

# Antibiotic Resistance is a Global Threat: How It Affected in Chronic Otitis Media

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## ABSTRACT

**Background:** Due to widespread use of antibiotics, the types of pathogenic microorganisms and their resistance to antibiotics have changed. Knowledge of the specific micro-organisms and resistance rates of current pathogens is important for determining the appropriate antibiotics for patients with chronic suppurative otitis media. This study was carried out to examine the current local bacteriological profile and antibiotic sensitivity in case of CSOM.

**Materials and methods:** This was a prospective study. We carried out analysis of ear swab cultures from 100 CSOM cases seen at the OPD in NIENT in period June 2023 to December 2023. Sensitivities to eleven locally available antibiotics were analyzed.

**Results:** We analyzed 100 ear swab culture from 100 patients and 118 organisms were detected and there were no organism in 2 cultures. Patients with age ranging from 3 years to 65 years and mean age is 37.06 years. Pseudomonas was the most common isolated bacteria (36.44% [43/118]) followed by Staphylococcus (22.9% [27/118]) and Proteus (11.86% [14/118]). The most effective antibiotics were ciprofloxacin followed by gentamycin, linezolid, clindamycin.

**Conclusion:** Though organisms and antibiotic sensitivity in different types of infection has changed over time but in case of CSOM conventional antibiotic (Ciprofloxacin) is effective still now against pseudomonas, most common organism in CSOM.

## KEY WORDS

CSOM; Infection; Sensitivity.

## INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a permanent abnormality of tympanic membrane, most likely a result of earlier acute otitis media, negative middle ear pressure or otitis media with effusion. It is one of the most common causes of preventable hearing loss especially in developing countries. CSOM is characterized by persistent or recurrent discharge for

three months or more through a perforation of the tympanic membrane.<sup>1,2</sup> The incidence of CSOM is increasing in the developing countries due to poor nutrition, poor hygienic practices and lack of health education.<sup>3</sup> According to World Health Organization (WHO) global burden of CSOM accounts for 28,000 deaths and a disease burden of over 2 million DALYs (Disability-Adjusted Life Year) and if appropriate treatment is not given at the right time it leads to irreversible local destruction of middle ear structures resulting in complications such as labyrinthitis, facial nerve paralysis, lateral sinus thrombosis, mastoiditis, meningitis and intracranial abscess.<sup>4</sup> Usually Gram negative bacterias (Pseudomonas aeruginosa, Escherichia coli, Proteus species, Klebsiella species) are involved in the pathogenesis of CSOM. The aim of the present study was to determine the microbiological profile and antibiotic sensitivity pattern.

## MATERIALS AND METHODS

We conducted a prospective analysis of clinically diagnosed CSOM seen in the National Institute of ENT(NIENT) Tejgaon, Dhaka from January 23 to December 2023. Those included had active ear discharge in one or both ears for at least 3 months and from whom ear swab specimens were sent for culture

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and sensitivity. Patients with recent history of ear trauma and diabetic patients, as well as those found to have attico-antral disease were excluded from this study. Details history and relevant findings were collected from the patients which included otoscopic examination findings. Collection of specimen swab samples were collected from the discharging ears by inserting a sterile specimen stick deep in the canal. The collected samples were enclosed in airtight plastic tubing and then sent to the microbiology test laboratory. The samples were always taken before cleaning/suctioning the ear canals of the excess purulent exudates. Culture for anaerobic organisms was not performed in this present study. The Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 16 was used for analysis. Chi-square test was used to test the statistical significance of the association between potential variables.

RESULTS

The age ranged from 3 years to 69 years with a mean of 35.9 years. The males accounted for 62% (62/100) of the patients with a male to female ratio of 1.63:1. Among the 100CSOM cases studied, 89 cases were unilateral while 9cases were bilateral. Among the 100 cultures, there were no organism in 2 cases. Among 98 cultures 118 organisms were identified.

Pseudomonas was the most common isolated bacteria (36.4% [43/120]), followed by Staphylococcus (27% [22.9/120]), Proteus (11.9% [14/120]) and klebsiella (9.3% [11/120]).

