Microbiological study of otitis media

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Abstract

Otitis media is a destructive & persistent disease with irreversible sequelae. It is associated with bacterial or fungal aetiology.

Objectives: 1) To identify bacterial isolates causing ear infection and their antibiogram. 2) To identify fungal isolates 3) To screen all smears for Acid Fast Bacilli (AFB).

Materials and Methods: This study was conducted for 1 year. Pus was collected with sterile swab before commencement of antibiotics, from 98 patients of otitis media, attending ENT OPD. Gram's staining & Gabbet's staining (Modified ZN staining) was done for all the samples. Bacterial & fungal isolates were identified by standard methods. Antibiotic susceptibility testing of bacterial isolates was carried out by Kirby Bauer's disc diffusion method.

Results: Age of the patients studied, ranged from 2 to 68 years. Of the 98 patients, 48 were females and 50 were males. Bacterial isolates and their incidence were: Staphylococcus aureus(31%), CONS(6%), Pseudomonas species(20%), Klebsiella species(7%), Proteus species(5%). 4 fungi were isolated. 2 samples showed acid fast bacilli on Gabbet's staining.

Conclusions: The most common organisim causing Otitis media in this study was Staphylococcus aureus (MSSA). Antibiotic treatment should be individualized depending on antibiotic sensitivity report, to reduce chronicity, complications & morbidity. It also showed in the study that, doing acid fast staining routinely could be of help as it helped to diagnose two cases of pulmonary tuberculosis.

Keywords: ENT- ear, nose, throat, OPD- out patient department, CONS- coagulase negative staphylococci, MSSA- methicillin sensitive staphylococcus aureus, AFB- acid fast bacilli

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Introduction

Chronic otitis media is one of the most common diseases, with highest prevalence in tropical countries like India[1]. Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of middle ear and mastoid cavity that may present with recurrent ear discharges for more than 3 months through a tympanic perforation.[2] It can occur in any age group but more common in childhood especially in lower socioeconomic group.[3] It is a destructive & persistent disease with irreversible sequelae.[2]

Most common organisms associated are *Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae, Escherichia coli, Aspergillus sp and Candida albicans.*[4] 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.[5]

Objectives

1. To know the bacterial etiology of CSOM
2. To know the fungal etiology of CSOM
3. To screen for acid fast bacilli in ZN smears.

Materials and Methods

Study was done for a period of one year from January to December 2014 in a District tertiary care hospital Mandya. Patients with history of ear discharge from 3 months were examined using aural speculum. Patients with central tympanic perforation who have not used any antibiotic in last 2 weeks were included in the study. Patients with history of antibiotic usage in 2 weeks were excluded. A total of 112 pus samples were received from the patients attending OPD of department of ENT. All samples were further processed in Department of Microbiology. 2 Sterile cotton swab was used to collect the ear discharge. Swab was first put for culture on Blood agar, MacConkey Agar plates and Saboraud Dexrose Agar slants. Other swabs were also used to make smears for Gram stain, ZN staining by Gabbett's method wet mount in 10% potassium hydroxide. All culture plates were incubated at 37^0 C for 24 hours. All smears were examined under microscope within 30 minutes. All the cultures were identified by standard protocols.[6] For fungal

identification Aspergillus Species and Candida albicans were used as controls.

Sensitivity of bacterial cultures was done by Kirby Bauer's disc diffusion method and Antibiotics were put according to CLSI guidelines.[7]Antibiotics were obtained by HiMedia laboratories.

Results

Out of 112 samples, 90 showed single growth and 6 showed mixed growth. Of the 112 patients, 44 were females and 68 were males. Age of the patients studied, ranged from 2 to 68 years. *Staphylococcus aureus* (36.3%) was predominat organism isolated followed by *Pseudomonas aeruginosa* (31.4%). *Staphylococcus aureus* showed highest sensitivity to Vancomycin and Linezolid. *Pseudomonas aeruginosa* showed highest sensitivity to Amikacin and Imepenem. 2 samples showed acid fast bacilli on ZN staining. They were found to be positive for pulmonary tuberculosis retrospectively. Results are shown in tables.

Table 1: Percentagewise Distribution of growth pattern

Type of Growth	Number of samples	Percentage
Single	90	80.3
Mixed	06	5.4
No growth	16	14.3
Total	112	100

Table 2: Distribution of patients based on different age groups

Age	Number (Percentage)
< 10 years	20 (17.8%)
11-20 years	40 (35.7%)
21- 30 years	24 (21.4%)
31-40 years	12 (10.7%)
41-50 years	10(8.9%)
51-60 years	04 (3.6%)
> 61 years	02 (1.8%)

Table 3: Sex distribution of patients

Sex	Number	Percentage
Male	68	60.7%
Female	44	39.3%
Total	112	100

Table 4: Percentage distribution of organisms

Microorganisms	Number	Percentage
Staphylococcus aureus	37	36.3%
Pseudomonas aeruginosa	32	31.4%
Coagulase negative staphylococci	3	2.9%
Steptococci	3	2.9%
Klebsiella pneumoniae	7	6.9%
Escherichiae coli	6	5.9%
Proteus spp	5	4.9%
Acinetobacter Sp	2	1.9%
Diphtheroids	3	2.9%
Aspergillus Niger	3	2.9%
Candida Sp	1	0.9%

Table 5: Antibiotic Sensitivity pattern of *Pseudomonas aeruginosa* (32), *Staphylococcus aureus* (37) and Enterobactericiae family- *E.coli, Klebsiella Sp, Proteus Sp* (18

