International Journal of Otorhinolaryngology and Head and Neck Surgery
Nagraj M et al. Int J Otorhinolaryngol Head Neck Surg. 2018 May;4(3):754-758
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20181866

Bacteriological and mycological profile of chronic suppurative otitis media

Nagraj M.[1], Premalatha D. E.[2]*

[1]Department of ENT, [2]Department of Microbiology, Shimoga Institute of Medical Sciences, Shimoga, Karnataka, India

Received: 10 February 2018
Accepted: 20 March 2018

***Correspondence:**
Dr. Premalatha D. E.,
E-mail: deprema@hotmail.com

ABSTRACT

Background: Chronic suppurative otitis media (CSOM) is the chronic inflammation of the middle ear cleft. It can cause permanent perforation and is famous for its recurrence and persistent infection. Haphazard use of antibiotics and increasing use of newer ones has led to persistent change in microbial flora. The aim of this study was to isolate and identify the bacteria and fungi causing chronic suppurative otitis media and to determine the antibiotic sensitivity pattern of the bacterial isolates.
Methods: This is a prospective cross sectional study was done in 70 patients of chronic suppurative otitis media presenting with active ear discharge. Sterile swabs were used to collect pus from discharging ear and sent for culture sensitivity. All organisms isolated were identified according to standard microbiological methods. Antimicrobial susceptibility test was performed using Kirby- Bauer disc diffusion method according to Clinical and Laboratory Standards Institute guidelines.
Results: *Staphylococcus aureus* and *Pseudomonas aeruginosa* were the most common organisms isolated in this study. Fungi isolated most commonly was *Aspergillus species. Pseudomonas aeruginosa* was most sensitive to Piperacillin-Tazobactam, and Gentamycin. *Staphylococcus aureus* was most sensitive to Linezolid and vancomycin and least sensitive to Erythromycin.
Conclusions: *Staphylococcus aureus* was the most common bacteria isolated and *Aspergillus* spp was the most common fungi isolated from patients with CSOM. Judicial use of antibiotics is necessary for the prevention of development of antibiotic resistance.

Keywords: Chronic suppurative otitis media, *Staphylococcus*, Pipercillin-tazobactam

INTRODUCTION

Chronic suppurative otitis media (CSOM) is an inflammation of the middle ear and mastoid mucosa with perforation of tympanic membrane.[1]

CSOM is usually classified into two types, tubotympanic and attico-antral depending on whether the disease process affects the pars tensa or pars flaccida of the tympanic membrane (TM). Tubotympanic is called as a safe type or benign type as there is no serious complication whereas, attico-antral is called as the unsafe or dangerous type because of associated complication and may be life threatening at times.[2]

Infection can spread from middle-ear to vital structures such as mastoid, facial nerve, labyrinth, lateral sinus, meninges and brain leading to mastoid abscess, facial nerve, paralysis, deafness, lateral sinus thrombosis, meningitis and intracranial abscess. Of all the

complications, hearing loss associated with chronic ear discharge is nearly always significant, reported in 50% of cases and tending to be more severe than those reported in other types of otitis media.[3]

Most commonly isolated aerobic bacteria in CSOM are *Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus, Streptococcus pyogenes, Proteus mirabilis, Klebsiella spp.*[4] Fungal infection of the middle ear and external auditory meatus are common as fungi thrive well in moist pus and the mostly isolated fungi are *Candida species* and *Aspergillus* species. But the type of organism isolated varies between the geographical areas and other factors.[5]

It is nowadays rare for an otologist to see ears with discharge that have not already had the bacterial flora modified by antibiotic therapy since most patients attend the hospital very late when treatment becomes a problem and cultures are frequently sterile. This may be because of microbial resistance to these antibiotics thereby suggesting their failure leading to continuation of purulent discharge in the discharging ear.[6] Hence, to know the prevalent isolates and their sensitivity toward antibiotics was the aim of this study.

