Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2017; 5(7D):2756-2762 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2017.v05i07.051

Original Research Article

Bacteriological implication of Antibiogram on Otitis Media: a cross sectional study

Karemera. K.John[1], Ritesh Kumar[2], Sandesh Shrestha[3*], Sri Ram Chaudhari[4]
[1,2,4]Department of Microbiology, Sharda University, Greater Noida, UP, India
[3]Dept. of Biochemistry, Rama Medical College, Hapur, UP, India

***Corresponding author**
Sandesh Shrestha
Email: sandycrestha@yahoo.com

Abstract: Otitis media (OM) is a notorious inflammation of middle ear that mainly affects tympanic membrane and a major health problem in developing countries causing serious local damage and threatening complications. An attempt was made to have a glimpse of the current antibiotic sensitivity pattern, Early and effective treatment based on the knowledge of causative microorganisms and their antimicrobial sensitivity. A total of 89 patients clinically diagnosed of OM were enrolled in the study and the samples were obtained from each patient using sterile cotton swabs and cultured for microbial flora. Drug susceptibility testing for aerobic isolates was conducted using Kirby-Bauer disc diffusion method. The most common causative organisms isolated were *Pseudomonas aeruginosa* 24(39%) followed by *Staphylococcus aureus* 20 (33%), Coagulase negative staphylococcus (CONS) 13(21%), Escherichia coli 3 (5%), Proteus Vulgaris 1(2%). Antimicrobial profile of aerobic isolates revealed maximum sensitivity to Ciprofloxacin. Knowing the etiological agents of OM and their antimicrobial susceptibility is of essential importance for an efficient treatment, prevention of both complications and development of antibiotic resistance and hence, the reduction of the treatment costs.
Keywords: aerobic isolates, antibiogram, antibiotic sensitivity pattern, Kirby-Bauer disc diffusion, Otitis media.

INTRODUCTION

Inflammation of the middle ear known as Otitis media, may affect tympanic membrane and generally this condition is caused due to upper respiratory tract infection [1, 2]. Otitis media may be classified as acute, subacute, and chronic suppurative otitis Media (CSOM) [3]. If the ear discharge or pus formation persists for longer than 12 weeks, the patient is supposed have chronic suppurative state. Middle ear infection is primarily seen in young children (80%) compared to adults (20%) [4, 5]. Compared to adults, children are more vulnerable to acquiring this condition because of shorter length and horizontal dimension of Eustachian tube. In addition, soft and thin tympanic membrane in children allows the easy penetration of pathogenic micro-organisms [6, 7]. Otitis media is more common among males. Male: female ratio is 1.4:1. This predominance in males may be due to their more exposed way of life [8].The otitis media is mainly caused by the pyogenic bacteria like Pseudomonas sp, Klebsiella pneumonia, *Staphylococcus aureus*, and Proteus sp [6]. These pathogens are the culprits behind causing stinking pus formation in the middle ear and interfering with normal auditory function. Apart from this condition, nasal allergy, cleft palate, tumors of then asopharynx, smoking of any family members and immunodeficiency etc could also engender the impairment of hearing capability [9, 10]. Factors which can reduce morbidity and mortality of otitis media include - proper vaccination, breastfeeding, better general health nutrition and public awareness [4, 7]. It tends to be more prevalent in areas low in sanitation , personal hygiene and malnutrition [7].The wide spread illicit prescription , sell and irradical use of broad spectrum antibiotics has created resilient multiple resistant strains of bacteria, which have adverse effect and obliterates ones immune potentiality [11, 12]. The purpose of this study is to acquire data on the pattern of causative agents of otitis media & the antibiotic

sensitivity of the isolated organism prevalent in Sharda hospital.

MATERIALS AND METHODS

Study Period

This study was performed between March 2015 to March 2016.