	Cot	Cip	E	LZ	Cx	Va	AK	C	CAZ	Pi	PiT	IPM	Amp	CTR	CXM	AZT
S.aureus (n=37)	20	24	34	37	37	37	34	34	-	-	-	-	-	-	-	-
P.aeruginosa (n=32)	-	15	-	-	-	-	29	-	16	20	29	32				
E.coli, Proteus, Enterobacteriaceae (n=18)	4	9	-	-	-	-	17	-	-	-	16	18	2	11	9	14

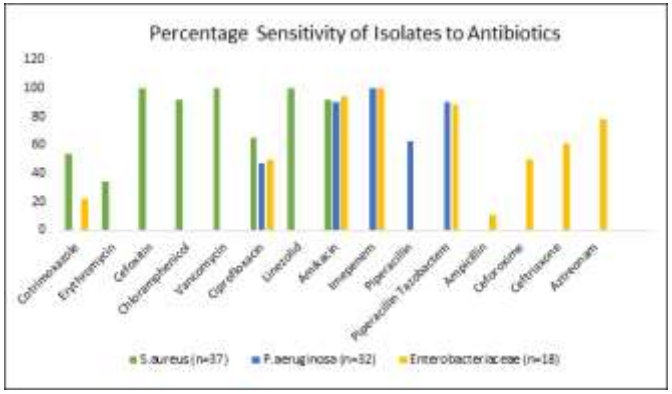

Fig. 1 : Percentage Sensitivity of Isolates to Antibiotics

Discussion

India has been identified as one of the high prevalent countries for chronic SOM. One of the reason for this kind of prevalence could be that SOM is often considered as a part of normal.

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.[8]

Adults face the risk of social stigma and decreased avenues of employment.

In the present study most of the isolates were from patients in the age groups of 10-20 years (35.7%) followed by 20-30 years (21.4%) and indirectly signal acute exposure during the childhood. Similar age pattern has been reported by Mansoor et al.[9], and Poorey et al.[10] In contrast, Loy *et al* showed the increased prevalence of CSOM in 30 - 40 years age in his study.[11]

Predominant involvement of males (60.7%) over females (30.7%) in our study corroborates with data reported by other authors.[12,13,14]

Managing CSOM cases on the basis of microbial causes, identification of aerobic, anaerobic and fungal isolates along with drug susceptibility testing is indispensable for taking appropriate clinical decisions. In our study, organisms were grown in 85.7% of the samples from CSOM patients which is similar to other study from India and other countries.[15,16] Study found *S. aureus* as the most common (36.3%) isolate which correlates with study by Prakash, et al.[2] Other studies shows *P. aeruginosa* as the most common isolate in CSOM followed by *S. aureus*.[17,18] Gulati et al. reported the most common isolate as *Klebsiella* spp.[19] 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. It is imperative to perform antibiotic sensitivity testing among isolates from CSOM because the antimicrobial resistance is not restricted to the hospital setting, rather manifesting at the community level also and CSOM is mainly the condition operating at the community level. Antibiotic sensitivity pattern of *P. aeruginosa* in our study revealed 100% susceptibility to Imepenem. Piperacillin-Tazobactum, showed 90% sensitivity among Gram negative isolates and Piperacillin was sensitive in only 62.5% of *P. aeruginosa*. Also 53 of the isolates were found resistant to Ciprofloxacin and 50% sensitivity to Ceftazedime. All the strains of *S. aureus* were 100% susceptible to Vancomycin, Teicoplanin, Cefoxitin and Linezolid. No strain was Methicillin Resistant *S. aureus* while 35-46% of *S.aureus* strains showed resistance to ciprofloxacin and cotrimoxazole. These findings are in comparison with previous studies[17,18,20]. Amikacin and Erythromycin shows 92% sensitivity. Other Gram negative isolates i.e. *Escherichia coli*, *Klebsiella* spp, and *Acinetobacter* spp. were found 100% sensitive to Imipenem and 90% sensitive to Piperacillin-Tazobactum which is in comparison with other studies[17,18]. Ciprofloxacin showed 50% resistance while Ampicillin showed 90% resistance.

Management of CSOM consists mainly of treating and eradicating infection and closure of tympanic membrane. Perforated tympanic membrane is a permanent threat of microbial attack of the middle ear and persistent infection is a cause of associated morbidity. Antimicrobials can be prescribed at the peripheral level but surgical intervention would require specialized facilities.

Conclusion

To choose the appropriate topical or systemic drug in individual cases antimicrobial susceptibility pattern of the isolates prevalent should guide the clinician. Changes in the sensitivity pattern of pathogenic organisms occurs as a result of irrational and widespread usage of antibiotics. Most common organisms were *S. aureus* and *P. aeruginosa* and these were less susceptible to drugs like Ciprofloxacin, Cotrimoxazole and Gentamicin which are used commonly. *Acinetobacter* spp. was found to be most resistant all antibiotics. For effective treatment and to prevent any complications, periodic evaluation of antimicrobial susceptibility pattern of microbial pathogens is mandatory. The role of ear toilet for better efficacy of topical antibiotics should be emphasized. By reducing the time lag between onset of symptoms and treatment, we can minimize complications of CSOM. Routine acid fast staining should be done in culture negative samples which can help to diagnose tuberculosis of systemic origin.

Consent: Not applicable.

Ethical Approval: Not applicable.

Competing Interests: Authors have declared that no competing interests exist.

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