MICROBIOLOGICAL EVALUATION OF CHRONIC SUPPURATIVE OTITIS MEDIA

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Abstract: Background: Chronic suppurative otitis media (CSOM) is one of the commonest diseases in developing countries affecting all age groups, especially children of lower socio-economic group. Early and appropriate management of active disease reduces the duration of illness, preventing complications like mastoiditis, sensori-neural deafness and facial paralysis. The aim of the study is to isolate the bacterial and fungal pathogens involved and to determine their antimicrobial susceptibility pattern in patients attending the ENT OP department of a tertiary care hospital.

Materials and methods: A total of 100 patients with unilateral or bilateral CSOM with active ear disease attending the ENT OPD were included in the study over a period of 3 months from September 2012 to November 2012. Pus samples were collected from patients with discharging ears using sterile cotton swabs and processed in the microbiology laboratory using standard techniques for the isolation and identification of bacterial and fungal isolates. Antimicrobial susceptibility of the bacterial isolates was performed by disc diffusion method.

Results: Among the 100 cases evaluated in the study, a total of 87 organisms were isolated from 84 patients with predominance of Gram negative bacilli. Monomicrobial infection was observed in 81 patients (81 isolates) and polymicrobial infection in 3 patients (6 isolates). Pseudomonas aeruginosa was the commonest organism isolated (28.3) followed by Staphylococcus aureus (21). Fungal isolates accounted for 6.89, which included Candida species and Aspergillus species. Sensitivity pattern of gram negative bacilli showed highest sensitivity to cefoperazone sulbactum followed by amikacin and that of Gram positive cocci showed highest sensitivity to amoxycillin-clavulanic acid followed by amikacin.

Conclusion: The study highlighted Pseudomonas aeruginosa as the commonest organism isolated from patients with CSOM followed by S. aureus. Amikacin was found to be effective against both Gram negative bacilli and Gram positive cocci.

Keyword: CSOM, Pseudomonas, Staphylococcus, Candida

Introduction: Chronic suppurative otitis media is a long standing infection of a part or whole of the middle ear cleft characterized by ear discharge and a permanent perforation. The inflammatory process in the middle ear space results in long term or often permanent changes in the tympanic membrane like perforation, atelectasis, tympanosclerosis, retraction pocket formation or cholesteatoma. Ossicular chain involvement is variable. CSOM results from long term dysfunction of the eustachian tube with poor aeration of middle ear space, multiple bouts of acute otitis media or other chronic inflammatory stimulus.

A higher incidence of CSOM is seen in developing countries, especially in children of lower socio-economic status. The hearing loss due to this condition has a major impact on social and intellectual development of children. CSOM can be classified into two types based on the anatomical involvement of the middle ear, tubotympanic disease and attico-antral disease. Tubotympanic disease is characterized by perforation of the pars tensa and is rarely associated with complications. Attico-antral disease is a chronic infection of the epitympanum and antrum characterized by formation of a retraction pocket in the pars flaccida in which keratin accumulates to produce cholesteatoma, and is often associated with complications. The complications include mastoiditis, subperiosteal abscess, labyrinthitis, facial paralysis, brain abscess, sigmoid sinus thrombosis and epidural abscess.

The organisms commonly isolated in CSOM are Pseudomonas aeruginosa, Staphylococcus aureus, Proteus spp., Klebsiella spp, Candida spp and Aspergillus spp. The anaerobes commonly isolated are anaerobic Gram positive cocci and Bacteroides spp.

Most of the cases of CSOM are treated with antimicrobials during the active disease to clear the infection. The indiscriminate use of antibiotics has led to the development of antibiotic resistance in organisms.

CSOM with Central Perforation
Aims and Objectives

This study was done with the aim of identifying the bacterial and fungal pathogens in patients with active chronic suppurative otitis media, both safe and unsafe types and to determine their antibiotic sensitivity pattern to help in the patients’ conservative management.