Study design, participants

Detail clinical history regarding sex, age, history of ear discharge, antibiotic therapy, family history, smoking history was taken. From each patient two swabs of the ear discharge were collected and delivered quickly to the lab. Within one hours or sample arrival, swabs were inoculated on the MacConkey and blood agar plates, which were then incubated at 37 degree Celsius for atleast 24 – 48 hours.

A single colony was taken from each primary positive culture on blood agar, and on MacConkey agar and it has been identified depending on its morphology (colony shape, Size, color, border, and texture), and then examined by the microscope after being stained with Gram's stain. After staining, the biochemical tests have been done on each isolate to complete the final identification. The antimicrobial susceptibility testing was done by the agar discs diffusion method [10].

Data collection

The study was conducted at the Sharda Hospital, Department of Microbiology and Department of Otorhinolaryngology.

Inclusion criteria

Individuals with chronic or acute whatsoever having inflammation of the middle ear and not under antibiotic regiment during sample collection was included in this study.

Exclusion criteria

Individuals under antibiotic therapy were excluded. Individuals with immune-compromised state due various etiologies; AIDS, cancer, pregnancy, malnourishment, major organ transplantation etc advised not to take part in the study.

Ethical committee approval

This study was approved by committee of ethics of Sharda University

Data management and statistical analysis

The frequency of isolated pathogens were grouped and tabulated while the antiobiotic susceptibility of such pathogens were presented by bar graph via Microsoft excel.

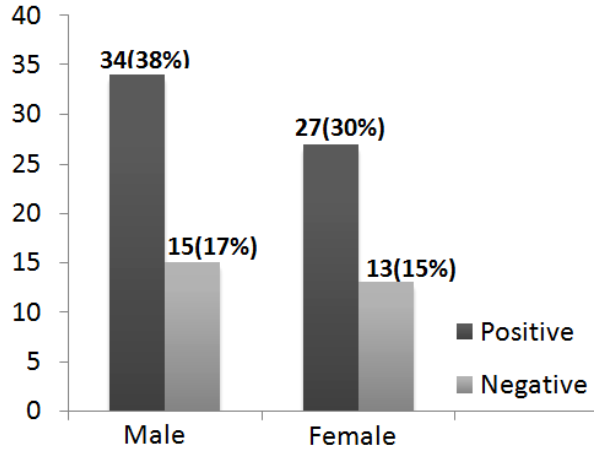
RESULTS

In this study, out of 89 samples (Ear swabs) collected from Department of Otorhinolaryngology, 61(69%) sample were bacterial culture positive on MacConkey and blood agar for different aerobic bacteria and 28(31%) were culture negative.

Table–1 Age and sex Distribution of cases

Age(years)	Table – 1	**Female**	**Total**
≤15	Table – 1	8(9%)	18(20%)
15- 40	Table – 1	27(30%)	62(69%)
≥40	Table – 1	5(6%)	9(11%)

In this study, 18(20%) patients were below 15 years of age, 62(69%) patients were in age range of 15-40 years while 9(11%) patients were above 40 years of age, however, all 18 patients below 5 years of age were diagnosed with OM. During the study period, ear swabs from patients have been subjected to aerobic culture on blood and MacConkey agar. Isolates of various micro-organisms were identified on the basis of cultural characteristics, Gram staining, and biochemical reactions.