METHODS

This study was carried out in the Department of Microbiology in collaboration with Outpatient department of ENT McGann hospital, Shimoga Institute of Medical Science, Shimoga, Karnataka, India, between January 2016 to June 2016, of patients who presented with ear discharge and tympanic membrane perforation/ retraction with or without cholesteatoma. This prospective cross sectional study was approved by the Institutional Ethical committee and informed consent was obtained from patients enrolled into the study.

A total of 204 patients clinically diagnosed of CSOM, who did not received antimicrobial therapy (topical or systemic) for the last 7 days were included in the study. Ear discharge was obtained from the diseased ear of the patient, using two separate pre-sterilized swabs. One of the swabs was used for aerobic culture and was plated on 5% sheep blood agar (BA), MacConkey's agar and chocolate agar (CA). The plates were incubated at 37°C for 48h.

Second swab was used for mycological culture and was inoculated on two slants of Sabouraud's dextrose agar (SDA) with chloramphenicol (0.05%) and were then incubated at 28°C and 37°C. The slants were later examined for gross and the microscopic morphology of the fungi.

Organisms were identified using standard procedures.[7] Antimicrobial sensitivity testing for aerobic isolates was carried out by Kirby Bauer disc diffusion method on Muller Hinton agar. Results were interpreted in accordance with central laboratory standards institute guidelines.[8]

All dehydrated media, reagents and antibiotic discs were procured from Hi-media Laboratories Pvt. Ltd., Mumbai, India.

RESULTS

Out of 70 samples collected from clinically suspected cases 60 were culture positive and 10 were culture negative. Out of 60 culture positive, 52 (86.66%) were positive for bacteria and 13 (21.66%) were positive for fungi. 5 (38.46%) fungi were present in combination with bacteria.

Of the 70 cases studied 40 (52.14%) were male and 30 (42.85%) were female. Among the 70 patients, no growth was seen in 10 patients. Of the 60 patients showing microbial growth, 36 were male and 24 female. Higher incidence of CSOM was seen in 1-10 (28.57%) yrs of age group.

Table 1: Antibiotic sensitivity pattern of gram negative organisms.

	P. aeruginosa (%)	*K. pneumonia* (%)	*Acinetobacter* species (%)
Amikacin	55.43	28.44	26.64
Piperacillin tazobactam	87.6	30.65	30.33
Gentamicin	70.5	65.5	36.66
Ciprofloxacin	20.22	12.8	15.54
Imepenam	48.82	1.56	48.88
Aztreonam	54.53	77.72	33.33
Amoxyclavulanic acid	49.93	9.56	33.33
Cefotaxim	37.66	6.66	5.55
Ceftazidim	36.66	6.66	5.55
Ceftriaxone	27.77	6.66	5.55
Cotrimoxazole	21.11	78.22	30.33
Ampicillin-sulbactam	21.11	6.66	10.33

Table 2: Antibiotic sensitivity pattern of gram positive organisms.

Antibiotic	*Staphylococcus aureus* (27) (%)	Coagulase negative *staphylococcus* (1) (%)
Linezolid	27 (100)	1 (100)
Vancomycin	27 (100)	1 (100)
Cefoxitin	23 (80.2)	1 (100)
Cotrimoxazole	15 (55.5)	0 (0)
Clindamycin	14 (60.6)	0 (0)
Doxycycline	18 (66.6)	1 (100)
Ciprofloxacin	11 (40.33)	0 (0)
Azithromycin	4 (14.81)	0 (0)
Erythromycin	3 (10.88)	0 (0)

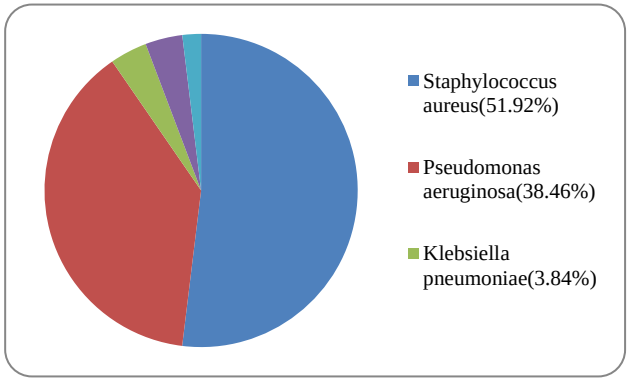

Figure 1: Bacterial isolates.

