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 worldwide\(^3\) 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 Staphylococcus aureus, Pseudomonas, Gram negative organisms such as Proteus spp, Klebsiella spp, Escherichia coli, Haemophilus 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) | Tubo-tympanic | Attico-antral | Total n= 82 |
|-------------------|---------------|--------------|------------|
| 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).

Zone of Inhibition of Different Antibiotic

CLSI-2015
(Diameter in mm)

| Symbol | Antibiotic         | Resistant | Intermediate | Sensitive |
|--------|--------------------|-----------|--------------|-----------|
| AMP    | Ampicillin         | <13       | 14-16        | >16       |
| AML    | Amoxycillin        | <13       | 14-17        | >18       |
| AMC    | Amoxyciav          | <13       | 14-17        | >18       |
| AMK    | Amikacin           | <14       | 15-16        | >17       |
| AZM    | Azithromycin       | <13       | 14-17        | >18       |
| AT     | Aztronam           | <17       | 18-20        | >21       |
| CIP    | Ciprofloxacin      | <15       | 16-20        | >21       |
| CAZ    | Ceftazidime        | <17       | 18-20        | >21       |
| CRO    | Ceftriazone        | <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       |

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).
| 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     | Levofoxacin    | <13       | 14-16        | <17       |
| IMP    | Imipenem       | <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       | 21-22        | >23       |
| 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 worldwide, 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. The commonest age group affected was 21-40 years just like in the study by Garima et al. & Mahajan RK et al. 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., but much higher than Malkappa et al.; 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., Sonia Akter et al. 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. 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, doxycycline, vancomycin and linezolid, chloramphenicol. 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 aminoglycosides and ciprofloxacin.

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.

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