ORIGINAL ARTICLE

Antimicrobial susceptibility pattern of pathogenic bacteria of Chronic Suppurative Otitis Media (CSOM) patients through culture and sensitivity in a tertiary level hospital in Khulna

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Abstract

Background: Chronic Suppurative Otitis Media (CSOM) is a chronic disease associated with irreversible consequences and serious intracranial and extracranial complications. Thereby early & effective treatment must be needed to avoid such complications. **Objectives:** This study was carried out to know antimicrobial susceptibility pattern of pathogenic bacteria through culture and sensitivity for better management and to reduce resistance & morbidity due to CSOM. **Methods:** After taking proper approval from hospital administration, this study was conducted on 82 patients of clinically diagnosed cases of both Tubo-tympanic & Attico-antral variety of CSOM attending ENT OPD of Gazi Medical College Hospital, Khulna from January 2018 to June 2018. After proper sample collection by sterile aural swabs, they were immediately sent to the microbiology laboratory of Gazi Medical College Hospital, Khulna for bacterial culture, isolation and identification. Routine antibacterial susceptibility was done as per CLSI guidelines. SPSS 18.0 was used for statistical analysis. **Results:** The commonest pathogens isolated were Staphylococci, Coagulase Negative Staphylococci (CONS), Pseudomonas aeruginosa, Klebsiella spp. & others; mostly showing susceptibility to high end antibiotics like Ceftriaxone and Amoxiclav for staphylococcal infection & piperacillin-tazobactum for Pseudomonal infection. **Conclusion:** Antibiotic sensitivity pattern determines the prevalent bacterial organism causing CSOM to start empirical treatment for a successful outcome, and thus to prevent the emergence of resistant strains.

Keywords: CSOM, Antimicrobial resistance, Culture & Sensitivity

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Introduction

Chronic suppurative otitis media (CSOM) is a chronic inflammatory disease of mucoperiosteal lining of the middle ear cleft with permanent perforation, ear discharge and hearing loss. It may be acute, subacute and chronic.[1,2] Otitis media is highly prevalent worldwide3 involves 65–330 million individuals with ear discharge, of which 39–200 million suffer from significant hearing impairment commonly in developing and developed countries.[4,5] Over 90% of cases are seen in the South-east Asia.[4] Most of the microbiological studies of CSOM have revealed that the most common aerobic pathogen frequently found in CSOM are Staphhylococcus aureus, Pseudomonas, Gram negative organisms such as Proteus spp, Klebsiella spp, Escherichia coli, Haemophillus influenzae, and Moraxella catarrhalis.[6-8] Untreated cases of CSOM can result in a wide range of complications like persistent otorrhoea, conductive deafness, mastoiditis, labyrinthitis and facial nerve paralysis to more serious intracranial abscesses or thromboses.[4,5] Among these all these complications, hearing loss is the most common and preventable one.[5] CSOM is a public health problem not only because of its high incidence and complications but also because of antimicrobial resistance.[4] Development and spread of resistant bacteria due to the over and indiscriminate use of antibiotics was a global public health threat.[3] The improper and indiscriminate use of antimicrobials and poor follow up of patients resulting high percentage of resistant bacteria regarded as a leading cause for recurrence and persistence of low grade infections.[8-10] However, antimicrobial susceptibility profile of bacteria in CSOM vary with time and geographical area due to local antimicrobial prescribing practices and prevalence of resistant bacterial strains.[4,5] So, it is very important for the physicians to know about antimicrobial sensitivity pattern for achieving appropriate management of CSOM

Materials and methods

After taking approval from hospital administration, this prospective observational study was conducted for a period of 6 months from January 2018 to June 2018 on 82 selected patients of clinically diagnosed cases of both Tubo-tympanic & Attico antral variety of CSOM attending ENT OPD of Gazi Medical College Hospital, Khulna. Patients of all ages and both sexes presenting with tympanic perforation and ear discharge of more than 3 months and patients who were not on any antibiotics (oral and systemic) in the previous five days were included in the study whereas patients with systemic diseases and ear discharge for less than three months were excluded from study. Informed consent was obtained at enrollment. The results were analyzed statistically after entering in excel worksheet by using SPSS 18.0 version.

Sample Collection

Before collecting the aural discharge, the external auditory canal was cleared of cerumen swabbed with boric acid spirit and allowed to dry. The external ear discharge was then aseptically collected in naked eye with a thin, sterile cotton swab without touching tympanic membrane or the external auditory canal. Collected specimens were transported immediately to the laboratory for further processing.

