ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 12 | December - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

BACTERIOLOGICAL PROFILE AND CHANGING TRENDS OF ANTIBIOTIC RESISTANCE PROFILE AMONG OTITIS MEDIA PATIENTS

Medical Microbiology

K.V. Kalyan Department of Microbiology, SGT University, Gurugram, Haryana
Sweta Jangra* Department of Microbiology, SGT University, Gurugram, Haryana *Corresponding Author
Manisha Khandait Department of Microbiology, SGT University, Gurugram, Haryana
Moumita Sardar Department of Microbiology, SGT University, Gurugram, Haryana
Poonam K Saidha Department of ENT, SGT University, Gurugram, Haryana

ABSTRACT

Background: Otitis media is an emerging inflammatory infection which refers to any suppuration of the inner ear. In proficiently treated cases may result into complications. The situation is further complicated by the emergence of antimicrobial resistant strains. Monitoring of such strains is required to reduce the burden of disease and its management. **Aim/Objective:** To study the antimicrobial susceptibility pattern of the bacterial isolates in aural discharge from patients attending a tertiary care hospital in Gurugram, Haryana **Material & Method:** This hospital-based study was assisted in the department of Microbiology. All the collected samples were plated on blood agar and MacConkey agar and incubated for 18-24 hrs at 37C. All the colonies were subjected to standard bacteriological identification procedures. AST was carried out by disc diffusion method as per CLSI 2021. **Results:** Among all the 177 specimens, 132(74.57%) were observed as cultures positive while 45(25.4%) were reported as no growth. 111(62.7%) isolates were identified as GNR among them 84(47.4%) were Pseudomonas spp.,18(10.1%) Klebsiella spp and 9 (5.1%) were Proteus, among remaining positive cultures 21(11.8%) were identified as GPC. All klebsiella strains were found resistant to ampicillin. Few isolates found as MRSA with all staphylococcus isolates as sensitive towards vancomycin. **Conclusion:** Otitis media is a matter of concern in the developing countries like India. Keep the same in mind appropriate antibiotic policy should be administered so combat with such infections.

KEYWORDS

Otitis media, GNR, Antimicrobial resistance, GPC, Antibiotic policy, MRSA

INTRODUCTION

Otitis media is an emerging inflammatory infection among all the age groups. It refers to any suppuration of the inner ear, however no peculiar information towards the etiology or pathogenesis is available.[1] it encountered in developing nations which are percurate suppurative forms however, they contribute a high burden for public health at these regions.[2] Other than the important consequence of a hearing loss it also effect on language development, Communication, comprehension, and behavior in early life and may leads to disadvantages of educational and social behavior in later years.[3] Otitis media is a spectrum of illness consisting with two major branches Acute otitis media (AOM) and Chronic otitis media (COM). Acute otitis media infection of the inner ear is one of the myriads frequents infections in children's, although it affects adults as well. Inner ear infections, and the complications caused by them, diverge between children and adults. Children are more susceptible to developing acute otitis media, due to anatomical and immunological immaturity, whereas ear infections in adults are typically chronic in nature.[4]

As per reports 80% of the children all over the world will have to face otitis media throughout their life while 80-90% of them have encountered otitis media with some emission before school life.[5]

AOM is considered as a multi organism disorder and may be originated by huge categories of organisms microorganisms. However specifically viruses contribute 20% of the overall cases with the bacterial co infection cases as 65%.[6]

COM is majorly caused by presence of bacteria, moreover it can also be associated with fungi and virus. The most frequently isolated aerobic microorganisms in chronic otitis media are *Escherichia spp., Pseudomonas aeruginosa (P. aeruginosa), Proteus spp., Klebsiella spp., Staphylococcus aureus (S. aureus) Citrobacter spp, Hemophilus influenza, and Moraxella catarrhalis* and anaerobic microorganisms are Bacteroides, Peptostreptococcus and Proprionibacterium.[7]

If untreated/ in proficiently treated cases cause complications in intracranial/ extracranial cavities. However the indefinite use of antibiotics may result into emergence of resistant strains. Nowadays antimicrobial resistance is the one of the major concerns all over the world due to an inadequate usage of antibiotics.[8]

We aimed to study the antimicrobial susceptibility pattern of bacterial isolates in aural discharge from patients attending a tertiary care hospital in Gurugram, Haryana. Objective of the study was to isolate & identify bacterial pathogens from aural discharge and to determine the antibiogram of the isolated bacteria's.