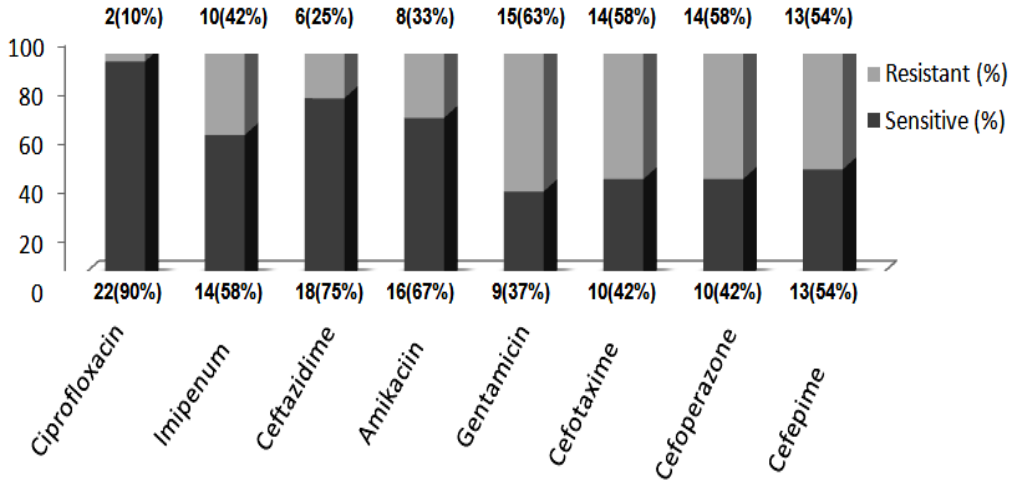


Fig– 1 Age and sex Distribution of positive cases

Table– 2 Isolation of various pathogens

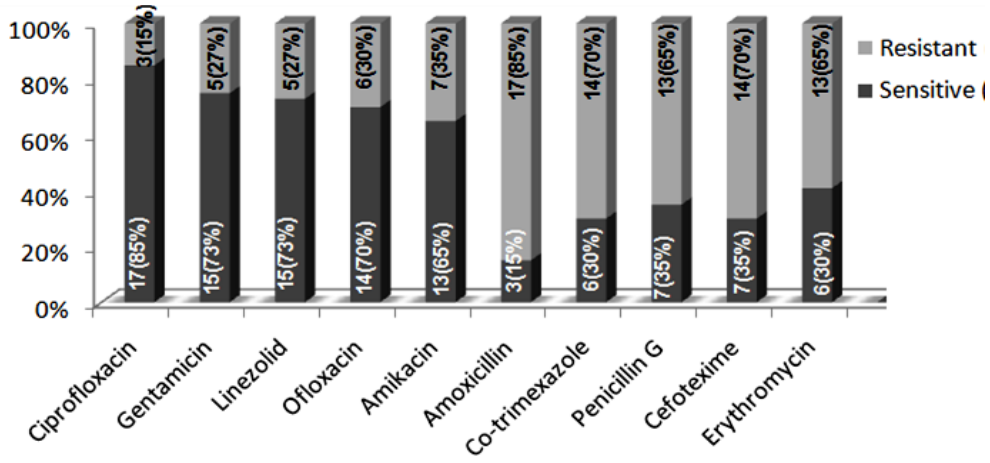
Bacteria	No. of	%
Staphylococcus aureus	20	33
Coagulase-negative	13	21
Pseudomonas	24	39
Escherichia coli	3	5
Proteus vulgaris	1	2

Pseudomans aeroginosa and S. aureus have more common occurrence while Coagulase-negative being moderately prevalent. Rest organism were less predominant in the given area at the time of study.



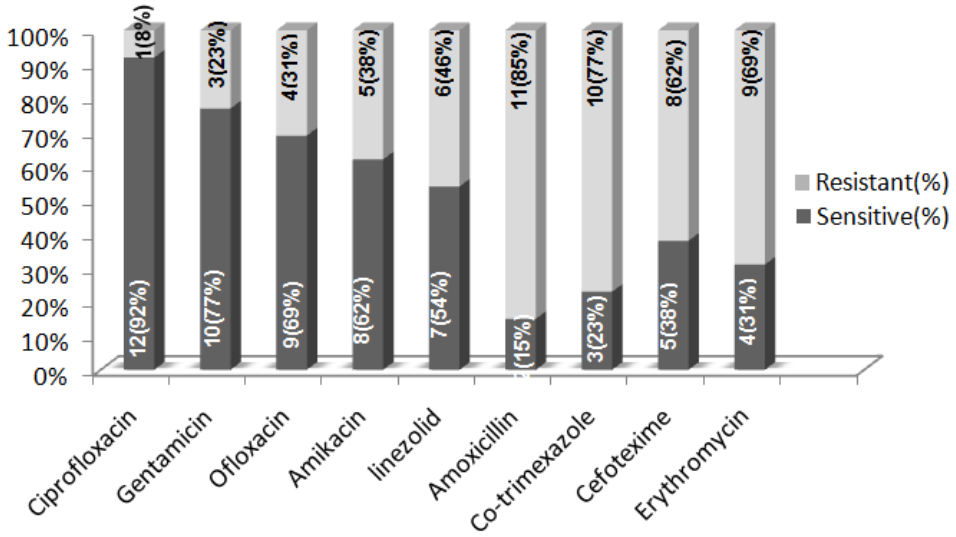
Fig– 2 represents antibiotic susceptibility pattern in Pseudomonas aeroginosa (n=24)

