

Original Research Article

A cross sectional study on the bacteriologic pattern of chronic otitis media and its antibiotic sensitivity

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ABSTRACT

Background: Chronic otitis media is the commonest middle ear and mastoid cavity disease, which has the tendency of causing morbidity to the patients ranging from deafness to intracranial complications. Hence this study was done to identify the local bacteriological pattern and its antibiotic sensitivity for treating them with appropriate antibiotic therapy.

Methods: This cross-sectional study was done retrospectively with reports of culture and sensitivity of chronic otitis media from microbiology department. The sample was sent from the department of otorhinolaryngology in Chettinad hospital and research institute, Chennai, during the period from January 2018 to January 2020.

Results: On assessing about 188 reports, 17 patients had no growth of organism. The commonest organism isolated was *Pseudomonas* species (33.0%) which was sensitive to imipenem (96.8%), followed by *Staphylococcus* (28.7%) which was sensitive to linezolid and teicoplanin (98.1%).

Conclusions: The study concludes imipenem for *Pseudomonas* species and linezolid/teicoplanin for *Staphylococcus*. The appropriate and adequate antibiotic therapy is always recommended for chronic otitis media to avoid complications.

Keywords: Chronic otitis media, *Pseudomonas* species, *Staphylococcus*

INTRODUCTION

Chronic otitis media (COM) is defined as a chronic infection of the middle ear and mastoid cavity. This is the most commonly occurring ear infection in children as well as adults. The disease usually presents as a chronic, intermittent or persisting ear discharge more than 2 weeks through a tympanic membrane perforation.¹

The ascending infection through the eustachian tube remains the main source of infection to the middle ear.² The other etiological factors include low socioeconomic status, poor hygiene, malnutrition and overcrowding.³ The spread of infection beyond the confines of the middle ear and its adjacent spaces depends upon the virulence of

the infecting organisms, antibiotic sensitivity and adequacy of antibiotic therapy. Inadequate treatment can result in persistent otorrhoea, mastoiditis, labyrinthitis, facial nerve paralysis to more serious intracranial complications.⁴ With the advent of antibiotics, the rate of progression and complications of the disease has decreased. However, due to inappropriate and inadequate use of antibiotics, bacterial resistance has become very common. Frequently isolated bacteria are *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus* species and *Klebsiella* species.⁵

Hence isolation of the bacteria and use of prompt antibiotic therapy is essential to prevent the fatal complications.

Objective

This study is aimed at finding the local pattern of bacteria involved, their antibiotic sensitivity pattern and to choose empirical antibiotic therapy in patients with chronic otitis media

METHODS

After obtaining approval from the ethical committee, the study was done with reports of culture and sensitivity of chronic otitis media from microbiology department. The sample was sent from the department of otorhinolaryngology in Chettinad hospital and research institute, Chennai, during the period from January 2018 to January 2020 was included. The culture and sensitivity reports of all chronic otitis media between the ages 5-50 years with a total of 188 reports were included in the study. For the collection of samples sterile cotton swab sticks were used. The swabs were cultured on Blood and MacConkey's agar and overnight incubation was done at 37°C.⁶ According to standard microbiological methods, the organisms were isolated. Kirby-Bauer disc diffusion method was performed to identify the antimicrobial susceptibility with the clinical and laboratory standards institute guidelines. The collected data was statistically analyzed with SPSS software and the most common bacteriological organism involved and their antibiotic sensitivity was identified.

RESULTS

The total numbers of reports collected were 188. Out of which 17 (9.05%) reported as no growth of any organisms. 188 reports comprising of 102 males (54.3%) and 86 females (45.7%) shown in (Table 1). Out of 188 reports, 167 (88.8%) were swabs of tubotympanic disease and 21 (11.2%) were swabs of attico antral disease (Table 1).

Table 1: Sex distribution and the type of otitis media (n=188).

Variables	Frequency	Percentage
Gender		
Male	102	54.3
Female	86	45.7
Type of COM		
Tubotympanic	167	88.8
Atticoantral	21	11.2

Age of the patients ranged from 5 to 50. The incidence decreased as the age advanced with maximum incidence was observed for second decade (30.9%) of life and less common in first decade with 19 reports (10.1%) (Figure 1).