MATERIALAND METHODS

Study population:

All the patients attending ENT OPD with having symptoms of otitis media in the given period of study were considered as the study population.

Study design: Hospital based observational study

Ethical consideration: Ethical approval was obtained from the institutional ethical committee.

Sample collection:

All consecutive ear swab specimens from otitis media patients received in Microbiology laboratory during study time frame according to time convenience. This study was conducted at Department of Microbiology, Shree Guru Gobind Singh Tercentenary Hospital, Chandu, Budhera, Gurugram (SGT).

Inclusion Criteria:

All ear swab sample from suspected patients of otitis media (Acute suppurative otitis media and chronic suppurative otitis media) were included in this study.

Sampling collection

Ear swab was obtained from the ENT and sent to the microbiology laboratory for further processing.

Processing of specimen

The collected specimens were transported immediately to microbiology laboratory for processing. Gram staining was done from one swab and the other swab was inoculated on sterile blood agar (BA), MacConkey's agar (MA) plates and were incubated then at 37°C for 24-48 hrs. Emergent bacterial colonies were identified according to standard procedures. For positive cultures Gram stain and biochemical tests were performed for the identification of specific bacteria.[9]

Antimicrobial susceptibility testing

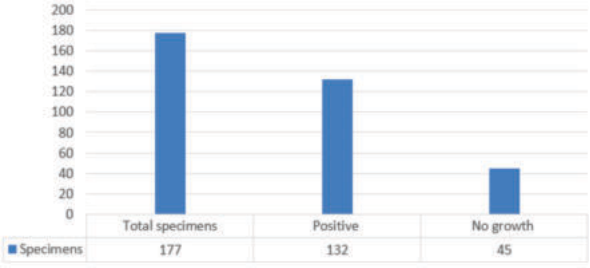
Antimicrobial susceptibility testing of the bacterial isolates were done on Muller Hinton Agar by disk diffusion method. The susceptibility result were interpreted according to the clinical Laboratory Standard

Institute (CLSI) guidelines 2021.[10]

RESULTS

The current study was carried out at the Microbiology department for the given study period of three months. A total of 177 consecutive pus specimens from ENT department were received and processed in the central Microbiology laboratory, SGT medical college and research hospital. Among all the specimens 132 (74.57%) were observed as cultures positive while 45 (25.4%) were reported as no growth. (Table 1)

Table 1: Distribution of all the Samples



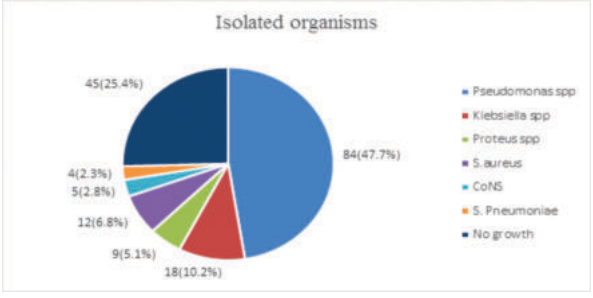


Figure 1: Distribution of isolated microorganisms

Out of the positive cultures (n=132), 111(62.7%) isolates were identified as GNR among them 84 (47.4%) were identified as Pseudomonas spp.,18 (10.2%) were identified as Klebsiella spp and 9(5.1%) were identified as Proteus spp, in addition the remaining cultures 21 (11.8%) were identified as GPC (Staphylococcus spp, Streptococcus Pneumoniae). (Figure 1)

All the isolates (n=84) of *Pseudomonas aeruginosa* were observed sensitive towards Imipenem and Piperacillin/ Tazobactum. However few isolates (n=6) showed resistance to Amikacin Ciprofloxacin and Levofloxacin which is followed by Gentamicin (n=17), Amoxicillin (n=17), Ampicillin (n=15), Cefaclor (n=20), Cefotaxime (n=19) and Azithromycin (n=18). (Table 2)

Klebsiella Pneumoniae showed highest resistance (n=6) to Ampicillin (100%) and Cefaclor (66.6%) (n=4). Moreover moderate level of resistant was observed for Cefotaxime (17%), Amoxicillin (34%), Azithromycin (34%) and Gentamicin (66%). All the isolates (n=6) were found sensitive for Amikacin, Ciprofloxacin, Levofloxacin, Imipenem, and Piperacillin Tazobactum. (Table 2) Proteus spp showed 100% sensitivity towards Amikacin, Gentamicin, Ciprofloxacin, Levofloxacin, Imipenem, and Piperacillin/ Tazobactam. Moreover moderate level of resistance were observed for Cefotaxime (34%), Amoxicillin (34%), and Azithromycin (34%). All the strains were found resistant to Ampicillin (100%) and Cefaclor (66%). (Table 2)

