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Aerobic bacteriology of chronic suppurative otitis media in Rajahmundry, Andhra Pradesh, India

AH Singh*, R Basu, A Venkatesh
Department of Microbiology, GSL Medical College & General Hospital,
Rajahmundry, Andhra Pradesh, India.

***Corresponding Author:** heramansingh@gmail.com

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Abstract
This is an aerobic bacteriological study of chronic suppurative otitis media to identify common pathogens and to evaluate their antibiotic susceptibility pattern. Hundred and fifty patients who had chronic ear discharge and had not received antibiotics recently were selected. Swabs were taken and cultured for bacteria aerobically. Antibiotic testing was done using modified Kirby–Bauer disk diffusion method. In addition to the usual antibiotics, three antibiotics commonly available as topical ear drops were tested. There were 192 bacterial isolates comprising mainly *Staphylococcus aureus* (36%), *Proteus* species (32%), *Pseudomonas aeruginosa* (24%), and coagulase-negative *Staphylococcus* (20%). Among the topical antibiotics, ciprofloxacin had the highest susceptibility rate (89%) for all the isolates tested followed by gentamicin (76.5%) and chloramphenicol (59.3%).

Keywords: Bacteriology; chronic suppurative otitis media; antibiotics; topical eardrops.

Introduction

Chronic suppurative otitis media (CSOM) is a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent otorrhea through a tympanic perforation. It is a massive public health problem, and India is one of the countries with highest CSOM prevalence where urgent attention is needed (WHO, 2004). It is a common cause of hearing impairment and can occasionally lead to fatal intracranial infections.

Inadequate antibiotic treatment and poor hygiene conditions are related to the development of CSOM (WHO, 2004). Bacterial predominance and their antibiotic sensitivity pattern change over time (Yeo *et al.,* 2007). So, knowledge of the local pattern of infection is essential to enable efficacious treatment of this disorder. As topical antibiotic treatment is often effective and seldom harmful, most experts would start with a wide-spectrum antibiotic on an empiric basis and make a request for cultures if drug resistance is suspected (WHO, 2004). The purpose of this study was to identify the common aerobic bacterial pathogens and to evaluate their antibiotic susceptibility pattern particularly against topical antibiotics.

Materials and Methods

Hundred and fifty patients who attended the ENT department from January 2010 to March 2012 were studied. They had perforated tympanic membranes with active purulent discharge. They did not have any antibiotic treatment recently. Aural swabs were collected from each patient before instillation of any local medication. The swabs were processed for the isolation of aerobic bacteria using standard bacteriological procedures, and the organisms grown were identified according to the standard bacteriological methods (Duiguild *et al.*, 2006; Forbes *et al.*, 2007).

The pathogens were tested for their antibiotic susceptibility by modified Kirby–Bauer disk diffusion method, and the interpretation of results was done by using standard guidelines (Clinical and Laboratory Standard Institute, 2012). Apart from the standard antibiotics, testing was also done specifically for ciprofloxacin, gentamicin, and chloramphenicol, which are available locally as topical ear drops. The data have been summarized by counts and percentages. Sensitivity of the isolates to topical antibiotics has been presented with the respective 95% confidence interval values.

Results

A total number of 192 strains were isolated from 150 patients enrolled in the study. Ninety six patients (64%) had a single organism isolated from the middle ear culture, while the remaining 46 patients (30.67%) had two or more organisms isolated. Eight patients (5.33%) had a

sterile culture with no organisms isolated (Table1).

Table 1: Number of isolates.

Number of Isolates	Number of Patients (%)
0	8 (5.3)
1	96 (64.0)
2	42 (28.0)
3	4 (2.6)

The most common causal organisms isolated were *Staphylococcus aureus* (36%), *Proteus* species (32%), followed by *Pseudomonas aeruginosa* (24%), and coagulase-negative *Staphylococcus* (20%) (Table 2). The antibiotic sensitivities of the pathogens were tested and the results are shown in Figures 1–4.

Table 2: Aerobic bacteria isolated from CSOM cases.