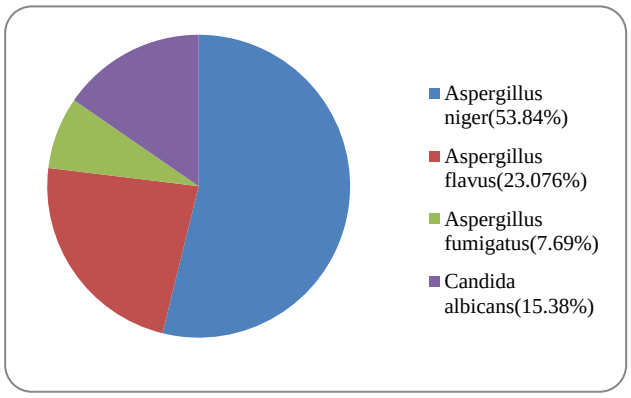

Figure 2: Fungal isolates.

The most frequently isolated organism in this study was *S. aureus* 27 out of 52 (51.92%) of which MRSA (Methicillin Resistant *Staphylococcus aureus*) were four (13.9%) The second most common organism isolated was *P. aeruginosa* 20 (38.46%), followed by *K. pneumoniae* two (3.84%), *Acinetobacter* spp two (3.84%), and Coagulase negative *Staphylococcus* one (1.92%).

In case of fungal isolates, *Aspergillus* species predominated of which *A. niger* was the commonest.

Most gram negative organisms were sensitive to pipericillin-tazobactam, gentamicin and least sensitive to ciprofloxacin. Most gram positive organisms were sensitive to linezolid and vancomycin and least sensitive to erythromycin.

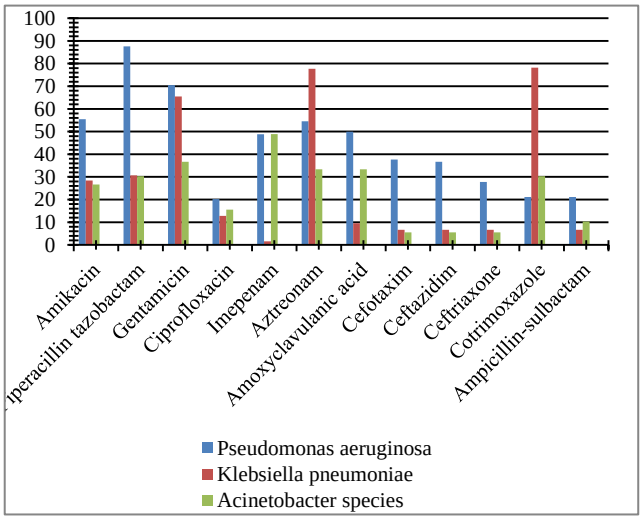

Figure 3: Antibiotic sensitivity pattern of gram negative organisms.

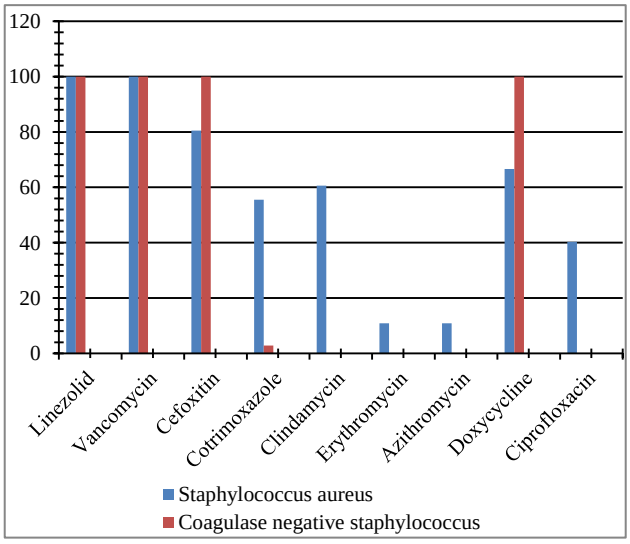

Figure 4: Antibiotic sensitivity pattern of gram positive organisms.