Table 2. Antimicrobial susceptibility pattern of Gram-negative organisms

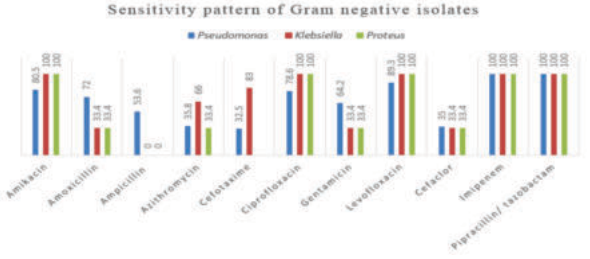
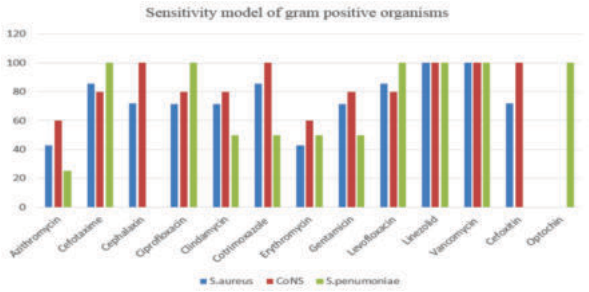


Table 3. Antimicrobial sensitivity pattern of Gram-positive isolates



All the isolates of *S. aureus* (n=12) exhibited highest (100%) sensitive to Vancomycin and Linezolid. Highest no of isolates (n=4) were found resistant for Azithromycin and Erythromycin. However few isolates (n=2) showed resistance towards cephalexin, cefoxitin and ciprofloxacin. (Table 3)

All the streptococcus pneumonia (n=4) species optochin disc is used to differentiate the Streptococcus pneumonia form other species of streptococcus. isolates showed 100% (n=4) sensitivity to Cefotaxime, Ciprofloxacin, Levofloxacin, Vancomycin and Linezolid while few isolates showed less sensitivity towards Erythromycin, Clindamycin, , Gentamicin and Erythromycin (50%)(n=2). (Table 3)

DISCUSSION

Due to pattern change in bacteriological isolates of otitis media and micro-organisms sensitivity towards the antibiotics, it is most important to identify the infection causing organism and to study its susceptibility pattern. In the present study, the prevalence of bacteria in otitis media is 75% i.e. 134 cases out of 177 cases enrolled in the study. **Gulati *et al*.** reported culture positivity rate as 78% while **Khan *et al.*** reported 70% culture positivity rate, which is quite similar to our study.[11-12] However discordant results with a positivity rate of 70- 96% have also been reported by some authors.[13-15] In the current research majority of the isolates were identified as Gram- negative bacilli (GNB) were isolated 37 (63%), remaining were identified as Gram-positive cocci (GPC) .

Among GNB *P. aeruginosa* was the major and commonest isolate followed by *Klebsiella spp* and *Staphylococcus aureus*. Similar study was performed by **Chauhan** *et al* for bacterial and fungal agents causing CSOM among patients attending a tertiary care hospital in Uttarakhand.[16] As per their study, the commonest organism was found as *P. aeruginosa* which is a concordant observation with our study Same observation have been reported by **Saranya** *et al* and **Aishwarya** *et al.*[17,18]

