent the emergence of multidrug resistant strains.

Keywords: Chronic suppurative otitis media, Multi drug resistance, Antibiotic sensitivity

INTRODUCTION

Chronic suppurative otitis media (CSOM) is one of the most common childhood diseases and according to WHO estimate affects 65 to 330 million people worldwide mainly in developing countries (WHO, 2004). It is an inflammatory process in middle-ear space that results in long-term, more often, permanent changes in the tympanic membrane including atlectasis, dimer formation, perforation, tympanosclerosis, retraction pocket development, or cholesteatoma.[1]

Through perforated tympanic membrane, organisms spread to adjacent structures of the ear leading to local damage in the ear or intracranial and extracranial complications. This can range from persistent otorrhoea, mastoiditis, labyrinthitis, facial nerve palsy to intracranial abscesses or thromboses.[2,3]

A variety of organisms which include bacteria (aerobes and anaerobes or a mixture of both), fungi is seen associated with CSOM. Most common pathogen found associated with CSOM are *Pseudomonas aeruginosa*,

Staphylococcus aureus, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Escherichia coli*, *Aspergillus* and *Candida*.[4]

Microbial antibiotic resistance is an emerging problem which is especially more common with *Pseudomonas* strains. Increased and irrational use of wide spectrum antibiotics, has resulted in development of resistance among bacterial isolates and change in microbial flora. Inadequate and improper treatment are thought to be other risk factors. It is important to understand the epidemiology and microbiology of CSOM in order to develop effective strategies for primary prevention and better management of the disease.[5] The present study was therefore undertaken to get an idea regarding the microbiological pattern in CSOM. This study also aims to know the drug resistance pattern, antibiotic sensitivity among these resistant strains and the risk factors associated with emergence of drug resistance in CSOM.

METHODS

The present study was conducted among patients with CSOM who attended Outpatient department of our institute for a period of 1 year from November 2018 to November 2019.

All the patients with discharge from one or both the ears for >3 months with TM perforation were included in the study. Patients with ear discharge of <3 months, discharge with intact TM (otitis externa), and who were on antibiotics (topical or oral or systemic) for last 7 days were excluded from the study.

From each patient sterile cotton tipped swab was taken and sent for culture. The culture was done on Mac Conkey agar and blood agar plates and incubated at 37° C overnight. The plates were examined next day for growth of organisms. The organisms were identified by their culture characteristics, morphology, pigment production, hemolysis on blood agar, motility and biochemical tests. The various organisms isolated were tested for their sensitivity against various antibiotics by Kirby-Bauer method as per CLSI guidelines (NCCLS, 2001).

RESULTS

100 patients who satisfied our inclusion criteria during the time period were included in the study.

Table 1: Age distribution.

Age (in years)	Male	Female	Total
1-10	4	1	5
11-20	3	2	5
21-30	9	4	13
31- 40	7	5	12
41- 50	14	10	24
51- 70	19	14	33
>70	5	3	8

Male patient outnumbered female ones (M:F=1.56:1). Most of the patients were found to be from 4th and 5th decades of life (Table 1).

Tubotympanic variety (94 cases) was more common than atticoantral type. Bacterial growth was obtained in 88 patients whereas 4 patients had shown growth of Candida spp. Out of these 88 patients' majority (79) showed growth of a single bacterium only. However, in remaining 9 patients mixed growth was obtained. No growth was seen in 8 patients (Table 2).

Table 2: Distribution of organisms isolated.

Organisms	Number
Bacteria	88
Fungus	4
No growth	8

S. aureus was the predominant organism followed by P. aerogenosa (Figure 1).

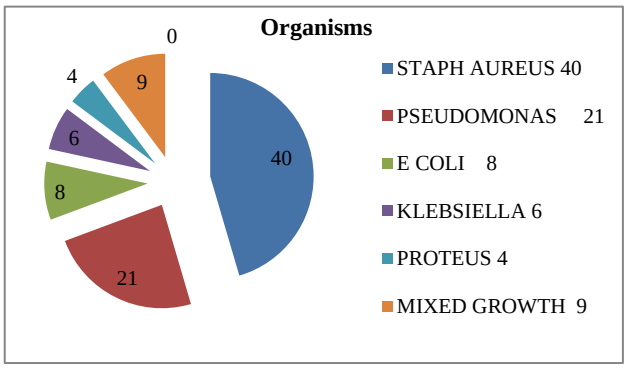

Figure 1: Distribution of bacteria isolated.

Most of the bacterial pathogens were sensitive to commonly used antibiotic groups which included amoxicillin-clavulanic acid, cephalosporins, amino-glycosides and fluroquinolones. Most of the organisms were resistant to the antibiotics azithromycin and ampicillin (85%).

Multidrug resistance was seen in 8 of the 88 cases (9%) cases; with causative pathogen in all cases was P. aeruginosa. A detailed history was taken in these patients including past treatment history. Table 3 show the antibiotic sensitivity pattern among multidrug resistant *Pseudomonas*.

Among the imipenem sensitive cases, 2 were found to be intermediate sensitive.