Type of Organism	No. of Isolates	Patients Infected (%)
S. aureus	54	36
Proteus sp.	48	32
P. aeruginosa	36	24
CONS	30	20
Klebsiella sp.	12	8
Escherichia coli	6	4
Corynebacterium sp.	3	2
Streptococcus pneumonia	3	2
Total	192	

CONS - Coagulase-negative staphylococci

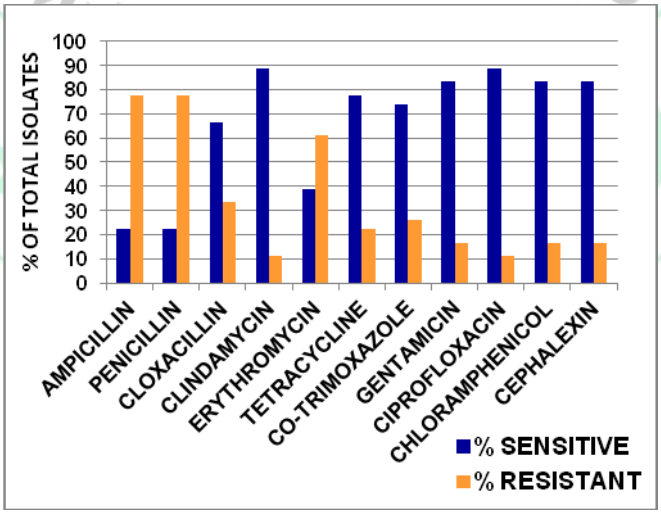

Figure 1: Antibiogram of *S. aureus*.

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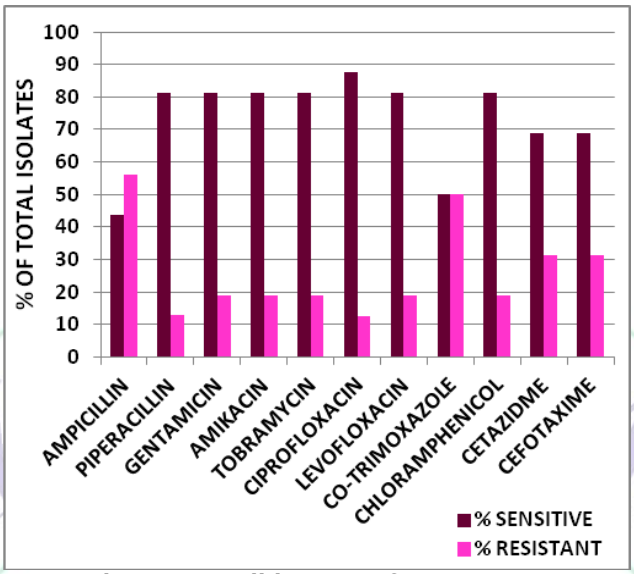

Figure 2: Antibiogram of *Proteus* sp.

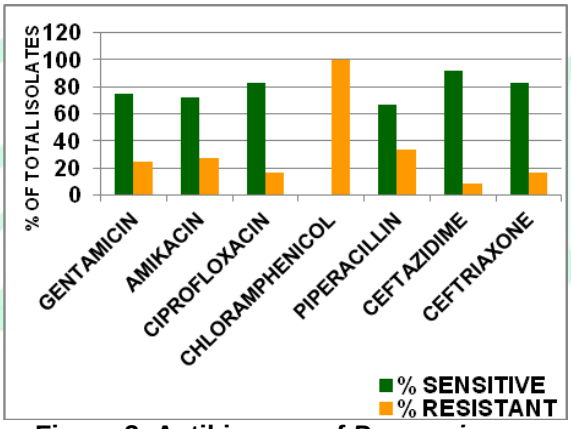

Figure 3: Antibiogram of *P. aeruginosa*.

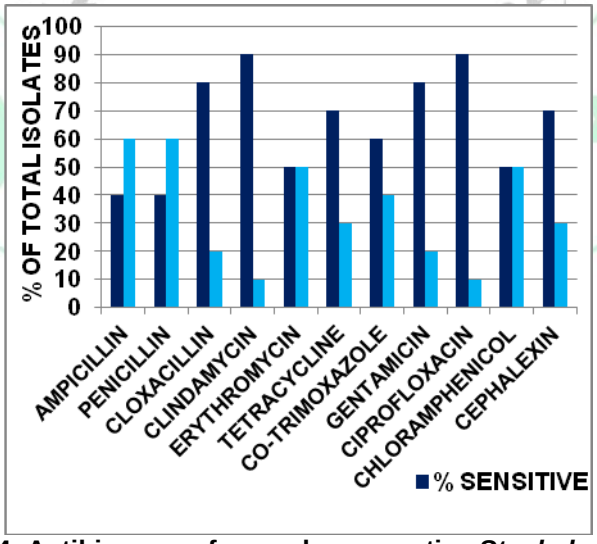

Figure 4: Antibiogram of coagulase-negative *Staphylococcus*.

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Among the three common topical antibiotics tested, ciprofloxacin has the highest susceptibility rate (89%) of all the isolates tested, followed by gentamicin (76.5%) and chloramphenicol (59.3%) (Figure 5); 95% Confidence interval data of three topical antibiotics are presented in Table 3; it is evident that sensitivity to gentamicin and ciprofloxacin is clearly better than to chloramphenicol. Furthermore, sensitivity to ciprofloxacin is also significantly better than to gentamicin.

