

Original Research Article

A study to evaluate the bacteriological profile of Chronic Suppurative Otitis Media and its antibiotic susceptibility pattern in subjects attending OPD of Tertiary Care Institution

Ranjan Kumar Srivastava¹, Poonam Sagar^{2*}, Nand Kishor³, Satyendra Narayan Singh⁴, Rajneesh Kumar Ranjan⁵

¹Associate Professor, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India

²Tutor, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India

³Tutor, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India

⁴Professor and HOD, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India

⁵Medical Officer, Department of Health, Govt. of Bihar, India

Received: 12-04-2021/ Revised: 13-05-2021 / Accepted: 25-06-2021

Abstract

Background: Chronic suppurative otitis media (CSOM) is defined as persistent or intermittent infection of ear for more than three months duration where the infected discharge occurs through the perforated tympanic membrane caused by bacteria, fungi and virus resulting in inflammation of mucosal lining that results in partial or total loss of the tympanic membrane and ossicles. **Aim:** To evaluate the bacteriological profile of Chronic Suppurative Otitis Media and to evaluate their antibiotic susceptibility pattern. **Methods:** A total of 66 patients with symptoms of CSOM were enrolled in the study. Out of 66 patients, 54 were unilateral cases and 12 were bilateral cases. Thus the total 78 samples were available for culture. Samples from 78 discharging ears were collected with the help of aural speculum by swabbing the discharging ears with two sterile cotton swabs. **Results:** Antimicrobial susceptibility testing was carried out for all the isolates. Imipenem resistance was not seen to any of the isolate. Amikacin was the most effective antibiotic in the present study. It was effective against maximum number of strains 74 (94.9%) followed by levofloxacin 72 (92.3%), Gentamicin 70 (89.7%), Ofloxacin 68 (87.2%) and Ciprofloxacin 62 (79.5%). **Conclusion:** The chronic suppurative otitis media has become public health importance in the present days in developing countries like India. It is well known disease of multiple etiology and its recurrence and persistence. Irregular, haphazard and indiscriminate use of antibiotics has precipitated the emergence of multi resistant bacteria. The most common the bacteriological agent associated with CSOM in our area was *Pseudomonas aeruginosa* with a gradual decline in their sensitivity pattern to a number of fluoroquinolones. Amikacin and levofloxacin has proven to be the drug of choice.

Keywords: Chronic suppurative otitis media, bacteria and antibiotics

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Chronic suppurative otitis media (CSOM) is defined as persistent or intermittent infection of ear for more than three months duration where the infected discharge occurs through the perforated tympanic membrane caused by bacteria, fungi and virus resulting in inflammation of mucosal lining that results in partial or total loss of the tympanic membrane and ossicles.[1] Otitis media is an inflammation of the middle ear that affects the tympanic membrane. [2] It is a disease of multiple etiology and pathogenesis of otitis media are multifactorial including genetic predisposition, infections, allergy, environmental, social and racial factors and eustachian tube dysfunction.[3] There are three common types of otitis media, acute purulent otitis media, otitis media with effusion and chronic suppurative otitis media.[4] Chronic Suppurative Otitis Media (CSOM) is a chronic inflammation of middle ear and mastoid cavity that may present with recurrent ear discharges or otorrhoea through a tympanic perforation.[5] It is one of the most common diseases of all age groups, especially of childhood and is prevalent in developing countries.[6] Chronic suppurative otitis media (CSOM) and its

complications are the bugbear of the otologists, paediatricians and general practitioners. It is a disease of multiple etiologies and is well known for its persistence and recurrence in spite of treatment.[7] CSOM - Chronic inflammation of middle ear and mastoid process with perforated tympanic membrane and ear discharge.[8] Destructive and persistent disease with irreversible sequelae and can proceed to serious intra or extra cranial complications.[9] Cholesteatoma is post inflammatory pseudo tumor which is always a consequence of CSOM.[10] Disease of multiple etiologies well known for its persistence and recurrence in spite of treatment.[11] There are 3 types of CSOM based on perforation of middle ear; Tubotympanic, Atticoantral and Marginal.[10] It is the single major cause of conductive deafness and 1.5% of speech disorders. The complications occur frequently because of the close relation of middle ear, cleft to facial nerve, auditory labyrinth, lateral sinus and middle and posterior cranial fossae makes it.[12] The later type of CSOM can cause severe adverse effects like intra and extracranial complications which can be life threatening. The complications of CSOM can be prevented to a greater extent by the judicious use of antibiotics. Due to the recurrent nature of the disease and the development of drug resistant pathogenic organisms, the control of infection poses a great therapeutic challenge. The knowledge of bacteriological profile helps in appropriate management of the cases. Hence this study was carried out to know the bacterial etiology of CSOM and their antibiotic susceptibility pattern. This present study