In current study, no resistance were found against to Imipenem and Piperacillin/ Tazobactum for *P. aeruginosa* isolates. However few isolates encountered as resistant to Amikacin, Ciprofloxacin and Levofloxacin. **Saranya** *et al* reported highest sensitivity of *P. aeruginosa* to Amikacin, Piperacillin/Tazobactum, Ciprofloxacin and Imipenem followed by Cefotaxime which is a concordant finding to the present study. [17] In our study, *Klebsiella Pneumoniae* as well as other *Klebsiella spp* has shown the 100% sensitive to the Amikacin, Ciprofloxacin, Levofloxacin, Imipenem, and Piperacillin tazobactum. Moreover moderate level resistance was seen in Cefotaxime, Amoxicillin, Azithromycin and Gentamicin. All *Klebsiella* strains were found resistant to Ampicillin. According to the study of **Vineetha *et al*,** *Klebsiella spp* were 100% sensitive to Imipenem and Amikacin, however Amoxicillin are 60-80% susceptible and shown less susceptibility was observed to Cephalosporin's (20-60%). Moreover, **Wan Nur AWD** *et al* has been observed that Klebsiella spp are second most common isolated Gram-negative bacilli along with antimicrobial sensitivity pattern of 100% sensitivity to Amikacin, Gentamicin, Piperacillin Tazobactum and Imipenem.[19,20] **Majumder** *et al* noted all the strains of GNR showed high level sensitivity (100%) towards Amikacin, Imipenem and Piperacillin tazobactum which is again a concordant finding with the present study.[21] Proteus spp showed 100% sensitivity towards Amikacin, Gentamicin, Ciprofloxacin, Levofloxacin, Imipenem, and Piperacillin/ Tazobactam. Moreover moderate level of resistance were observed for Cefotaxime (34%), Amoxicillin (34%), and Azithromycin (34%). **Majumder** *et al* noted all the strains of GNR showed high level sensitivity (100%) towards

Amikacin, Imipenem and Piperacillin tazobactum which is again a concordant finding with the present study All the strains were found resistant to Ampicillin (100%) and Cefaclor (66%).[21] All the *S. aureus* isolates showed highly (100%) sensitive to Vancomycin and Linezolid while few isolates showed resistance towards Cefotaxime, Levofloxacin, Clindamycin, Ciprofloxacin, Gentamicin, Cephalexin and Cefoxitin. 28% of *S. aureus* strains were found as Methicillin resistant *Staphylococcus aureus* (MRSA). Concordant results has been reported by **Ghogare H** *et al* and **Harshika YK** *et al* with 100% sensitivity rate to the antibiotics such as Vancomycin and Linezolid with less sensitivity towards Erythromycin (50%)and Cefoxitin(56%).[22-23] All the streptococcus pneumonia species optochin disc is used to differentiate the Streptococcus pneumonia form other species of streptococcus. isolates showed 100% sensitivity to Cefotaxime, Ciprofloxacin, Levofloxacin, Vancomycin and Linezolid while few isolates showed less sensitivity towards Erythromycin, Clindamycin, , Gentamicin and Erythromycin (50%).

CONCLUSION

Otitis media is another matter of concern in the developing countries like India. Keep the same in mind our findings highlight the relevance of Identification of the microorganisms responsible for otitis media and accurate antibiotic susceptibility testing of the pathogens which in turn play an important role in the accurate antibiotic treatment for the cure of such disease. This will prevent the development of drug resistance and various hospital acquired infections as well. Systematic monitoring of the antibiogram will assist the department for preparing antibiotic strategy in the hospital which in turn will help in advance coherent use of antibiotics and intercept development of resistance.

Acknowledgments
None

Conflict of Interest
The authors declare that there is no conflict of interest.

Authors' Contributions
All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding
None

Data Availability
The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics Statement
Ethical approval was obtained from the institutional ethics committee.