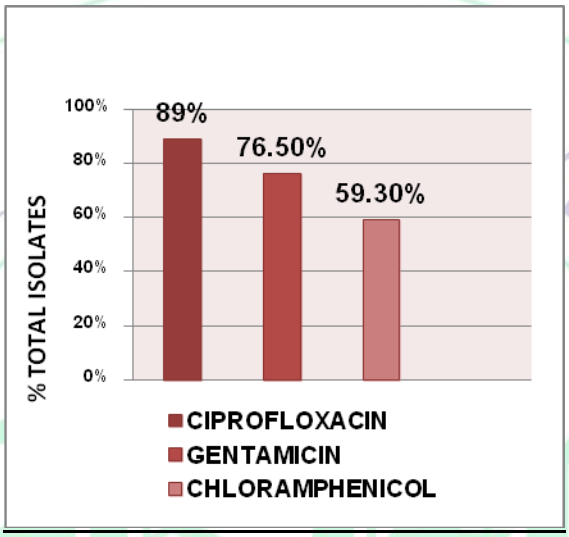

Figure 5: Per cent of total isolates sensitive to topical antibiotics.

Table 3: 95% Confidence interval data of three topical antibiotics.

Topical Antibiotic	Sensitive/Total Isolates	Sensitive (%)	95% Confidence Interval
Ciprofloxacin	171/192	89.06	83.86–92.73
Gentamicin	147/192	76.56	70.05–82.00
Chloramphenicol	114/192	59.38	52.31–66.07

Discussion

Chronic suppurative otitis media is a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges through a tympanic perforation. Through the perforation bacteria gain entry into the middle ear. Infection of the middle ear mucosa subsequently results in ear discharge. Untreated cases of CSOM can result in a broad range of complications like persistent otorrhea, mastoiditis, labyrinthitis, meningitis, and facial nerve paralysis. Some may develop life-threatening complications like lateral sinus thrombosis or brain abscess. Hence, treatment needs to be instituted early and effectively to avoid such complications.

The mainstay of treatment for uncomplicated CSOM is twofold: meticulous aural toilet and instillation of a topical antimicrobial agent. The therapeutic use of antibiotics is usually started empirically before the results of microbiological culture are obtained. Selection of any antibiotic is influenced by its efficacy, resistance to bacteria, safety, risk of toxicity, and cost. Knowledge of the local micro-organismal pattern causing CSOM and their antibiotic sensitivity is therefore essential to start an effective and cost-saving treatment.

Various bacteriological studies on CSOM have shown that the most frequently isolated bacteria were *P. aeruginosa*, *S. aureus*, coagulase-negative *Staphylococcus*, *Proteus* species, and *Klebsiella* species (Loy *et al.*, 2000; Saini *et al.*, 2005; Maji *et al.*, 2007; Nikakhlagh *et al.*, 2008; Madana *et al.*, 2011; Sanjana *et al.*, 2011).

The present study shows that active CSOM in this region of Andhra Pradesh is

mainly due to *S. aureus* (36%), *Proteus* species (32%), *P. aeruginosa* (24%), and coagulase-negative *Staphylococcus* (20%). This finding is in tandem with the pattern of CSOM infection of the other studies mentioned earlier.

More frequent isolation of fecal bacteria like *Proteus* and water bacteria like *Pseudomonas* indicates that individuals are at high risk of infection due to poor hygiene conditions (van Hasselt and van Kregten, 2002).

Staphylococcus aureus was shown to be mostly sensitive to ciprofloxacin, clindamycin, cephalexin, gentamicin, and chloramphenicol. *Proteus* species were sensitive to piperacillin, chloramphenicol, gentamicin, and ciprofloxacin, while *P. aeruginosa* was sensitive to piperacillin, ceftazidime, gentamicin, and ciprofloxacin. Cogulase-negative *Staphylococci* may represent skin flora contamination and not be a true pathogen. However, they were mostly sensitive to ciprofloxacin, gentamicin, cloxacillin, and clindamycin.

Review of literature reveals topical antibiotics that are effective in the medical management of CSOM. The risk of ototoxicity is one stumbling block in the widespread use of topical antibiotics. But much of the evidence on ototoxicity is from animal studies. In addition, most of the clinicians were more concerned about the very real danger of sensory-neural hearing loss from otitis media than with the less clear possibility of ototoxicity from topical usage of antibiotics. Studies have revealed that quinolones like ciprofloxacin are safe and effective particularly against *P. aeruginosa* and *S. aureus* (Agro *et al.*, 1998; Morden and Berke, 2000; Kardar *et al.*, 2003; Macfadyen *et al.*, 2005; Masum and Fakir, 2010).

