



Study of aerobic bacterial and fungal etiology of chronic suppurative otitis media in tertiary care hospital in out skirts of Chennai, India

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Abstract:

Background: Chronic suppurative otitis media (CSOM) is a persistent disease of middle ear, which is capable of causing severe destructive sequelae with the manifestation of deafness, discharge and a permanent perforation. Early, specific and effective treatment can ensure prompt clinical recovery and prevention of possible complications. **Aim:** To study the aerobic bacterial and fungal etiology of CSOM and to also analyze the antibiogram of aerobic bacterial isolates from cases of chronic suppurative otitis media. **Materials & Methods:** One hundred patients with CSOM were prospectively studied. Two swabs were collected from each patient and cultured for bacteria and fungus. Standard method for isolation and identification of bacteria and fungus were followed. Antibiotic susceptibility testing was done by Kirby-Bauer's disc diffusion method. **Results:** Out of the 100 samples studied for bacterial and fungal isolates, 83 samples yielded growth of potential pathogens, 10 samples did not yield any growth at all. The most predominant organism was *Pseudomonas aeruginosa* (60%) followed by *Klebsiella* (16%) and among fungal isolates the *Aspergillus* spp accounted for 50% of isolates. *Pseudomonas aeruginosa* and other Gram negative bacilli were most sensitive to amikacin and piperacillin-tazobactam. **Conclusion:** The study reveals that in a tertiary care hospital situated in the outskirts of Chennai the commonest etiological agent is *Pseudomonas aeruginosa* and isolates seems to be most susceptible to amikacin, ceftazidime and piperacillin- tazobactam.

Key words: Aerobic; Bacterial; Chronic suppurative otitis media; Fungal

Introduction

Chronic suppurative otitis media is a disease of multiple etiology and well known for its persistence and recurrence. It can be defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges or otorrhoea through a tympanic perforation [1]. The organisms isolated in CSOM can be aerobes, anaerobes, mixed or fungi [2]. In many cases of CSOM the antibiotics are prescribed indiscriminately, these result in treatment failure, the emergence of drug resistant microbes, superinfections and complications ultimately ending in patient suffering and prolonged treatment costs.

The incidence of chronic suppurative otitis media is higher in developing countries especially among low socio-economic society because of malnutrition, overcrowding, poor hygiene, inadequate health care, and recurrent upper respiratory tract infection [3]. The treatment of CSOM is controversial and subject to change

particularly in the developing countries, the prevalence and antibiogram of these organisms has been reported to vary with time and geographical area as well as continent [4]. Also with the increasing use of broad spectrum antibiotics, corticosteroids, cytotoxic chemotherapy and increasing number of immune deficiency conditions there is increasing incidence of fungal infections.

The objective of the study was to determine the fungal and aerobic bacterial etiology of CSOM and to study the susceptibility of the aerobic bacterial isolates.

Materials and Methods

This prospective study was conducted for a period of 1 year (Jan-Dec 2012) at Chettinad Hospital and Research Institute located at the outskirts of Chennai. Written informed consent was obtained at enrollment. A total of 100 patients clinically diagnosed of CSOM were included in the

study. **Inclusion criteria:** Samples were collected from patients attending the ENT OPD and of all age groups who were clinically diagnosed with CSOM.

Exclusion criteria: Cases with duration of ear discharge less than 2 weeks and with history of antibiotic drops for the last ten days.

After obtaining consent from the patient, the ENT surgeon collected the sample by pulling the pinna of the ear outward, laterally and backwards after which the sterile swab stick was gently introduced into the external auditory meatus and then gently rotated and the pus specimen was collected. Two pus samples were collected from the middle ear and the samples were immediately sent to the microbiology laboratory for fungal and bacterial studies. In the laboratory, out of the two swabs, first swab was used for Gram staining, acid fast staining and KOH mount. The ear discharges were examined microscopically (in 10% potassium hydroxide) for the presence of epithelial cells, pus cells, budding yeast cells, fungal hyphae and spores, etc. The second swab was inoculated on blood agar, MacConkey's agar and chocolate agar media and was incubated at 37°C for 24hrs. The organisms were identified by using standard procedure [5]. The antimicrobial susceptibility of the aerobic bacterial isolates was performed by Kirby Bauer's disc diffusion method. A part of the discharge from second swab was cultured on Sabouraud's dextrose agar with chloramphenicol and was examined for gross and the microscopic morphology of the fungi. The yeasts were identified by performing Grams stain, standard biochemical tests and inoculating on chrome agar. Lactophenol cotton blue mount and slide culture was performed for identifying molds.