Materials and Methods

The study included 100 clinically diagnosed cases of chronic suppurative otitis media with active ear discharge attending the ENT OP department of a tertiary care hospital. Patients with unilateral or bilateral active chronic suppurative otitis media, safe or unsafe type, not having received antibiotics for a week were selected for the study. As the study was conducted at the adult OPD, children under 11 years were excluded.

Pus was collected from the discharging ears using 2 sterile cotton swabs after cleaning the external auditory canal using 70% ethanol. One swab was used for direct microscopic examination by Gram stain and 40% potassium hydroxide (KOH) wet mount preparation. The other swab was used to inoculate on MacConkey agar, blood agar, chocolate agar plates for aerobic bacteria and 2 tubes of Sabouraud Dextrose Agar (SDA) for fungi. The culture plates and one tube of SDA were incubated at 37 °C and the other tube of SDA was incubated at room temperature. All organisms isolated were identified by standard microbiological methods. A negative culture was reported for bacteria after 48 hours and for fungi after 4 weeks of incubation.

Antimicrobial susceptibility of the bacterial isolates was done by Kirby- Bauer’s disc diffusion method as per Clinical and Laboratory Standards Institute (CLSI) guidelines (2011).

Results

100 samples were collected over a period of 3 months and processed. 11 patients had bilateral CSOM with active disease in at least one ear. 3 patients had complications like mastoiditis, Luc’s abscess and tempo-parietal abscess. 5 patients had attico-antral disease and presented with cholesteatoma or granulation. The age of the study group was in the range of 11 to 75 years, with maximum number of 53 patients in the second and third decades of life (53%). Females (55%) were more commonly affected than men (45%) [Table 1]. The most common symptoms of presentation were otorrhoea and diminished hearing. [Table 2]

Study results showed 87 isolates from 84 patients. Monomicrobial infection occurred in 81 patients (81 isolates) and polymicrobial infection occurred in 3 patients with 2 isolates each (6 isolates) [Table 3]. Culture was negative in 16 patients.

The most common organisms isolates were Pseudomonas aeruginosa (29.8%) and Staphylococcus aureus (26.4%) followed by Proteus species (9.2%), Coagulase negative staphylococci (9.2%, obtained by repeated cultures), Klebsiella spp. (8%) and Escherichia coli (5.7%). Fungi accounted for 6.9% of the isolates, Candida albicans being the most common (2.3%).

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Biofilms have been implicated in cholesteatoma formation and both gram positive and gram negative bacteria have been identified in them. If left untreated, CSOM can result in a wide range of complications - intracranial or extracranial. Effective and early management with aural toileting and appropriate antibiotics can make the ear dry which helps the surgeon to plan surgical management. Knowledge of the pattern of local microorganisms and their antibiotic sensitivity is essential to formulate empirical antibiotic therapy.

Analysis of the study showed that about 53% of patients with CSOM were in the second and third decades of life. A study conducted by Harvinder Kumar et al showed similar age incidence of 47% 8. Females were more commonly affected than males, as also seen in a study done by Loy et al in Singapore 9.

Analysis of the microbial flora in the present study shows that Gram negative bacilli were the predominant isolates contributing to 57.47%, Gram positive cocci accounted for 35.63% and fungi about 6.9%. Pseudomonas aeruginosa was the most common organism isolated (29.8%), followed by Staphylococcus aureus (26.4%). The other organisms isolated were Coagulase negative staphylococcus (CONS-9.2%), Proteus mirabilis (6.9%), E.coli (5.7%) and K.pneumoniae (4.6%). The less frequently isolated organisms were K.oxytoca (3.4%), P.vulgaris, Acinetobacter spp and C.koseri (2.5%) each.[Table 4]

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Table 5. Antibiotic sensitivity pattern of Gram negative bacilli (in percentage)