Specimen processing and susceptibility testing

The swabs were inoculated onto MacConkey agar and nutrient agar for aerobic culture. After overnight incubation at 37°C, growth of microorganisms were examined, then after proper biochemical tests, species level identification was done and antimicrobial susceptibility testing for isolated bacteria was performed using Disc diffusion method by following CLSI guidelines.

Results:

Of the 82 patients enrolled for the study, 59 (71.95%) had tubo-tympanic disease and rest 23 (28.04%) presented with attico-antral

disease. Majority of the patients (45.12%) were in the age group of 21–40 years (45.12%) (Table 01).

Table 01: Distribution of middle ear disease in different age groups

Age group (years)	Types of CSOM		Total n= 82	
	Tubo-tympanic	Attico-antral	Number of patients	%
0-20	15	7	22	26.82%
21-40	26	11	37	45.12%
41-60	11	3	14	17.07%
61-80	7	2	9	10.97%
Total	59	23	82	100%

A total of 55 organisms (0.67 isolates per specimen) were detected. Single bacteria were isolated from 55 (67.07%) samples, whereas no bacterial growth was found in 27 (32.92%) samples. The most common isolate was Staphylococcus aureus (35, 63.63%) followed by Coagulase negative Staphylococcus spp. (8, 14.54%), Pseudomonas aeruginosa (6, 10.90%), and Klebsiella pneumoniae (3, 5.45%) (Table 02).

Table 02: Different types of organisms isolated from CSOM patients

Types of organisms	Number of isolates	Percentage
Single bacterial growth	55	67.07%
Staphylococcus aureus Coagulase negative *Staphylococcus spp* *Pseudomonas aeruginosa* *Klebsiella pneumoniae* *Streptococcus pneumoniae* Anaerobic gram positive cocci	35 8 6 3 2 1	63.63% 14.54% 10.90% 5.45% 3.63% 1.81%
No growth	27	32.92%

By following CLSI guideline (Figure 01), Ceftriaxone 35(100%) followed by Amoxiclav (94.28%), Cefepime (91.42%), Imipenem 30 (85.71%) were the most effective antibiotics against Staphylococcus aureus (Figure 02). On the other hand, Piperacillin-tazobactum (100%), Ceftriaxone (100%), Meropenem (100%) were the most effective antibiotics against Pseudomonas aeruginosa (Figure 03).

Zone of Inhibition of Different Antibiotic
CLSI-2015
(Diameter in mm)

Symbol	Antibiotic	Resistant	Intermediate	Sensitive
AMP	Amplicillin	<13	14-16	>16
AML	Amoxycillin	<13	14-17	>18
AMC	Amoxyciauv	<13	14-17	>18
AMK	Amikacin	<14	15-16	>17
AZM	Azithromycin	<13	14-17	>18
AT	Aztronam	<17	18-20	>21
CIP	Cipropioxacin	<15	16-20	>21
CAZ	Ceftazidime	<17	18-20	>21
CRO	Ceftriaxone	<19	20-22	>23
CB	Carbinicillin	<13	14-16	>17
CFC	Cefaclor	<14	15-17	>18
CXM	Cefuroxime	<14	15-22	>23
CFX	Cefoxitim	<14	15-17	<18
CTX	Cefotaxime	<22	23-25	>26
C	Chloramphenicol	<12	13-17	>18
CD	Clindamycin	<14	15-20	>21
COT	Cotrimoxazole	<10	11-15	>16
CE	Cefradin	<14	15-17	>18

Symbol	Antibiotic	Resistant	Intermediate	Sensitive
CFM	Cefixime	<15	16-18	>19
DOX	Doxycycline	<12	13-15	>16
E	Erythromycin	<13	14-22	>23
FD	Fusidic Acid	<11	12-15	>16
GEN	Gentamycin	<12	13-14	>15
LZ	Linezolid	<20	21-22	>23
LE	Levofloxacin	<13	14-16	<17
IMP	Imipenam	<19	20-22	>23
NF	Nitrofurantoin	<14	15-16	>17
NT	Netilmicin	<12	13-14	>15
NA	Nalidixic Acid	<13	14-18	>19
MEL	Mecillinam	<11	12-14	>15
MEM	Meropenem	<19	20-22	<23
OFL	Ofloxacin	<12	13-15	>16
OX	Oxacillin	<10	11-12	>13
P	Penicillin	<28		>29
PC	Piperacillin	<14	15-20	>21
RIF	Rifampicin	<16	17-19	>20
TET	Tetracycline	<11	11-14	>15
TOB	Tobramycin	<12	13-14	>15
VA	Vancomycin	<14	15-16	>17