For the antibiotics commonly available locally as topical ear drops, ciprofloxacin was shown to be the most effective with high sensitivities for the most commonly isolated organisms. With specific regard to the three most common pathogens isolated, *S. aureus* and *Proteus* species were found mostly sensitive to all three topical antibiotics tested, while *P. aeruginosa* showed resistance to chloramphenicol.

Conclusion

Ciprofloxacin and gentamicin thus appear to be the effective first-line topical antibiotics in the treatment of active CSOM. However, they should be used judiciously to prevent the emergence of resistance in these pathogens. Continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity of CSOM is necessary to decrease the potential risks of complications by early institution of appropriate treatment. We believe that our data may contribute to an effective medical management of CSOM.

Ethical Approval

The patients' consent was taken before collection of samples.

Conflict of Interests

Authors do not have any conflicting interests.

References

Agro AS, Garner ET, Wright JW, Caballeros de Escobar I, Villeda B, Seidlin M, 1998. Clinical trial of ototopical ofloxacin for treatment of chronic suppurative otitis media. Clinical Therapeutics, 20(7): 44–59.

Clinical and Laboratory Standard Institute, 2012. Performance standards for antimicrobial susceptibility testing. Clinical and Laboratory Standards Institute, Wayne. 22nd Informational Supplement, 32(3).

Duiguid JP, Collee JG, Fraser AG, 2006. Laboratory strategy in the diagnosis of infective syndromes. In: Mackie and McCartney Practical Medical Microbiology (14th Edition), Churchill Livingstone, London.

Forbes BA, Sham DF, Weissfeld AS, 2007. Bailey & Scott's Diagnostic Microbiology (12th Edition), Mosby Elsevier, St. Louis, MO.

Kardar AA, Usman M, Tirmizi S, 2003. Topical quinolones versus topical aminoglycosides in the medical management of chronic suppurative otitis media: a comparative trial. Journal of Surgery Pakistan, 8(4): 6–9.

Loy AHC, Tan AL, Lu PKS, 2000. Microbiology of chronic suppurative otitis media in Singapore. Singapore Medical Journal, 43(6): 296–299.

Macfadyen CA, Acuin JM, Gamble CL, 2005. Topical antibiotics without steroids for chronically discharging ears with underlying eardrum perforations. Cochrane Database of Systematic Reviews, 4(2): CD004618.

Madana J, Yolmo D, Kalaiarasi R, Gopalakrishnan S, Sujatha S, 2011. Microbiological profile with antibiotic sensitivity pattern of cholesteatomatous chronic suppurative otitis media among children. International Journal of Paediatric Otorhinolaryngology, 75(9): 1104–1108.

Maji PK, Chatterjee TK, Chatterjee S, Chakrabarty J, Mukhopadhyay BB, 2007. The investigation of bacteriology of chronic suppurative otitis media in patients attending a tertiary care hospital with special emphasis on seasonal variation. Indian Journal of Otolaryngology, Head & Neck Surgery, 59(2): 128–131.

Masum S, Fakir M, 2010. Systemic antibiotics versus topical treatments for chronic discharging ears with underlying eardrum perforations. Journal of Dhaka Medical College, 19(2): 86–90.

Morden NE, Berke EM, 2000. Topical fluoroquinolones for eye and ear. American Family Physician, 62(8): 1870–1876.

Nikakhlagh S, Khosravi AD, Fazlopour A, Safarzadeh M, Rashidi N, 2008. Microbiologic findings in patients with chronic suppurative otitis media. Journal of Medical Science, 8(5): 503–506.

Saini S, Gupta N, Aparna, Seema, Sachdeva OP, 2005. Bacteriological study of paediatric and adult chronic suppurative otitis media. Indian Journal of Pathology and Microbiology, 48(3): 413–416.

Sanjana RK, Singh YI, Reddy NS, 2011. Aerobic bacteriology of chronic suppurative otitis media (CSOM) in a tertiary care hospital: A retrospective study. Journal of College of Medical Sciences — Nepal, 7(2): 1–8.

van Hasselt P, van Kregten E, 2002. Treatment of chronic suppurative otitis media with ofloxacin in hydroxypropyl methylcellulose ear drops: A clinical/bacteriological study in a rural area of Malawi. International Journal of Pediatric Otorhinolaryngology, 63(1): 49–56.

World Health Organization (WHO), 2004. Chronic suppurative otitis media: burden of illness and management options. WHO Library Cataloguing-in-Publication Data, Geneva, Switzerland, 1.

Yeo SG, Park DC, Hong SM, Cha C-II, Kim MG, 2007. Bacteriology of chronic suppurative otitis media — A multicenter study. Acta Oto-Laryngologica, 127(10): 1062–1067.

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