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Ak</th>
<th>Gen</th>
<th>Cip</th>
<th>Of</th>
<th>Cef</th>
<th>Cz</th>
<th>CS</th>
<th>PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>94</td>
<td>68</td>
<td>68</td>
<td>62</td>
<td>62</td>
<td>55</td>
<td>85</td>
<td>87</td>
</tr>
<tr>
<td>E.coli</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>K.pneumoniae</td>
<td>75</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>k.oxytoca</td>
<td>68</td>
<td>68</td>
<td>68</td>
<td>68</td>
<td>0</td>
<td>33</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>P.vulgaris</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>P.mirabilis</td>
<td>100</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
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<tr>
<td>C.koseri</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Acinetobacter spp</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
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<td>50</td>
</tr>
</tbody>
</table>

Table 6. Antibiotic sensitivity pattern of Gram positive cocci (in percentage)

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Ak</th>
<th>Pen</th>
<th>Co</th>
<th>Ery</th>
<th>CP</th>
<th>Cip</th>
<th>AC</th>
<th>Vanco</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.aureus</td>
<td>70</td>
<td>35</td>
<td>70</td>
<td>55</td>
<td>74</td>
<td>71</td>
<td>71</td>
<td>100</td>
</tr>
<tr>
<td>CONS</td>
<td>71</td>
<td>33</td>
<td>29</td>
<td>29</td>
<td>43</td>
<td>43</td>
<td>43</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 7. Isolates in polymicrobial infection of chronic suppurative otitis media

<table>
<thead>
<tr>
<th>Organisms</th>
<th>No. of cases</th>
<th>No. of isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.aureus + Candida albicans</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>S.aureus + Citrobacter koseri</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>S.aureus + Pseudomonas aeruginosa</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

Mixed infection was seen in 3 patients [Table 7]. S.aureus was one of the isolates in all 3 cases of polymicrobial infection.

The results show that the most common pathogens isolated in active CSOM were Pseudomonas aeruginosa and Staphylococcus aureus. The study results were comparable to a Nigerian study conducted by Osazuwa F et al, wherein Pseudomonas aeruginosa (28.3%) was the predominant bacteria isolated from cases of CSOM followed by Staphylococcus aureus (21%) 10. This pattern of CSOM infection is found in many tropical countries 11, 12. Study conducted by Tahira Mansoor et al in Karachi in 2006 showed Pseudomonas aeruginosa as the commonest offender (40%) followed by S.aureus (30.9%), Proteus (11.6%) and Klebsiella (8%) 13.

All the 8 isolates of CONS were documented only after repeated isolation from a second sample from each patient. In a study conducted by Loy et al, S.aureus and P.aeruginosa were the most common pathogens isolated (22.22%), followed by CONS (14.07%).

Conclusion

In this study, culture positivity was noted in 84% of cases of CSOM with 87 isolates. Bacterial isolates accounting for 93.1% and fungi for 6.8%. Pseudomonas aeruginosa was the predominant isolate. Amikacin, ceftazidime, CS and PT were highly sensitive to amikacin, 72% to vancomycin and 86% to ceftazidime but only 48% to amikacin.

The study also revealed that all the Gram positive cocci were highly sensitive to amoxicillin-clavulanic acid and vancomycin (100%). Besides, S.aureus showed moderate sensitivity to cephalexin (74%), ciprofloxacin (71%), amikacin (70%) and co-trimoxazole (70%). Out of the 23 isolates of S.aureus, 14 were methicillin resistant (61%). Study done by Harvinder Kumar et al showed 89.6% of the isolates of S.aureus to be sensitive to amikacin, 72% to vancomycin and 69% to ciprofloxacin and erythromycin. 8
found to be the most suitable drugs for \textit{P.aeruginosa}. 
Amoxycillin-clavulanic acid, amikacin and ciprofloxacin were found to be suitable for \textit{S.aureus}. Hence the above drugs can be used for empirical antibiotic therapy.

As development of resistance is most often due to inappropriate dosage and duration of antibiotic intake, it is essential to use antibiotics diligently to prevent the emergence and spread of resistant strains of bacteria.

\textbf{References}

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