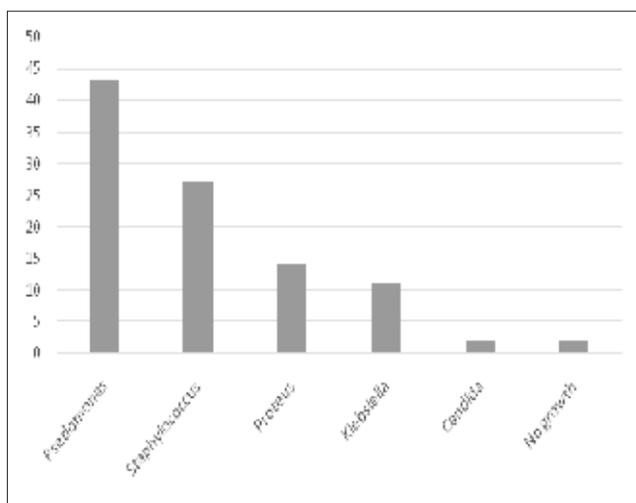


Figure 1 Bar diagram reveals isolated organisms from CSOM

Overall, The most effective antibiotics were ciprofloxacin (50.83%) followed by gentamicin (50%)

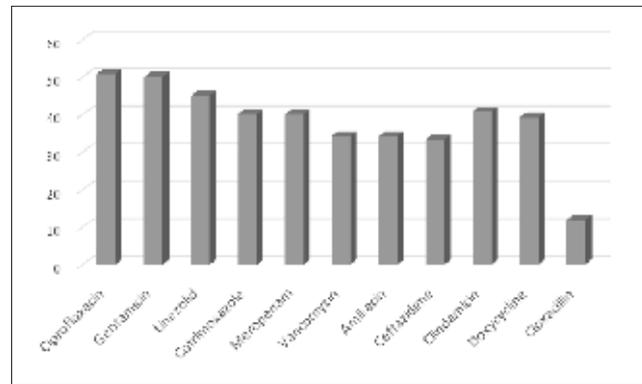


Figure 2 Bar diagram reveals different antibiotics according to sensitivity

As the most common organism is pseudomonas and most sensitive antibiotic is ciprofloxacin. But in significant cases ciprofloxacin is less sensitive. In these particular cases antibiotic sensitivity was tested to other antibiotic. In 60% cases ciprofloxacin in highly sensitive, intermediately sensitive in 38% cases and resistant in 2% cases.

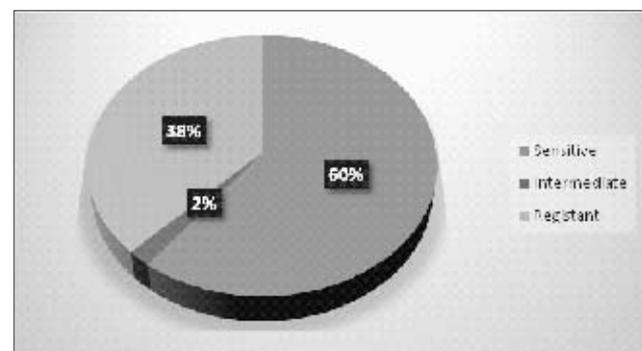


Figure 3 Sensitivity status to ciprofloxacin which is most commonly used antibiotic in CSOM

It is important to assess the sensitivity of other antibiotics where ciprofloxacin less sensitive or intermediately sensitive. In this cases sensitivity of clidamicin-78.9%, linezolid-78.9%, doxycycline-73.7, vancomycin-68.4% and gentamicin-39.5%.