Results

Out of the 100 samples processed, the number of samples which yielded pure bacterial growth were 83 (83%), commensals 7 (7%) and no growth was observed in 10(10%). Of the 83 positive samples (Table 1), monobacterial isolates were 67(81%), pure fungal isolates were 6 (7%), mixed bacterial isolates were 8 (10%), and mixed bacterial and fungal isolates were 2 (2 %) (Table 1).

The incidence of otitis media was the highest (38%) in < 20 year age group followed by 20-40yrs (34%) and >41yr the incidence was 28%. The number of female patients was 53% compared to number of male patients which was 47%. Out of 67 pure bacterial isolates (Table 2) the predominant bacteria was *Pseudomonas aeruginosa* in 40 (60%), followed by *Klebsiella* 11 (16%), *Staphylococcus*

aureus 7 (10%), *Proteus mirabilis* 4 (6%), *Proteus vulgaris* 1 (1%), *Acinetobacter* 4 (6%) and *Beta hemolytic streptococci* 1(1%).

In this study, among the 67 positive isolates, 8 isolates were obtained from mixed culture. *Pseudomonas aeruginosa* was predominantly mixed with different bacteria like *Proteus vulgaris*, *Klebsiella*, *Staphylococcus aureus*, *Morganella morganni*, *Enterobacter*, *Citrobacter* with 14.2% each.

Out of six fungal isolates two were pure growth, *Candida tropicalis* was mixed with *Staphylococcus aureus* and *Pseudomonas aeruginosa* was mixed with *Aspergillus flavus* (Table 3).

All the bacterial strains which were isolated in the present study were tested against various antibiotics. The overall sensitivity pattern of *pseudomonas* is shown (Figure 1). Highest sensitivity was seen with amikacin and imipenem (100%). The other *Enterobacterceae* were also most susceptible to amikacin and piperacillin –tazobactam.

Table 1: Results of bacterial and fungal cultures

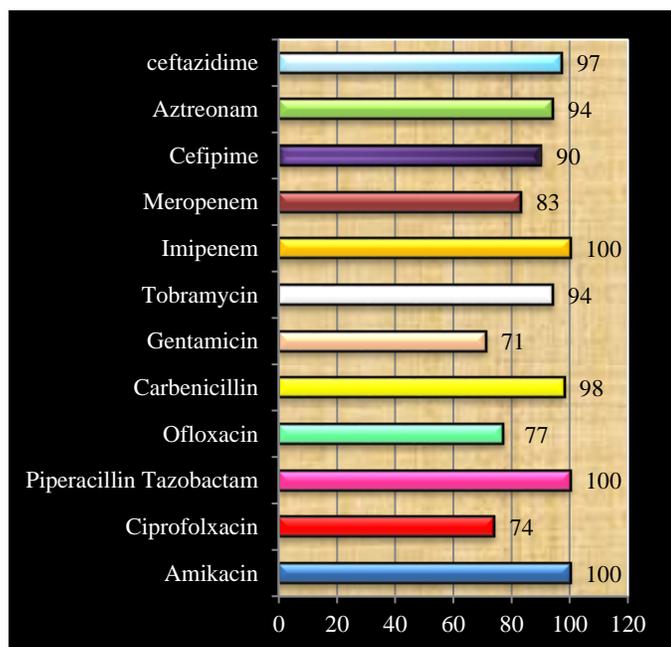
Pure bacterial isolates	67	81%
Pure fungal isolates	6	7%
Mixed bacterial isolates	8	10%
Mixed bacterial and fungal isolates	2	2%
Total	83	100%

Table 2: Bacterial isolates in CSOM

Bacterial isolates	No.	%
<i>Pseudomonas aeruginosa</i>	40	60
<i>Klebsiella</i>	11	16
<i>Staphylococcus aureus</i>	7	10
<i>Proteus mirabilis</i>	4	6
<i>Proteus vulgaris</i>	1	1
<i>Acinetobacter</i>	4	6
<i>Beta haemolytic Streptococci</i>	1	1

Table 3: Fungal isolates in CSOM

Fungal isolates	Number	Percentage
Aspergillus niger	2	33
Aspergillus flavus	1	17
Candida tropicalis	1	17
Candida krusei	1	17
Syncephalastrum	1	17

Figure 1: Antibiotic susceptibility pattern of Pseudomonas (in %)

Discussion

India is one of the countries with high prevalence of CSOM [1]. In this study a total of 100 samples were collected of which bacterial isolates are more predominant (81%). In bacteria, gram negative bacilli mainly *Pseudomonas aeruginosa* (60%) is the common organism causing CSOM followed by *Klebsiella* (16%), *Proteus mirabilis* (6%), *Proteus vulgaris* (1%), *Acinetobacter* (6%) other bacterial isolates are *Staphylococcus aureus* (10%), *Beta haemolytic Streptococci* (1%).