*Correspondence

Dr. Poonam Sagar

Tutor, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India

E-mail: poonamsagar2k7@gmail.com

was carried out to know the bacteriological profile of CSOM and to evaluate their antibiotic susceptibility pattern.

Materials and Methods

This prospective study was conducted at Department of Microbiology at Patna Medical College and Hospital, Patna. The study was approved by the institutional ethical and research committee. The study was conducted from September 2020 to March 2021. An informed and written consent was taken from all the participating subjects prior to the commencement of the study. Patients reporting to the ENT Outdoor Department with chronic or recurrent ear discharge and on clinical examination found to have discharging ears with perforation of the tympanic membrane were included in the study. A total of 66 patients with symptoms of CSOM were enrolled in the study. Out of 66 patients, 54 were unilateral cases and 12 were bilateral cases. Thus, the total 78 samples were available for culture. Samples from 78 discharging ears were collected with the help of aural speculum by swabbing the

discharging ears with two sterile cotton swabs. The swabs were sent to the Microbiology laboratory without delay. The first swab was used for direct Gram stain and the second swab was cultured on Blood agar and Mac conkey's agar plates and incubated at 37°C for 24 -48 hrs. The isolates grown were identified by their cultural characteristics, morphology and biochemical reactions.[13] Antibiotic susceptibility testing of the organisms was done by Kirby Bauer disc diffusion method in Distribution of bacterial species associated with CSOM patients.Muller Hinton agar. The plates were read after overnight incubation at 37°C by measuring the zone of inhibition around the antibiotic discs as per CLSI (Clinical Laboratory Standards Institute) guidelines.[14]

Results & Discussion

The present study was carried out in the Department of Microbiology at Patna Medical College and Hospital, Patna. A total of 66 patients with symptoms of CSOM were enrolled in the study. Figure-1 and Table-1.

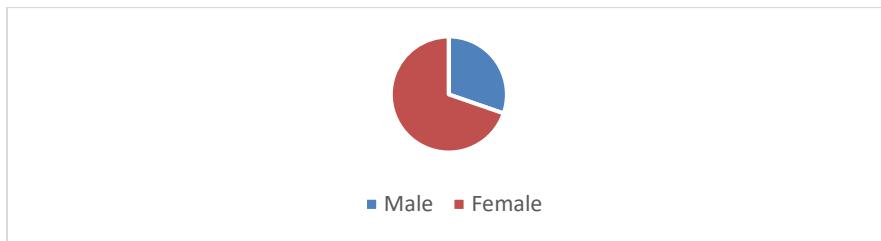


Fig 1: Distribution of subjects according to gender

Table 1: Showing age distribution

Age in Years	Number of cases	Percentage (%)
<10	19	28.8
11-20	13	19.7
21-30	17	25.75
31-40	05	7.6
41-50	07	10.6
51-60	04	6.06
61-70	01	1.51
>70	0	0.0

Their ages ranged from 4 years to 65 years. 54 cases were unilateral and 12 were bilateral cases. Out of 78 samples cultured, 73 (93.6%) showed microbial growth while 5 (6.4%) had no growth. Among the 73 samples with growth, 69 (88.5%) samples showed growth of

single isolates while 4 (5.1%) showed mixed isolates. Out of 78 culture smears, 64 (82.05%) were Gram negative and 14 (17.9%) were Gram positive. Table-2.

Table 2: Distribution of bacterial species associated with CSOM patients.

