



Bacteriology and antibiotic sensitivity pattern of ear discharge in patients with chronic otitis media; A cross sectional study conducted in tertiary care hospital of Peshawar.

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ABSTRACT... Objective: To determine the frequency of common bacteria and antibiotic sensitivity pattern of ear discharge in patients with chronic otitis media. **Study Design:** Descriptive Cross Sectional study. **Setting:** Department of ENT, Northwest General Hospital & Research Centre, Peshawar. **Period:** February to September 2019. **Material & Methods:** A total of 196 patients of both gender and age between 13 to 60 years with clinical diagnosis of active chronic otitis media were recruited through consecutive sampling technique. After detailed history and relevant examination, demographic data was recorded and pus specimens were collected from the infected ear on cotton swabs. They were sent to pathology laboratory of hospital for culture of common bacteria (*E.coli*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Staphylococcus aureus* and *Klebsiella* spp) and their respective antibiotic sensitivity (Co-trimoxazole, Co-Amoxiclav, Ciprofloxacin, Ampicillin, Imipenem, Ceftriaxone and Cefixime). **Results:** Bacterial isolates were analyzed as 48% *Staph aureus*, 28% *Pseudomonas*, 12% *Proteus mirabilis*, 8% *E. coli* and 4% *Klebsiella* spp. Imipenem was sensitive to 94%, ceftriaxone 84%, ciprofloxacin 80%, co-trimoxazole 66%, ampicillin 63%, cefixime 45% and co-amoxiclav against 43% of total bacterial isolates. **Conclusion:** The common causative organism for active chronic otitis media was *Staph aureus* followed by *Pseudomonas*. Imipenem was the most sensitive antibiotic against majority of bacterial isolates followed by ceftriaxone and ciprofloxacin.

Key words: Antibiotic Sensitivity, Bacteriology, Chronic Otitis Media, Ear Discharge.

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INTRODUCTION

Active chronic otitis media (ACOM) is one of the most common infections of ear which is characterized by recurrent or persistent purulent discharge from the middle ear for more than 6 weeks through non-intact tympanic membrane.^{1,2} In 2004, WHO reported the prevalence of chronic otitis media as 5.2% in South East Asia. Although it is common globally but its incidence is relatively high in developing countries because of poor hygiene, malnutrition, overcrowding, recurrent upper respiratory tract infections and lack of health care services.³⁻⁶

With respect to control of infection, the disease exhibit good prognosis but infection may spread locally causing serious complications like lateral sinus thrombosis, mastoid abscess, intracranial

abscess, facial nerve paralysis and meningitis.^{7,8} Moreover, some studies have also reported sensorineural hearing loss as a consequence of COM, but other studies contradicts this claim.^{9,10} Jensen et al conducted a study on children with active COM and found 91% cases with permanent hearing loss of >15 dB HL.¹¹ Aarhus et al also revealed association of adult hearing loss with childhood hearing loss secondary to active COM.¹²

One of the major therapeutic challenges is control of this infection due to development of resistant strains of causative microorganisms resulting its recurrence. Among many reasons, one factor for development of this resistance is irrational and indiscriminate use of antibiotics by quacks in this part of the world. This is evident from the

fact that specialists these days rarely encounter bacterial flora of COM patients which has not been altered by unjudicial use of antibiotics previously.¹³ Before starting an empirical therapy, the prescriber must have necessary information regarding local bacterial flora commonly involved in causing COM. Thus, it is mandatory to conduct periodic surveillance of bacteria causing COM and sensitivity pattern of their respective antibiotics in the region.

Various studies has been carried out in this regard in different parts of our country like Karachi, Punjab¹⁴ and Gilgit¹⁵ but rewarding studies has not been conducted in Peshawar. This study was an attempt to generate local statistics of the disease in Peshawar and its adjacent areas. It will help us to determine the common causative microbes and their sensitivity pattern in our local population, enabling the clinicians to formulate an appropriate treatment plan with more certainty.