DISCUSSION

Chronic suppurative otitis media is one of the chronic infectious diseases worldwide, commonly having its onset in childhood and causing considerable morbidity into adulthood. Chronic suppurative otitis media, according to WHO, is defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges or otorrhea through a tympanic membrane perforation.[9]

In this study male predominance was higher (52.14%) than female. It is in accordance to other studies.[10,11] Age group 1-10 years had the higher prevalence of CSOM (28.57%.) Study done by Shrestha et al and Jha et al also found the similar result.[12,13] High prevalence rate in children may be due to multiple reasons as young children and infants may have low resistance and also because of relatively short Eustachian tube. Due to short Eustachian tube, infected material from the nose, adenoids and sinuses passes more readily along the Eustachian tube to the tympanic cavity, particularly during coughing, sneezing, vomiting, and forced feeding commonly practiced in our environment with the child's nose blocked, while being held head down and half prone.[14]

In the present study *S. aureus* was found to be the most predominant organism (51.92%) followed by *P. aeruginosa (*38.46%). Higher prevalence of *S. aureus* in this study also resembled very much with Park et al having 54% of *S. aureus.*[15] The reason behind *S. aureus* to be most prevalent organism might be because it is an opportunistic pathogens and a normal flora of skin, but when it gains entrance into the human body it causes infection to tissues and mucous membrane.[16]

Thirteen (21%) fungal isolates were obtained in the present study. In a study carried out by Nia et al 24.57% of fungi were isolated.[17] Of the fungal isolates, *Aspergillus* spp. predominated which was similar with the study conducted by Shrestha et al but in contrast, Parveen and Rao found *Candida spp*. to be the most common fungal isolates whereas only *Candida spp*. were isolated in the study done by Nwabuisi and Ologe.[12,14,18]

Antibiotic susceptibility testing was carried out for all the bacteria isolated. Most of the isolates were found to be sensitive to Imepenem, Piperacillin Tazobactam and Gentamycin. *Pseudomonas aeruginosa* isolates were most sensitive to Piperacillin Tazobactam and *Staphylococcus aureus* isolates were most sensitive to Linezolid. Most of the studies showed maximum susceptibility of culture isolates to amikacin.[19,20] Study by Prakash et al showed ciprofloxacin and gentamicin as an effective first line topical antibiotic in the treatment of otorrhea in CSOM.[19]