Ciprofloxacin, impenum, ceftazidime and amikacin had fairly moderate efficacy while few others such as gentamic, cefotaxie, cefoperazone and cefepime were easily resisted by the organism.



Fig–3 represents Antibiotic susceptibility pattern in *Staphylococcus aureus* (n=20)

Initial five antibiotics all showed the maximum efficacy towards killing the organism however slightly descending in order with respect to its potency. Ciprofloxacin being the most effective. While the following ones failed to maintain the same legacy as the antecedents with organism being most resilient to amoxicillin.



Fig– 4 Antibiotic susceptibility pattern in Coagulase negative Staphylococcus aureus (n=13)

Coagulase negative staphylococcus aureus has recently emerged out as a potent threat to antiobiotic treatment regiment and seemed to restraint inhibitory potency of most of the antibiotics such Amoxicillin, co-trimexazole, cefotexime and erythromycin. However, the figure depicts that linezolid, amikacin, ofloxacin, gentamicin and ciprofloxacin tend to have its sensiivty in ascending oder.

DISCUSSION

In the present study frequent occurrence of this diseases among the children is comparable to others in which Otitis Media was most prevalent in young children than in adults. This is basically due to shorter length of Eustachian tube [5, 6]. The findings obtained from this study, showed in males 49(55%) than in females 40(45%) implicating males to be more vulnerable to this inflammation (Fig-1). This is in

agreement with other studies [13,14] whose results depicted male: female ratio of (1.4:1). It was observed that gram positive bacteria were more frequent than gram-negative bacteria (Table-2). This is not in agreement with another study where gram negative rods 84 (72.4%) outnumbergram-positive rods 32 (27.6%).This is due to geographic factors and variations of organisms in different communities [7].

Otalgia was the commonest mode of onset among the Otitis Media patients during the course of this study, which was high compared to another report from Iraq where Otalgia was present only in 50 (41.7%) patients. This onset of acute pain was characterized by purulent foul smelling an indication of middle ear infection [15]. The most common isolated organism was *Pseudomonas aeroginosa* followed by *Staphylococcus aureus*, Coagulase negative staphylococcus and other enteric bacteria (Table-2). Our study does not fetch any diverged fact, as many of such conducted study seemed to have same result worldwide. *Pseudomonas aeroginosa* is the predominant organism in this study because it is anopportunistic pathogen, cosmopolitan and nosocomial as well [16]. Another comparative study was done in urban areas of Kenya and Nigeria [17] which showed that Proteus mirabilis was the commonest isolate and also in urban areas of Congo and Ethiopia. Another study was done by kenna *et al.* [18] also found that Pseudomonas was a predominant pathogen (67%).

Study conducted by Nikaklagh *et al*. showed following occurrence Staphylococcus aureus (32.4%) followed by *Pseudomonas aeroginosa* (21.69%) were the most common ones. This could be attributed to the effect of climate, Ethic, geographic factors, a variation of organisms in different communities and localities and different study sites which are either hospital or community based [4, 7].

In this study E.coli 3(5%) was isolated as the only coli form-organism (Table-2); this is comparable to another study which reported 13 (8.4%) E.coli and 6(4%) Klebsiella [19]. The entire organism isolated was subjected to various antibiotic to obtain the antibiogram which would suggest the suitable drugs to be preferred.