MATERIAL & METHODS

A descriptive cross sectional study was conducted at ENT department of Northwest General Hospital & Research Centre (NWGH & RC), Peshawar from February to September 2019. After taking ethical approval from the board, 196 patients of both genders and age between 13 to 60 years with clinical diagnosis of active COM (purulent ear discharge for a period of more than six weeks and a perforated tympanic membrane on ear examination) and who did not receive any antimicrobial therapy during last seven days were enrolled in the study by consecutive sampling technique. COM patients with underlying diabetes mellitus, acute infections of upper aero-digestive tract, acute otitis externa or otomycosis were excluded from the study to avoid confounders. After taking written informed consent from patients, detailed history and relevant examination was carried out and demographic data was recorded in predesigned proforma. Pus specimens were collected from the infected ear on cotton swabs and after proper labeling they were sent to pathology laboratory of the hospital for culture of common bacteria (pseudomonas aeruginosa, staphylococcus aureus, proteus mirabilis, klebsiella spp and E.coli) and their

respective antibiotic sensitivity using standard procedures and protocols.^{16,17} The antibiotics tested in this study were Co-trimoxazole, Co-Amoxiclav, Ciprofloxacin, Ampicillin, Imipenem, Ceftriaxone and Cefixime.

Data collected was analyzed by SPSS version 20. Mean \pm SD was calculated for quantitative variables like distribution of age. Percentage and frequencies were computed for categorical variables like gender, common bacterial isolates and their respective antibiotic sensitivities. Bacterial profile was stratified with antibiotic sensitivity to see the effect modifications.

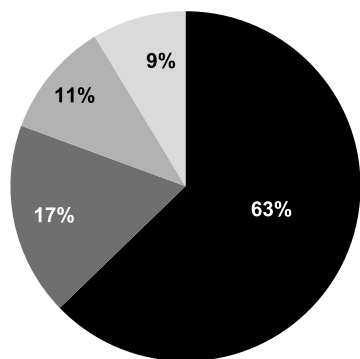
RESULTS

The study was conducted at ENT department of Northwest General Hospital where of total 196 patients with mean age 36.5 years \pm 9.83, 123(63%) subjects were in age group of 13-20 years, 35(17%) in 21-35 years, 21(11%) in 36-50 years and 17(9%) in 51-60 years as given in Figure-1. Gender distribution is analyzed in Figure-2 as 91(46%) female and 105(54%) male patients.

Distribution of bacterial isolates is mentioned in descending order in Figure-3 where Staph aureus was 94(48%), Pseudomonas aeruginosa 56(28%), Proteus Mirabilis 23(12%), E. coli 15(8%) and Klebsiella spp was 8(4%) while distribution of antibiotic sensitivity is given in Figure-4, where imipenem was sensitive to 185(94%), ceftriaxone to 164(84%), ciprofloxacin 157(80%), Co-trimoxazole 130(66%), ampicillin 124(63%), cefixime 88(45%) and co-amoxiclav against 86(43%) of total 196 bacterial isolates. Moreover, in Table-I stratification of bacterial isolates with antibiotic sensitivity describes the fact that staph aureus was mainly susceptible to imipenem (96%) and ceftriaxone (92%), pseudomonas to imipenem (100%) and ciprofloxacin (82%), proteus mirabilis to ciprofloxacin (91%) and ceftriaxone (82%) whereas E. coli and klebsiella to imipenem (100%).

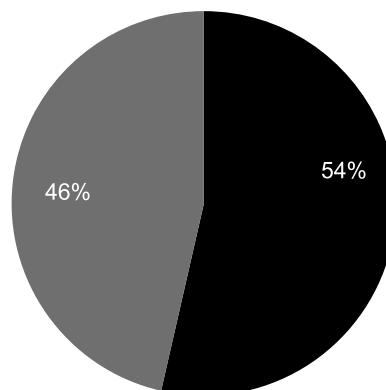
DISCUSSION

Chronic otitis media is a serious healthcare issue globally, causes suffering and agony to the patients