Bacterial isolates		No. of isolates(%)
Gram positive isolates	Staphylococcus aureus	10(12.8)
	Coagulase negative Staphylococcus	04(5.1)
Gram negative isolates	Pseudomonas spp.	31(39.7)
	Escherichia coli	25(32.05)
	Klebsiella pneumonia	06(7.7)
	Proteus spp.	02(2.6)

Table 3: Antibiotic susceptibility pattern of CSOM isolates

Antibiotics	No. of susceptible strains (%)
Amikacin	74 (94.9%)
Gentamicin	70 (89.7%)
Levofloxacin	72 (92.3%)
Ofloxacin	68 (87.2%)
Ciprofloxacin	62 (79.5%)
Cefoperazone	52 (66.7%)
Co-trimoxazole	47 (60.2%)
Cefotaxime	42 (53.8%)
Imipenem	78 (100%)

[Table 3] shows the frequency of sensitivity of different strains to different antibiotics. Antimicrobial susceptibility testing was carried

out for all the isolates. Imipenem resistance was not seen to any of the isolate. Amikacin was the most effective antibiotic in the present

study. It was effective against maximum number of strains 74 (94.9%) followed by levofloxacin 72 (92.3%), Gentamicin 70 (89.7%), Ofloxacin 68 (87.2%) and Ciprofloxacin 62 (79.5%). CSOM is a middle ear disease leading to considerable morbidity by causing hearing loss; and even life threatening complications like mastoiditis, meningitis and brain abscess, if left untreated over long periods of time. The present study showed that 46 (69.7%) were male and 20 (30.3%) were female patients. Okesola and Fasina, [15] Akingbade et al and Shrestha et al,[16,17] studies also demonstrated more males than females. The male preponderance may be due to decreased attention to personal hygiene thus increased vulnerability of the male child to pathogens. Majority of the patients were below 10 years of age. So, this finding agrees with the fact that CSOM is predominantly a childhood disease, particularly of under 10. This is partly because the immune system of children is not well developed compared to adult. Among the 78 samples with growth, 73 (93.6%) samples showed microbial growth, which is similar to the previous study by Agarwal et al.[18] In present study, no growth was seen in five (6.4%) samples. Vijaya et al also found 5.28% sterile samples in their study.[19] In our study, *P. aeruginosa* (39.7%) has the highest prevalence of the isolated organism. Many of the previous studies showed *Pseudomonas* to be the most common bacteria isolated from CSOM cases.[20-22] The predominance of *Pseudomonas* could be attributed to its higher adaptation ability compared to other organism. *E. coli* (32.05 %) was the second highest isolate in this study which is similar to the study done by Kazeem MJ, Aiyeloso R and Oni et al.[23,24] The other isolated organisms in our study are *S. aureus* and *Klebsiella pneumoniae*. This is similar to study by Loy et al. Antibiotic susceptibility pattern was tested for all the isolated organisms. Imipenem resistance was not seen to any of the isolate. These drugs are considered as reserve drugs and should not be used primarily. Amikacin was the most effective antibiotic next to imipenem in the present study. It was effective against maximum number of strains 74 (94.9%) followed by levofloxacin 72 (92.3%) and Gentamicin 70 (89.7%). Fluoroquinolones such as ciprofloxacin, ofloxacin and levofloxacin are generally used for the treatment of *Pseudomonas* infections. But, sensitivity of these drugs is seemed to be gradually dropping probably because of widespread self-medication due to availability of these drugs over the counter in developing countries like India.

Conclusion

These findings conclude that, the chronic suppurative otitis media has become public health importance in the present days in developing countries like India. It is well known disease of multiple etiology and its recurrence and persistence. Irregular, haphazard and indiscriminate use of antibiotics has precipitated the emergence of multi resistant bacteria. The most common the bacteriological agent associated with CSOM in our area was *Pseudomonas aeruginosa* with a gradual decline in their sensitivity pattern to a number of fluoroquinolones. Amikacin and levofloxacin has proven to be the drug of choice. The knowledge of the etiological agents causing CSOM and their antimicrobial susceptibility pattern is of great importance for an effective treatment and prevention of complications.