Antibiogram of the isolated Pathogens

The observation from this study indicates that ciprofloxacin (more than 70%) was found to be the most effective drug against all infectious bacteria isolated, both gram negative and gram positive bacteria, and then followed by Amikacin. (Figure -2, 3, 4).

Antibiogram of *Pseudomonas aeroginosa*

According to our study, (Figure-2), 90% of the isolates of Pseudomonas aeroginosa were sensitive to Ciprofloxacin (90%), Ceftazidime (76%), Amikacin (68%) which was similar to the study conducted by C.Manikandan and A.Amsath (2013) sensitivity to Ciprofloxacin, Amikacin and Ceftazidime was (88%),(100%) and (73%) respectively.

In another study done by Arshi *et al*., sensitivity to Ceftazidime, Ciprofloxacin, Gentamicin, Piperacillin and Tobramycin was 50%, 33.33%,45.8%,78.3% and 54.2% respectively compared to the sensitivityof in this study. This difference may be due to thedifference in antimicrobial policies which vary from hospitals to hospitals.

Antibiogram of Staphylococcus aureus

This study was in accordance with other studies conducted by Sikkim [20] where Erythromycin was resistant and sensitivity to Gentamicin was 70%. This study was also in agreement with the study done by Srikanth *et al*. [21] where Erythromycin was (67%) resistant.

Antibiogram of Coagulase negative staphylococcus (CONS)

The present study showed a higher sensitivity to Ciprofloxacin (92%), Gentamicin (77%), Ofloxacin (69%), Amikacin (62%), linezolid (54%) and resistant to Amoxicillin (85%), Co-trimoxazole (77%), Cefotaxime (62%) and Erythromycin (69%) (Figure- 4).These results were consistent with those of other studies conducted who also showed a higher resistance to Erythromycin i.e. 75% and 91.2% respectively and more than 80% resistant to Amoxicillin. Our report suggests that organsims have become resilient to the conventional drugs; clear indication of the emergence of antibiotic resistance is becoming more common in this era of antibiotics.

CONCLUSION

Continuous variation of Bacterial profile due to misuse of drugs, variations in climate, community, and patient populations has been associated with the emergence of the drug-resistant strains. Hence, it is of immense concern to develop new drugs to overcome the

immenent threat posed by the multiple drug resilient strains. Strict laws need to be enacted and enforced to discourage the illegitimate prescription, sell and irradical use of broad spectrum antibiotics.

Limitations & future scope of the study

The sample size obtained was only 89 samples, although the patients with Otitis Media visited often but had prior been under antibiotics, therefore despite of having infection substantial causal organism was not isolated rather technical missampling would further end up with swabbing normal flora like *Staphylococcus epidermidis* leading to mass sample rejection incurring low appropriate sample size.

Abbreviations

Paste Conclusion here Autonomic nervous system (ANS), blood pressure (BP), electrocardiogram (ECG), heart rate (HR),

Competing interests

Authors declare that they do not have any competing interest.

Authors' contribution

Formulation of study, sample collection, biochemical analysis, data collection and interpretation was done by Keramera John. Data collection, biochemical test, Statistical analysis, drafting, revising and editing the manuscript done by Sandesh Shrestha, Ritesh Kumar and Sri ram Chaudhari. All authors critically revised the manuscript and finally approved it for publication.

ACKNOWLEDGMENTS

The Department of Microbiology, School of Medical Sciences and Research and Hospital, Sharda University supported in this work fully.