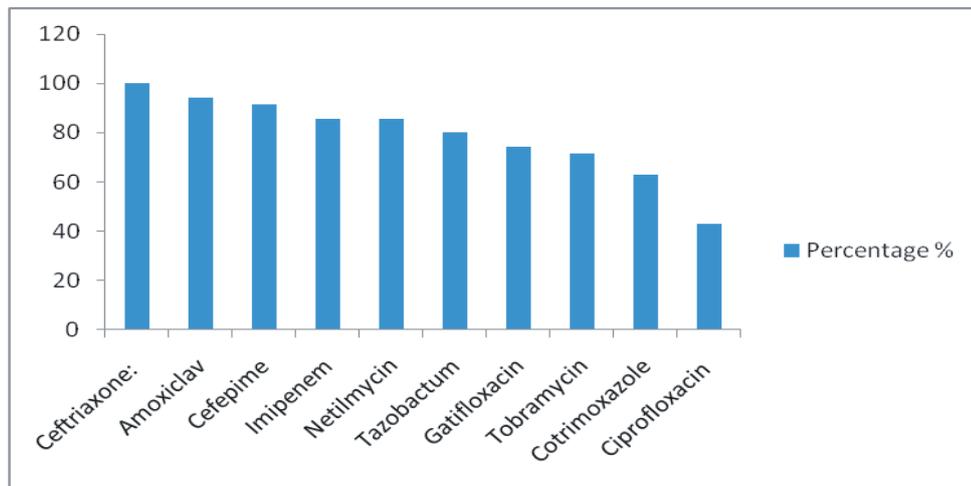**Figure 01: CLSI (Clinical & Laboratory Standards Institute) guidelines**

Figure 02: Antibiotic sensitivity pattern of Staphylococcus spp.
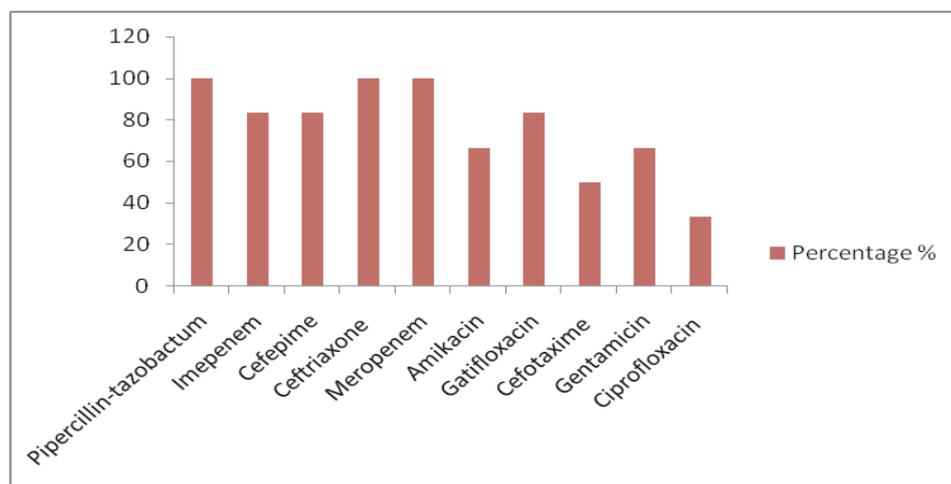

Figure 03: Antibiotic sensitivity pattern of Pseudomonas spp.

Discussion

The CSOM is a major health problem world-wide, but more in developing countries. It has a negative impact on the development of speech, language and social interaction due to chronic hearing loss and is also responsible for significant morbidity and mortality due to its complications.[2] The commonest age group affected was 21-40 years just like in the study by Garima et al. & Mahajan RK et al.[4,5]

In our study 27 (32.92%) samples from clinically suspected CSOM cases showed no growth on culture. This is comparable to the studies by Garima et al.[4], but much higher than Malkappa et al.10; this may be due to prior antibiotic therapy. Out of the total samples cultured, 67.07% revealed single bacterial growth just like Garima et al.[4], Sonia Akter et al.[7]

The results of this study showed that Staphylococcus aureus (63.63%) was found to be the most predominant organism isolated in CSOM followed by Pseudomonas aeruginosa (10.90%) which is in agreement with the reports of some other investigators in different studies.[1,2,3,11,12]

Antibiotic susceptibility patterns serve as a useful guideline for choosing the appropriate antibiotic. In present study majority of staphylococcus isolates were more sensitive to ceftriaxone (100%), amoxiclav (94.28%), cefepime (91.42%), Imipenem (85.71%) etc. But some other studies showed majority of isolates are highly sensitive to Amikacin, gentamicin,[3] doxycycline[7], vancomycin and linezolid, chloramphenicol.[6,8]