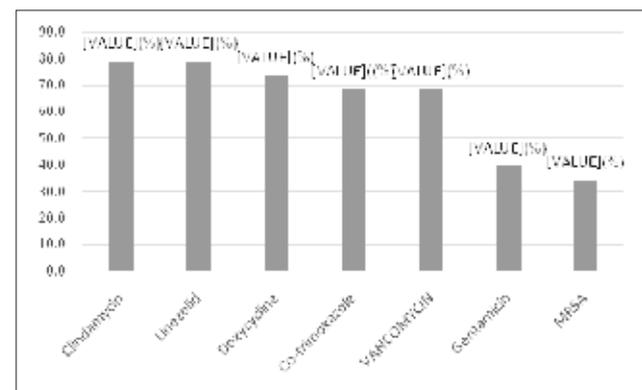


Figure 4 Sensitivity status to other antibiotic where Ciprofloxacin is resistant

## DISCUSSION

Chronic suppurative otitis media are a common disease with approximately 5% global incidence.<sup>1</sup> It is characterised by chronic inflammation of the middle ear cleft with recurrent ear discharge through a persistent perforated ear drum. The susceptibility of organisms causing CSOM to antibiotics changes considerably from time to time and this variation is even worsened by misuse of antibiotics, which tend to create multidrug resistance among the organisms, thereby making the management of CSOM more difficult.<sup>5-7</sup> Often, it is common in the otologic practice to see actively discharging ears yielding sterile cultures in view of previous antibiotic therapy which had modified the bacterial making treatment problematic.<sup>8,9</sup> For rational antibiotic use and successful of treatment of CSOM, an appropriate knowledge of antibacterial susceptibility of causative microorganisms essential. The results of this study showed that overall Pseudomonas was the most common isolate in CSOM followed by Staphylococcus which is in agreement with the reports of some other investigators in different parts of the worlds.<sup>6,9,10</sup> Madana et al. similarly documented *P. mirabilis* as the second most common bacteria isolate in their series.<sup>5</sup> In one study, however, *S. aureus* was reported as the most common isolated microorganism in 117 CSOM cases.<sup>8</sup> This, therefore, implies that sole reliance on empirical antibiotic therapy is not appropriate for effective treatment of CSOM. As a policy, bacteriological study and antibiotic sensitivity should be obtained for every CSOM patient so that specific antibiotic therapy will be applied to the individual cases. In our study, 2% of the cultures did not yield any microbial growths which is compatible with the findings in other reports in which negative cultures were also documented.<sup>11,8,9</sup> Such negative cultures may have been as a result of the modification of the bacterial flora in the affected ears by prior empirical antibiotic therapy.

Our study also showed that 9% of the patients had bilateral CSOM, which agrees with other investigators from a developing country.<sup>12</sup> The sensitivities of most bacteria isolated in this study are comparable to the reports of most investigators. Most of the investigators reported high sensitivity rate for Pseudomonas and Staphylococci to ciprofloxacin, though emergence of ciprofloxacin-resistant Pseudomonas in CSOM is being reported.<sup>11,7,10</sup> Overall, we found that the most effective antibiotics tested was ciprofloxacin followed by Gentamicin, which is in agreement with the report of other investigators in which the sensitivities to aminoglycosides (Amikacin and Gentamicin) approach

100%.<sup>11,6</sup> However, in other reports, ciprofloxacin was found to be the most effective antibiotics.<sup>8,9</sup> Since pseudomonas is by far the predominant bacteria isolated in most CSOM and is mostly highly sensitive to ciprofloxacin which has none of the ototoxic risks of aminoglycosides, it may be beneficial to concluded that ciprofloxacin ear drops be adopted as a first line antimicrobial treatment for CSOM. Ciprofloxacin resistant rate is not negligible. Ciprofloxacin is sensitive in 60 percent cases. Intermediate sensitive in 38% cases and resistant in 2% cases. This agrees with results of other investigators.<sup>11,8,12</sup>

So where the ciprofloxacin less sensitive or intermediately sensitive, it was important to assess the sensitivity of other antibiotics in those particular microbes. In this cases clindamycin, linezolid, doxycycline, vancomycin and gentamicin are sensitive.

## CONCLUSION

Pseudomonas was the most common isolated bacteria in CSOM and was highly sensitive to gentamicin and ciprofloxacin antibiotics. In this era of increasing resistance to antimicrobial agents by bacteria, a periodic surveillance of bacteriological profile is essential for effective management of CSOM.

## RECOMMENDATION

Large sample size with multicenter study needs to be conducted to get actual results.

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## DISCLOSURE

All of the authors declared no competing interests.

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