REFERENCES

1. Monasta, L, Ronfani, L, Marchetti, F, Montico, M, VecchiBrumatti, L, Bavcar, A, Grasso, D, Barbiero, C & Tamburlini 'Burden of disease caused by otitis media: systematic review and global estimates. PloS one 2012; 7:4.
2. Aarhus L, Tambs K, Kvestad E, Engdahl B. Childhood otitis media: a cohort study with 30-year follow-up of hearing (the HUNT study). Ear Hear. 2015; 36:302-8.
3. Grindler, DJ, Blank, SJ, Schulz, KA, Witsell, DL & Lieu, JEC, 'Impact of Otitis Media Severity on Children's Quality of Life', Otolaryngol Head Neck Surg 2014;151:333-40.
4. Gibney KB, Morris PS, Carapetis JR, Skull SA, Smith-Vaughan HC, Stubbs E, Leach AJ. The clinical course of acute otitis media in high-risk Australian Aboriginal children: a longitudinal study. BMC Pediatr 2005; 5:1-8.
5. Usonis V, Jackowska T, Petraitiene S, Sapala A, Neculau A, Stryjewska I, Devadiga R, Tafalla M, Holl K. Incidence of acute otitis media in children below 6 years of age seen in medical practices in five East European countries. BMC Pediatr. 2016 Jul 26;16:108.
6. Segal N., Leibovitz E., Dagan R., Leiberman A. Acute otitis media-diagnosis and treatment in the era of antibiotic resistant organisms: updated clinical practice guidelines. *Int J Pediatr Otorhinolaryngol*. 2005;69(10):1311–1319.
7. Barenkamp SJ, Bodor FF. Development of serum bactericidal activity following nontypableHaemophilus influenzae acute otitis media. Pediatr Infect. Dis. J. 1990; 9:333-9.
8. Segal N, Givon-Lavi N, Leibovitz E, Yagupsky P, Leiberman A, Dagan R. Acute otitis media caused by Streptococcus pyogenes in children. Clin Infect Dis. 2005; 41:35-41.
9. Mackie T, Collee J, McCartney J. Mackie and McCartney practical medical microbiology. 13th ed., Churchill Livingstone Elsevier. 1989:70-80.
10. CLSI. Performance Standards for Antimicrobial Susceptibility Testing. 30th ed. CLSI supplement M100. Wayne, PA: Clinical and Laboratory Standards Institute; 2021.
11. Gulati SK. Investigative profile in patients of chronic suppurative otitis media. Indian J Otol. 1997:3; 3:59-62.
12. Khan JA, Paul SK, Chowdhury CS, Bacteriology of Chronic Suppurative Otitis Media (CSOM) at a Tertiary Care Hospital, Mymensingh. Mymensingh Med J: 2020; 29:545552.
13. Kombade SP, Kaur N, Patro SK, Nag VL. Clinico-bacteriological and antibiotic drug resistance profile of chronic suppurative otitis media at a tertiary care hospital in Western Rajasthan. *J Family Med* Prim Care. 2021; 10:2572.
14. Maheshwari RK, Singhal A, Goyal P, Mishra RK, Microbial profile with their antimicrobial susceptibility pattern in ear discharge of CSOM patients at a tertiary care hospital in Northern Rajasthan. Int. j. med. 2018; 4:152-56.
15. Raakhee T, Unguturu SR. Bacteriological study of discharging ear in patients attending a tertiary care hospital. Int J Res Med Sci. 2014; 2:602-6.
16. Chauhan J, Nautiyal S. Bacterial and fungal profile in Chronic Suppurative Otitis Media in a tertiary care hospital in Uttarakhand. IOSR J Pharmacy Biological Sci. 2019; 14:3844.
17. Saranya S, Vazhavandal G, Ganesh BV, Ismail M, Uma A, Subramaniam T. Bacteriological and mycological profile of chronic suppurative otitis media in a tertiary teaching hospital, Trichy, Tamilnadu. Int. J. Pharm. Sci. Invent. 2015;4:13-9.
18. Aishwarya B, Nair PK. Aerobic bacterial profile and antibiotic susceptibility pattern of chronic suppurative otitis media in a tertiary care centre in Kerala. J. Evolution Med. Dent. Sci. 2019; 8:2713-18.
19. Vineetha M, Swapna L, Ambulla CK. Bacteriological Study on Chronic Suppurative Otitis Media in a tertiary care hospital Res. J. Microbiol 2021; 2: 10-12.
20. Wan Draman WN, Md Daud MK, Mohamad H, Hassan SA, Abd Rahman N. Evaluation of the current bacteriological profile and antibiotic sensitivity pattern in chronic suppurative otitis media. Laryngoscope Investig. Otolaryngol. 2021; 6:1300-6.
21. Majumder P, Shetty AK, Tulasidas MB. Microbial profile of ear discharge in children with chronic suppurative otitis media and the antibiotic susceptibility pattern of bacterial isolates. Indian J. Microbiol. 2019; 6:174-9.
22. Ghogare, Harish & Vitore, Vijay & Hatkar, Sunil & Bhalchandra, M.H. & Wyawhare, A.S. & Bansal, V.P.. (2018). Microbiological Profile of Chronic Suppurative Otitis Media. International Journal of Current Microbiology and Applied Sciences. 7. 1152-1159. 10.20546/ijcmas.2018.710.128.
23. Harshika YK, Sangeetha S, Prakash R. Microbiological profile of CSOM and their antibiotic sensitivity pattern in a tertiary care hospital. Int J Curr Microbiol App Sci. 2015; 4:735-43.