In our study, Pseudomonas spp. isolates were found to be highly susceptible (100%) to piperacillin-tazobactum, meropenem and ceftriaxone; imipenem (83.33%), cefepime (83.33%), gatifloxacin (83.33%). Gentamicin (66.66%) and amikacin (66.66%) also showed better sensitivity. These findings are nearly similar as observed in other studies where isolates were found resistant to amino-glycosides and ciprofloxacin.[5,11]

The organisms were resistant to commonly used drugs like cefuroxime, azithromycin, linezolid, cephalexin. This might be due to irrational use of broad spectrum antibiotics. Prescription of antibiotics without proper investigation can contribute to high level drug resistant pattern. Therefore, drug prescription for patients should be based on laboratory evidence.

Conclusion

Present study provided the information of bacteriological profile and their antimicrobial susceptibility in CSOM patients through culture and sensitivity which proved successful management of these cases. Staphylococcus aureus and Pseudomonas spp. were found to be the major pathogens in CSOM. Staphylococcus aureus was highly sensitive to ceftriaxone, amoxiclav, cefepime and piperacillin-tazobactum, meropenem and ceftriaxone were found to be most sensitive for strains of Pseudomonas spp. So, periodic evaluation of regional antimicrobial sensitivity pattern should be encouraged for successful treatment of CSOM and thus minimizing its complications and preventing antibiotic resistance.

References

1. Kumar D, Priyadarshini, Agarwal MK, Prakash P. Bacteriological Profile of Chronic Suppurative Otitis Media in Patients at a Tertiary Level Hospital. Eastern J Med Sci. 2016; 1(1): 5-7.

2. Chandra Sahu M, Swain SK. Surveillance of antibiotic sensitivity pattern in chronic suppurative otitis media of an Indian teaching hospital. World J Otorhinolaryngol Neck Surg .Available from: https://doi.org/10.1016/j.wjorl.2018.05.008

3. Basnet R, Sharma S, Rana JC, Shah PK. Bacteriological Study of Otitis Media and Its Antibiotic Susceptibility Pattern. J Nepal Health Res Counc 2017;15(36):124-9.

4. Garima, Chaurasia D, Poorey VK. Antimicrobial susceptibility pattern of bacterial isolates from chronic suppurative otitis media patients in Central India. Indian J Microbiol Res 2016;3(4):373-382.

5. Mahajan RK, Agarwal S, Jeram H, Vashishtha RC. Antimicrobial susceptibility pattern of bacterial isolates in patients of chronic suppurative otitis media in a tertiary care hospital in India. Int J Res Med Sci. 2018 ;6(11):3705-3709

6. Kumar R, Srivastava P, Sharma M, Rishi S, Nirwan PS, Hemwani K, et al. Isolation and antimicrobial sensitivity profile of bacterial agents in chronic suppurative otitis media patients at Nims hospital,Jaipur. Int J Pharm Bio Sci. 2013;3(4): 265-269

7. Akter S, Shamsuzzaman SM, Nehar N, Siddiqui I, Islam S. Bacterial isolates and drug susceptibility patterns of ear discharge from patients with ear infection at Shaheed Monsur Ali Medical College . Bangladesh J Med Microbiol 2015; 9 (2): 20-23.

8. Harshika YK, Sangeetha S, Prakash R. Microbiological Profile of CSOM and their Antibiotic Sensitivity Pattern in a Tertiary Care Hospital. Int.J.Curr.Microbiol. App.Sci. 2015; 4(12):735–43.

9. Perveen S, Naqvi SB, Fatima A. Antimicrobial susceptibility pattern of clinical isolates from cases of ear infection using amoxicillin and cefepime. SpringerPlus. 2013 2:288.

10. Malkappa SK, Kondapaneni S, Surpam RB, Chakraverti TK.Study of aerobic bacterial isolates and their antibiotic susceptibility pattern in chronic suppurative otitis media. Indian Journal of Otology. 2012;18(3):10–3.

11. Agrawal A, Kumar D, Goyal A, Goyal S, Singh N et al. Microbiological profile and their antimicrobial sensitivity pattern in patients of otitis media with ear discharge. Indian Journal of Otology. 2013;19(1):5–8.

12. Nia KM, Sepehri G, Khatmi H, Shakibaie MR. Isolation and Antimicrobial Susceptibility of Bacteria from Chronic Suppurative Otitis Media Patients in Kerman, Iran. Iran Red Crescent Med J. 2011; 13(12):891-894.