In this study the bacteriological profile showed aerobic growth in 161 (85.6%) cases and anaerobic growth in 10 (5.3%) cases. Monomicrobial growth was observed in all

the cases. The most common organism isolated was *Pseudomonas aeruginosa* seen in 62 (33.0%), followed by *Staphylococcus aureus* 54 (28.7%), methicillin resistant *Staphylococcus aureus* 11 (5.9%), *Citrobacter freundii* & *Proteus mirabilis* 8 (4.3%), *Escherichia coli* 6 (3.2%) of total 171 cases. *Pseudomonas aeruginosa* 62 (33.0%) being the most common aerobic and *Prevotella intermedia* being the common anaerobic organism isolated (Figure 2).

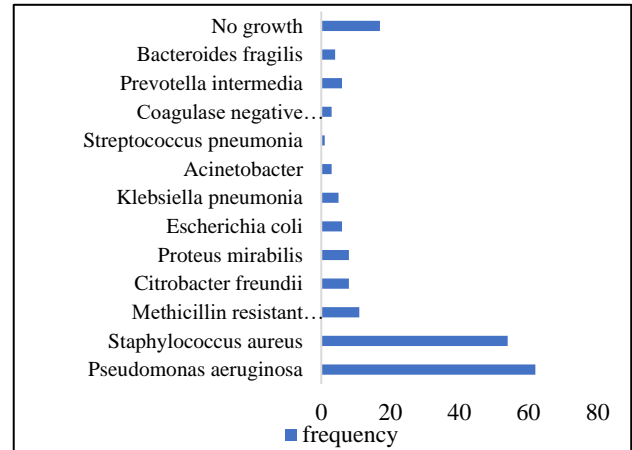


Figure 1: Distribution of bacterial isolates.

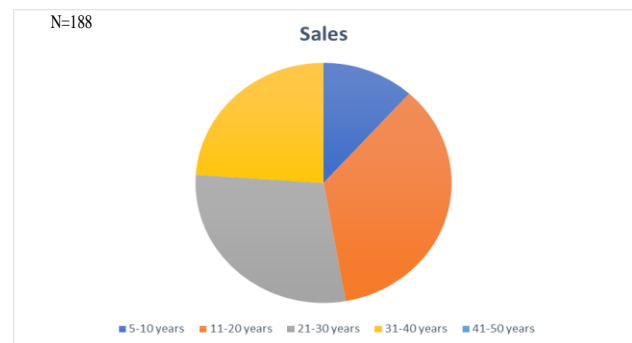


Figure 2: Age distribution.

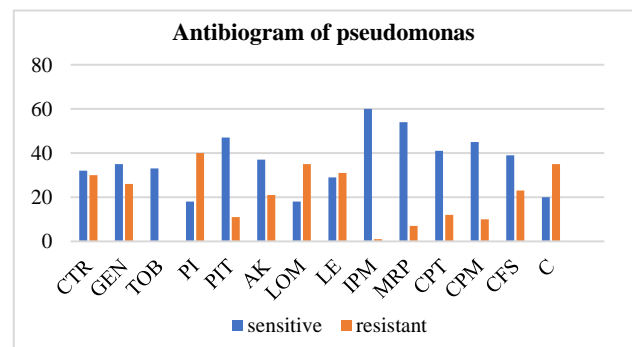


Figure 3: Geographic representation of antibiogram of Pseudomonas (n=62).

CTR: Ceftriaxone, GEN: Gentamycin, TOB: Tobramycin, PIT: Piperacillin-Tazobactam, CPT: Cefepime/Tazobactam; CFS: Cefoperzone/sulbactam; AK: Amikacin; Le: Levofloxacin; LOM: Lomefloxacin, IPM: Imipenem, MRP: Meropenem, C: Ciprofloxacin, CPM: Cefepime.