CONCLUSION

Staphylococcus aureus and *Pseudomonas aeruginosa* were the commonly isolated organisms in this study; and most of the gram positive organisms were sensitive to linezolid and vancomycin, where as gram negative isolates showed sensitivity to higher antibiotics like Imepenem, Piperacillin Tazobactam and Gentamycin.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. World Health Organisation. Prevention of Deafness and Hearing impairment (PDH). WHO / CIBA Foundation workshop held at the CIBA Foundation, London, U.K. 19-21 Nov. 1996.
2. PooreyVK, Iyer A. Study of bacterial flora in CSOM and its clinical significance. Indian Journal Otolaryngol Head Neck Surg. 2002;54(2):91-5.
3. Berman S. Otitis media in developing countries. Pediatrics. 1995;96:126–31.
4. Alsaimary IE, Alabbasi AM, Najim JM. Impact of multi drugs resistant bacteria on the pathogenesis of chronic suppurative otitis media. Afr J Microbiol Res. 2010;4(13):1373-82.
5. Srivastava A, Singh RK, Varshney S, Gupta P, Bist SS, Bhagat S, et al. Microbiological evaluation of an active tubotympanic type of chronic suppurative otitis media. Nepalese J ENT Head Neck Surg. 2010;1(2):14-6.
6. Sharma K, Aggarwal A, Khurana PMS. Comparison of bacteriology in bilaterally discharging ears in chronic suppurative otitis media. Indian J Otolaryngol Head Neck Surg. 2010;62(2):153-7.
7. Forbes BA, Sahm DF, Weissfeld AS. 10th ed. St Louis, Misssouri, USA: Mosby Inc; Bailey and Scott's Diagnostic Microbiology. 1998.
8. Performance Standards for Antimicrobial Susceptibility Testing. Vol. 1 No. 1, M2 A9. Vol. 1. Pennsylvania, USA: Clinical and Laboratory Standard Institute; 2007. Clinical and Laboratory Standard Institute.
9. Acuin J. Geneva: World Health Organisation; 2004. Chronic Suppurative Otitis Media- Burden of Illness and Management Options. Avaliable at http://www.who.int/pbd/publications/Chronicsuppurativeotitis_media.pdf Accessed on 12 November 2016.
10. Kumar H, Seth S. Bacterial and fungal study of 100 cases of chronic suppurative otitis media. J Clin Diagn Res. 2011;5 (6):1224-7.
11. Yousuf M, Majumder K.A, Kamal A, Shumon A.M and Zaman Y. Clinical study on chronic suppurative otitis media with cholesteatoma. Bangladesh J Otorhinolaryngol 2011;17(1):42-7
12. Shrestha BL, Amatya RCM, Shrestha I, Ghosh I. Microbiological profile of chronic suppurative otitis

media. Nepalese J ENT Head Neck Surg. 2011;2(2):6-7.
13. Jha AK, Singh JB, Dutta D. Microorganisms present in discharging otitis media in a group of patients in Kathmandu. Nepal Med Coll J. 2007;9(3).
14. Nwabuisi C, Ologe FE. Pathogenic Agents of Chronic Suppurative Otitis Media in Ilorin, Nigeria. East Afr Med J. 2002;79(4):202-5.
15. Park DC, Lee SK, Cha CI, Lee SO, Lee MS, Yeo SG. Antimicrobial resistance of Staphylococcus from otorrhea in chronic suppurative otitis media and comparison with results of all isolated Staphylococci. Eur J Clin Microbiol Infect Dis. 2008;27(7):571-7.
16. Alo MN, Anyim C, Okonkwo EC, Orji JO. Prevalence, Antibiogram of Bacterial Pathogens Associated with Otitis Media among Primary School Children in Ebonyi State. J Pharm Bio Sci. 2012;1(7- 8):17-20.
17. Nia KM, Sepehri G, Khatmi H, Shakibaie MR. Isolation and Antimicrobial Susceptibility of Bacteria from Chronic Suppurative Otitis Media Patients in Kerman, Iran. Iranian Red Cresecent Med J. 2011;13(12):891-4.
18. Parveen SS, Rao JR. Aerobic bacteriology of Chronic Suppurative Otitis Media (CSOM) in a teaching hospital. J Microbiol Biotech Res. 2012;2(4):586-9.
19. Prakash R, Juyal D, Negi V, Pal S, Adekhandi S, Sharma M, et al. Microbiology of Chronic Suppurative Otitis Media in a Tertiary Care Setup of Uttarkhand State, India. N Am J Med Sci. 2013;5(4):282-7.
20. Prakash M, Lakshmi K Anuradha S, Swathi GN. Bacteriological profile and their antibiotic susceptibility pattern of cases of chronic suppurative otitis media. Asian J Pharm Clin Res. 2013;6(3):210-2.

Cite this article as: Nagraj M, Premalatha DE. Bacteriological and mycological profile of chronic suppurative otitis media. Int J Otorhinolaryngol Head Neck Surg 2018;4:754-8.