Out of the 8 cases, 2 patients were not taking treatment properly as advised by the doctors and had discontinued treatment in between. Four patients had consulted different doctors and were taking medications for more than one-month duration due to continuous otorrhea.

Table 3: Antibiotic susceptibility pattern among multidrug-resistant *Pseudomona* strains.

Antibiotic class	Antibiotic	Sensitive	Resistant
Fluroquinolones	Ciprofloxacin		8
	Levofloxacin		8
Aminoglycosides	Amikacin		8
	Gentamycin		8
	Tobramycin		8
Antipseudomonal penicillins	Piperacillin/ tazobactam (PTZ)	8	
Cephalosporins	Ceftriaxone		8
	Cefuroxime		8
	Ceftazidime		8
Carbapenem	Imipenem (IMP)	8	

DISCUSSION

Treatment of CSOM based on antibiotic susceptibility pattern of pathogen will help to lessen the severe complication of the infection and guide the empirical antibiotic prescribed by the physicians, especially for developing countries.[6,7] Increased antimicrobial resistance is one of the greatest global public health challenges, which has been accelerated by injudicious 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.[7-9]

In our study, males were more commonly affected than females (1.56:1). A similar incidence of CSOM in males have been reported by Lakshmiphati et al and Mishra et al.[10,11] Male predominance might be due to their more exposed way of life. In our study fourth and fifth decades were the most commonly affected groups. This was contrary to other studies conducted by Bansal et al, Poorey et al, Shyamla et al and, Michael et al where first decade age group to be the commonest.[12-15]

Out of 100 cases studied, pure growth of a single bacterium was obtained in 79 cases, whereas 9 patients showed mixed bacterial infection. Four patients yielded growth of *Candida* sp. and no growth was seen in eight patients. These eight patients might have been infected either by fungi like *Aspergillus* or by *anaerobic* bacteria. Predominance of aerobic bacteria is well known whereas anaerobic bacteria are responsible for a minority of cases only (Ayyagari et al).[16]

In our study Staphylococcus aureus was found to be the most common bacterial pathogen (45.4%). Similar finding was observed in study conducted by of Prakash et al.[17] Vaishnavi et al, Patricia et al, while Vishwanath et al, Arvind et al, have found it to be second commonest.[18-21] Its incidence has been reported to vary from about 6% (Gulati et al), to 43% (Rao et al).[22,23] *Pseudomonas* was the second most common pathogen (23.8%) in our study.

The other bacteria isolated include *E. coli* (9%), *Klebsiella pneumoniae* (6.8%), and *Proteus* sp. (4.5%). The variations in isolation rates of different organisms reported by different workers may be due to antibiotic uses, ethnic, climatic and other geographical factors (Yildirim et al).[24]

In the present study, 9% (8/88) strains were designated as multidrug-resistant (MDR) strains and all of them were found to be *Pseudomonas* strains. Study conducted by Song et al found that more recently, bacteria including *P. aeruginosa* have acquired resistance to majority of antibiotics giving rise to increasing number of MDR strains thus limiting the therapeutic options for clinicians.[26] This can cause significant risk of nosocomial infections to other patients. From patient's side, these infections caused by MDR *Pseudomonas* strains result in significant pharmacotherapeutic and pharmacoeconomic losses.

Fluoroquinolones and aminoglycosides are broad-spectrum antibiotics used to treat various *P. aeruginosa* infections. We observed high degree of resistance against these antibiotic classes, which was similar to studies published by various authors who also reported high degree of resistance to fluoroquinolones and aminoglycosides.[27-29] Fluoroquinolone and amino-glycoside otic drop preparations are the most commonly prescribed antibiotics to CSOM patients in our setup and this probably could be the reason for developing high degree of resistance to these drug groups.

Anti pseudomonal penicillins, PTZ and carbapenem- IMP showed good activity against the *P. aeruginosa* strains, but the use of these antibiotics in CSOM patients has limited by the absence of oral formulations of these drugs. IMP is regarded as the final medication for MDRPA infections, but it is also important to limit the use of carbapenems in order to combat the appearance of other types of resistance. 2 of our MDR cases were showing only intermediate sensitivity to IMP.

As a drug of last resort, however, polymyxin alone or with a β-lactam antibiotic has shown some success.[30,31]

Over and injudicious prescription of antibiotics, treatment with illogical antibiotic combinations and in many cases economical constrains on patient resulting in discontinuation of treatment has also played a role in the development of antimicrobial resistance.

CONCLUSION

Staph. aureus was found to be the predominant pathogen in the present study followed by *Pseudomonas* aerogenosa. All the MDR strains in our study were *Pseudomonas* with resistance to all the first line drugs. The fact that some strains with only intermediate sensitivity to even broad-spectrum antibiotic like IMP is alarming. Widespread use of antibiotics has resulted in changes in pathogenic microbial flora in CSOM and their resistance to antibiotics. Hence in all CSOM patients before administering antibiotics either local or systemic, culture of aural discharge should be performed and the local antimicrobial susceptibility data should be utilized to formulate antibiotic policy for every institution. This will definitely help to prevent the emergence and spread of new resistant strains.

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