In tubotympanic disease out of 167 (88.8%) bacterial growth was observed in 154 (92.2%) with high prevalence of *Pseudomonas aeruginosa* 57 (34.1%), whereas 13 (7.7%) cases reported as no growth (Table 2). In attic antral disease, out of 21 cases (11.2%) staphylococcus was the most common organism isolated in 6 (35.2%) reports and no organism was isolated in 4 (19.1%) reports (Table 3).

The first and second most common organism and their antibiotic sensitivity has been explained in detail in this study. *Pseudomonas aeruginosa* was susceptible to imipenem in almost all 60 cases and resistance was observed to piperacillin-tazobactam 40 (64.5%) (Figure 4) followed by *Staphylococcus* (28.7%), the second most common bacterial isolate which was sensitive to linezolid and teicoplanin (98.1%).

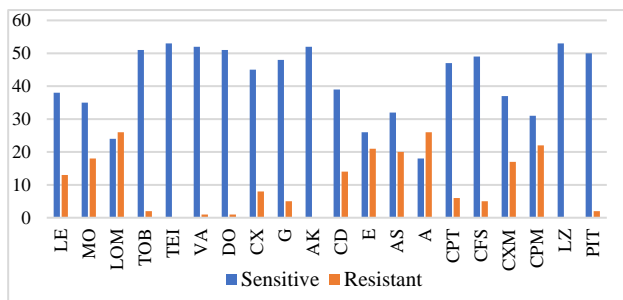


Figure 4: Geographic representation of antibiogram of Staphylococcus (n=54).

PIT: Piperacillin-Tazobactam; CPM: Cefepime; CPT: Cefepime/Tazobactam; CXM: Cefuroxime; CFS: Cefoperzone/sulbactam; G: Gentamycin; CX: Cefoxitin; AK: Amikacin; TOB: Tobramycin; AS: Ampicillin/Sulbactam; LZ: Linezolid; Le: Levofloxacin; A: Ampicillin; DO: Doxycycline; MO: Moxifloxacin, E: Erythromycin; VA: Vancomycin; TEI: Teicoplanin; LOM: Lomefloxacin, IP: Imipenem, G: Gentamicin, MRP: Meropenem.

Table 2: Bacterial isolates in tubotympanic disease (n=167).

Organisms	Frequency	%
Aerobic organisms		
<i>Pseudomonas aeruginosa</i>	57	34.1
<i>Staphylococcus aureus</i>	48	28.7
Methicillin resistant <i>Staphylococcus aureus</i>	9	5.3
<i>Citrobacter freundii</i>	8	4.7
<i>Proteus mirabilis</i>	8	4.7
<i>Escherichia coli</i>	6	3.5
<i>Klebsiella pneumonia</i>		
<i>Acinetobacter</i>	2	1.1
<i>Streptococcus pneumonia</i>	1	0.5
<i>Coagulase negative staphylococcus</i>	3	1.7
Anaerobic organisms		
<i>Prevotella intermedia</i>	6	3.5
<i>Bacteroides fragilis</i>	2	1.1
No growth	13	7.7

Table 3: Bacterial isolates in attic antral disease (n=21).

Organisms	Frequency	Percentage
Aerobic organisms		
<i>Staphylococcus aureus</i>	6	35.2
<i>Pseudomonas aeruginosa</i>	5	29.4
Methicillin resistant <i>staphylococcus aureus</i>	2	11.7
<i>Klebsiella pneumonia</i>	1	5.8
<i>Acinetobacter</i>	1	5.8
Anaerobic organisms		
<i>Bacteroides fragilis</i>	2	11.7
No growth	4	19.1

DISCUSSION

Chronic suppurative otitis media is the disease of middle ear which presents with persistent or recurrent discharge through a perforated tympanic membrane. The bacteria gain its access into the middle ear cavity via the tympanic membrane perforation. Subsequent infection results in ear discharge. This further leads to the development of more serious complications ranging from persistent ear discharge, labyrinthitis, petrositis, facial nerve paralysis to intracranial abscesses. These complications were reported to be more common in the pre antibiotic era, now with the advent of antibiotics the prevalence of these complications has drastically reduced.⁷