References

- WHO/CIBA foundation workshop. Prevention of hearing impairment from chronic otitis media-London: 19-21 Nov 1996. Geneva: World health organization, 1998.
- Bhargava KB, Bhargava SK, Shah TM. A Short Textbook of E.N.T. Diseases. Usha publications, India. 2005; 7:110.
- Maharjan M, Bhandari S, Singh I, Mishra SC. Prevalence of otitis media in school-going children in eastern Nepal. Kathmandu Univ. Med. J. 2006; 16:479-82.
- Berman S. Classification and criteria of Otitis Media. Clin. Microbiol. Infect. (Suppl). 1997; 3:1-4.
- Mirza, Arshad M. Microbiology of chronic suppurative otitis media - experience at Bahawalpur. Pak. Armed Forces Med. J. 2008; 58:372-6.
- Rao R, Jayakar PA. Bacteriological study of chronic suppurative otitis media. Indian Journal of Medical Association. 1980; 75:30-33.
- Cutonen M, Uhar M et al. Recurrent Otitis media during infancy and linguistic skills at the age of 9 years. Paediatric Infect. Dis. J. 1996; 15:854-8.
- Poorey VK, Iyer Arati. Study of Bacterial Flora in CSOM and its clinical significance. Ind. J. Otolaryngology and Head and Neck Surgery. 2002; 2:54.
- Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Lalwani A et al. Principle's of Internal Medicine-16th ed. New York: McGraw Hill, 2005, 190.
- WHO/CIBA Foundation workshop. Prevention of hearing impairment from chronic otitis media. Geneva, 19-21 November 1998; Geneva: WHO, 1998.
- Saini S, Gupta N, Aparna, Seema, Sachdeva OP. Bacteriological study of paediatric and adult chronic suppurative otitis media. Indian J Pathology Microbiology. 2005; 48:413-416.
- Forbes BA, Sahm DF, Weissfeld AS. Baily and Scott's Diagnostic Microbiology, 12th Ed., Missouri Mosbi Elsevier. Laboratory Methods in Basic Mycology, 2007, 629-716..
- Performance Standards for Antimicrobial Susceptibility Testing; Twenty-Fifth Informational Supplement. M100- S25. Wayne, PA: Clinical and Laboratory Standards Institute, 2015.
- Okesola AO, Fasina OA. Trends in the resistance pattern of bacterial pathogens of otitis media in Ibadan, Nigeria. Afr J Clin Exp Microbiol. 2012; 13:46-50.
- Akingbade OA, Awodera OB, Okerentugba PO, Nwanze JC, Onoh CC, Okonko IO. Bacterial spectrum and their antibiotic sensitivity pattern in children with otitis media in Abeokuta, Ogun state, Nigeria. World Rural Obs. 2013; 5:1.
- Shrestha BL, Amatya RC, Shrestha I, Ghosh I. Microbiological profile of chronic suppurative otitis media. Nepal J ENT Head Neck Surg. 2011; 2:6-7.
- Agrawal A, Kumar D, Goyal A, Goyal S, Singh N, Khandelwal G. Microbiological profile and their antimicrobial sensitivity pattern in patients of otitis media with ear discharge. Indian J Otol. 2013; 19:5-8.
- Vijaya D, Nagarathnamma T. Microbiological study of chronic suppurative otitis media. Indian J Otol. 1998; 4:172-4.
- Kumar S, Sharma R, Saxena A, Pandey A, Gautam P, Taneja V. Bacterial flora of infected unsafe CSOM. Indian J Otol. 2012; 18:208-11.
- Goyal R, Aher A, De S, Kumar A. Chronic suppurative otitis media - A Clinico-Microbiological study. Indian J Otol. 2009; 15:18-22.
- Malkappa SK. Study of aerobic bacterial isolates and their antibiotic susceptibility pattern in chronic suppurative otitis media. Indian J Otol. 2012; 18:136-9.
- Kazeem MJ, Aiyeloso R. Current bacteriological profile of chronic suppurative otitis media in a tertiary facility of Northern Nigeria. Indian J Otol. 2016; 22:157-61.
- Oni AA, Bakare RA, Nwaorgu OG, Ogunkunle MO, Toki RA. Bacterial agents of discharging ears and antimicrobial sensitivity patterns in children in Ibadan, Nigeria. West Afr J Med. 2001; 20:131-5.
- Loy AH, Tan AL, Lu PK. Microbiology of chronic suppurative otitis media in Singapore. Singapore Med J. 2002; 43:296-9.

Conflict of Interest: Nil **Source of support:Nil**