In a study of 100 cases of CSOM by Harvinder Kumar et al similar results were seen in

which the causative agent of otitis media is *Pseudomonas aeruginosa* (45.5%) followed by *Staphylococcus aureus* (37.7%), *Klebsiella* (9.1%), β haemolytic *Streptococci* (2.9%) and *Proteus mirabilis* (2%) [6].

A study from Pondicherry on CSOM in children shows that *Pseudomonas aeruginosa* being the most predominant isolate constituting about 32% (72 discharging ears) of the total isolates followed by *Proteus mirabilis* (20% of isolates) and *Staphylococcus aureus* (19% of isolates) [7].

Sharma et al from eastern Nepal, found a predominance of *Pseudomonas aeruginosa* (36.4%), followed by *Staphylococcus aureus* (30.2%) from a total of 322 swab cultures. In this study gram negative organisms accounted 58% of total isolates and gram positive organisms constituted 22% isolates [8].

The increased rate of isolation of *Pseudomonas aeruginosa* has its own implications, as this organism is an important cause of nosocomial infections and has developed resistance to even many potent antibiotics. *Pseudomonas* infections are mostly seen where there is discontinuity of normal skin or when normal flora is replaced by it due to constant use of topical antibiotics. The easy availability of the over the counter topical antibiotic drops and their rampant use breeds an environment where organisms like *Pseudomonas* can grow and cause serious intra and extra cranial complications.

Among the 100 samples, fungus was isolated in 7% of the cases, *Aspergillus* species accounting for almost for 49% of the fungal isolates. In a Singapore study on 90 patients of otitis media, Loy et al found that fungi accounted for 8.8% of the isolates and that the fungal organisms which were commonly isolated were *Aspergillus* sp (33.3%), followed by *Candida* sp (22.2%) which is similar to our finding [9].

All the strains which were isolated in the present series were tested against various antibiotics. Amikacin (100%) was found to be the most effective drug, followed by piperacillin- tazobacam (100%) and ceftazidime (98%) for *Pseudomonas*. Mansoor et al showed that amikacin was active against 96% of the isolates of *Pseudomonas*, followed by ceftazidime (89%) [10]. In a study done at Vellore it was observed that *Pseudomonas* was sensitive to Piperacillin in 94% isolates, Ceftazidime in 83% and Amikacin 81% [11].

Many studies have found that *Staphylococcus aureus* as second most predominant etiologic agent of CSOM but in our study *Klebsiella* species was

second most commonly isolated isolate [11-13]. Our study shows that gram negative rods outnumber the gram positive organisms in CSOM as reported in some studies [6, 10, 14]. These result shows that the bacteriology and the antibiotic sensitivity pattern of chronic suppurative otitis media are different in different regions. Therefore evaluation of microbiological pattern in local area becomes helpful in prescribing empirical antibiotics for successful treatment of otitis media and thus minimizing its complications and emergence of resistant strains.

Conclusion

Chronic Suppurative Otitis Media (CSOM) is the most common ear disease which is encountered in day to day clinical practice. The disease is notorious for causing irreversible local destruction of middle ear structure and also the dreadful intracranial complications.

Pseudomonas aeruginosa species was the most common isolate and Gram negative bacteria accounted for almost 89% of all the isolates. Isolates were most susceptible to amikacin, piperacillin – tazobactam and ceftazidime. Fungal isolates were seen in 7% of the samples. So it is desirable for laboratory to culture all cases of CSOM for bacteria and fungus on a routine basis. Since the prolonged use of broad spectrum antibiotics and / or steroid ear drops may cause suppression of the bacterial flora and the subsequent emergence of fungal flora. Continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity of isolates is necessary to decrease the potential risk of complications by early institution of appropriate treatment. All this suggests that correct identification, knowledge of the pathogens and judicious use of antibiotics is need of the hour.

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