REFERENCES

1. Geneva: World Health Organization; Global burden of disease due to chronic suppurative otitis media: Disease, deafness, deaths and DALYs Chronic Suppurative Otitis Media–Burden of Illness and Management Options. Acuin J. *2004:9–23*
2. Bhargava KB, Bhargava SK, Shah TM, A Short Textbook of E.N.T. Diseases. Usha publications. India. *2005*; *7:110-4.*
3. Sentara BH. Bluestone CD, Klein JO, Lim DJ, Paradise JL, Ann. Otol. Rhinol. Laryngol. Suppl.*1980*; *89(68):3-7.*
4. Dinur AD, Tekeli A, Ozturk S, Turgut S. Microorganisms Isolated from chronic suppurative otitis media and their microbial Sensitivities. Microbiyol. Bul. *1992*; *26(2): 131-8.*
5. Ad Dahhan, H.A.Bacteriological and Enzymatic study on patients with chronic suppurative otitis media, thethesis of M.Sc.College of Science. Unversity of Kufa. *2001:1-45.*
6. Fliss DM, Shoham I, Leiberman A, Dagan R. Chronic suppurative otitis media without cholesteatoma in children in southern Israel: incidence and risk factors. Paediatric infection disease journal.*1991*; *10:895-9.*
7. Saini S, Gupta N, Aparna, Seema, Sachdeva OP. Bacteriological study of pediatric and adult chronic suppurative otitis media. Indian J Pathol Microbiol. *2005*; *48(3):413–416* Prevention of hearing impairment from chronic otitis media. WHO/PDH/*98.4.* London: CIBA Foundation. *1996:6*
8. Jahn AF. Chronic otitis media: diagnosis and treatment. Med Clin North America. *1991*;*75(6):1277-1291*
9. Couzos S, Lea T, Mueller R, Murray R, Culbong M. Effectiveness of to topical antibiotics for chronic otitis media in Aboriginal children: a community-based, multicenter, double-blind randomized controlled trial. Med J Australia. *2003*;*179:185-90*
10. Browning GG, Rovers MM, Williamson I, et al; Grommets (ventilation tubes) for hearing loss associated with otitis media with effusion in children. Cochrane Database Syst Rev. *2010* Oct *6* ;(*10):162-169.*
11. Hassan O, Adeyemi. A study of bacterial isolates in cases of otitis media in patients attending Oautch, Ile-Ife. Afr J Exp Microbial. *2007*; *8:130-6.*
12. Lakshmipathi G, Bhaskaran CS. Bacteriology of chronic Suppurative otitis media. J. Ind. Med. Assoc. *1965*; *45:436-439.*
13. Singh N, Bhaskar R. Microbiological study of Otitis Media. Ind. J. Otolaryngology. *1972*;*24(4):161–1.*
14. Osazuwa F, Osazuwa E, Osime C, Igharo EA, Imade PE, Lofor P, et al. Etiologic agents of otitis media in Benin city, Nigeria. N Am J Med Sci. *2011*; *3:95-8.*

15. Alho OP. How common is recurrent acute otitis media?Acts Otolaryngol Suppl. *1997*; *529:8–10.*
16. Albert RR, Job AG, Kuruvilla, R. Joseph KN. Brahmadathan,. The outcome of bacterial culture from mastoid granulations: is it relevant in chronic ear disease. J. Laryngol. Otol., *2005*; *119: 774-8.*
17. 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(2):131–5.*
18. Tiwari HK, sapkota D, Sen MR. High risk. High prevalence of multi-drugresistant in a tertiary care hospital of northern India. Infect drug resist. *2008*; *1:57-61.*
19. Bilal AM, Srinkanth. Prevalence and antimicrobial susceptibility of Methicillin-resistant staphylococcus aureus and Coagulase-negative staphylococci in a tertiary care hospital. Asian j pharm clin Res. *2013*; *6:231-4.*
20. Shubha D, SageraB, Shashidhar V, Farheen F, Venkatesa D.Speciation and Antibiogram of coagulase Negative Staphylococci (CONS) from - variousclinical specimens. Indian journal of public Health Research and Development. *2012*; *3:91-5*
21. Sharma S, Rehana HS, Goyal A, Jha AK, Upadhyaya S, Mishra SC. Bacteriological profile in chronic suppurative otitis media in Eastern Nepal. Trop Doctor *2004*; *34:102-04.*