The disease is more common in pediatric age group due to their frequent episodes of upper respiratory tract infections, immature immunity and the nature of eustachian tube which is shorter and more horizontal when compared to adults. Hearing loss in pediatric age group has shown effect in childhood development.⁸ Surgery remains the mainstay of treatment for chronic otitis media with perforated tympanic membrane. Aural toileting, suction clearance, dry mopping along with topical antibiotic ear drops are the first line of management to control the disease progress in initial stage.⁹ Ototoxicity has been reported due to the use of aminoglycosides containing topical antibiotics like gentamycin. Oral empirical antibiotics are also given along with topical antibiotic ear drops. Surgical management is planned once the organisms are under control. Inappropriate treatment can result in progression of irreversible complications.¹⁰ Therefore, early detection of bacteria and appropriate treatment with antibiotics prevents the progression of the disease.

Many reports have been published regarding chronic otitis media-the most common organism and their antibiotic sensitivity in corresponding region, this study is done to see the most prevalent organism in our setting.

The incidence of disease is more common in 2nd decade of life which was found similar to the studies conducted

by Parveen et al and Chirwa et al.^{4,10} Male predominance was seen in most of the studies Ahmed et al, Agrawal et al.¹¹

In our study 17 cases reported no isolation of any organism and this might have resulted due to the use of prior antibiotic therapy. The most common organism isolated was *Pseudomonas aeruginosa* seen in 62 (33.0%), followed by *Staphylococcus aureus* 54 (28.7%), methicillin resistant *Staphylococcus aureus* 11 (5.9%), *Citrobacter freundii* and *Proteus mirabilis* 8 (4.3%), *Escherichia coli* 6 (3.2%) of total 171 cases similar to studies conducted by Sanjana et al, Hiremath et al, Mehta et al.¹³ *Staphylococcus* was found to be most common organism in the study conducted by Hailegiyorgis et al and methicillin sensitive *Staphylococcus aureus* in Ahmad observation.^{14,15} *Klebsiella* was found common in Malpani's study and proteus in Chirwa et al.^{10,16}

The bacterial growth of tubotympanic disease was observed more when compared to attic antral disease with prevalence of *Pseudomonas* in tubotympanic and *Staphylococcus* in attic antral disease. The pattern of bacterial growth was observed like the study conducted by Mehta et al.¹³

Pseudomonas aeruginosa was susceptible to imipenem in almost all 60 cases in our study which was unique. Reviewing the literature, *Pseudomonas* was susceptible to tobramycin (93.2%), polymyxin B (98.4%), piperacillin (91.11%). Although many studies reported resistance to ciprofloxacin, the study conducted by John et al showed 90% sensitivity.¹⁷ Resistance was found common with piperacillin-tazobactam 40 (64.5%) followed by lomefloxacin and ciprofloxacin 35 (56.5%).

In our study *Staphylococcus* species was sensitive to linezolid and teicoplanin (98.1%) followed by vancomycin and amikacin in 52 (96.3%) and tobramycin in 51 (94.4%). Resistance was maximum to lomefloxacin and ampicillin whereas in the study conducted by Kumar et al *Staphylococcus aureus* was sensitive 100% to linezolid and vancomycin followed by cefoperazone/sulbactam.¹⁹

Among the topical antibiotic preparations available over the counter, ciprofloxacin is the potential antibiotic used in the management of chronic otitis media. John et al showed 90% sensitivity to ciprofloxacin but many recent studies has reported resistance to ciprofloxacin.¹⁷

The mainstay of treatment for chronic otitis media remains surgery but it is essential to know about the organism and their antibiogram for the appropriate management either before or after the surgery to prevent complications.

CONCLUSION

With the analysis of ear swab culture and sensitivity report of 188 chronic otitis media *Pseudomonas*

aeruginosa was found to be the most common organism which was susceptible to imipenem in almost all 60 cases and resistance was observed in piperacillin-tazobactam 40 (64.5%) followed by *Staphylococcus* (28.7%) which was sensitive to linezolid and teicoplanin (98.1%). Hence this study concluded that use of higher antibiotics is essential for the patients who are reporting with persistence of symptoms even after the use of topical antibiotics.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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