■ 13-20 Years ■ 21-35 Years
■ 36-50 Years ■ 51-60 Years

Figure-1. Distribution of age



■ Male ■ Female

Figure-2. Distribution of gender

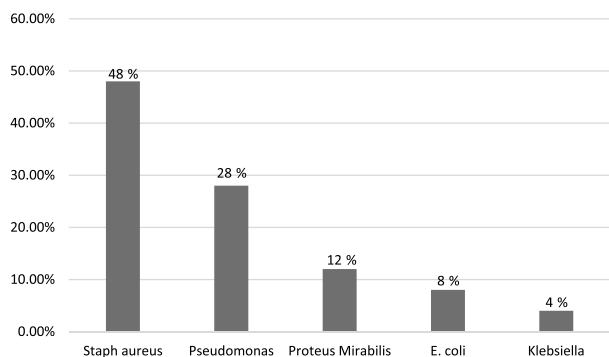


Figure-3. Distribution of bacterial isolates

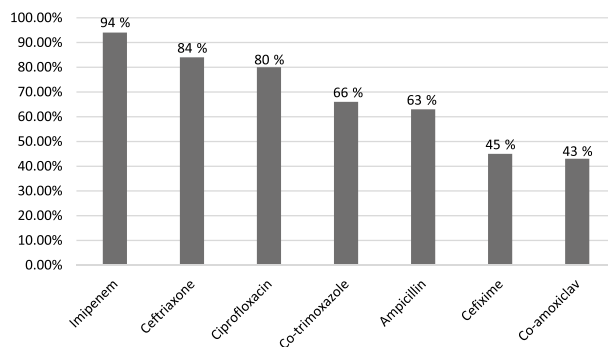


Figure-4. Distribution of antibiotic sensitivity

Bacterial Isolates		Antibiotic Sensitivity						
Bacteria	No of Isolates	CO-Trimoxazole	Co-Amoxiclav	Ampicillin	Ceftriaxone	Cefixime	Imipenem	Ciprofloxacin
Staph aureus	94 (48%)	68 (72%)	70 (74%)	66 (70%)	87 (92%)	50 (53%)	90 (96%)	74 (79%)
Pseudomonas	56 (28%)	44 (78%)	4 (7%)	43 (76%)	39 (69%)	8 (14%)	56 (100%)	46 (82%)
Proteus mirabilis	23 (12%)	2 (9%)	4 (17%)	11 (48%)	19 (82%)	17 (74%)	16 (70%)	21 (91%)
E. coli	15 (8%)	12 (80%)	6 (40%)	4 (27%)	13 (86%)	10 (67%)	15 (100%)	9 (60%)
Klebsiella spp	8 (4%)	4 (50%)	2 (25%)	0 (0%)	6 (75%)	3 (37%)	8 (100%)	7 (87%)
Total	196	130 (66%)	86 (43%)	124 (63%)	164 (84%)	88 (45%)	185 (94%)	157 (80%)

Table-I. Stratification of bacterial isolates with antibiotic sensitivity

and increases the economic burden on health care system. But early bacteriological diagnosis and appropriate antibiotic therapy can reduce this burden. Selection of antibiotic is influenced by its efficacy, safety, microbial resistance and cost. Knowledge of the local susceptibility pattern of bacteria may help in formulating a protocol for empirical antibiotic therapy.

In this study, COM was found slightly more common in males than females (but not statistically significant) resembling many reports revealing that gender has no impact upon the risk of acquiring middle ear infections.¹⁸ This slight increase could be a reflection of the male pre-dominance of childhood infections due to anatomic, socioeconomic and behavioral differences between the two genders. However, it is found that age has a strong association with the risk of acquiring middle ear infections. Our study reported high prevalence of the disease among children and young adults i.e. constituted more than 50% of total cases similar to many previous reports suggesting children highly vulnerable to ear infections due to colonization of bacteria in the middle ear or upper respiratory tract.^{19,20}

Our analysis of 196 active COM cases revealed Staph aureus as the most prevalent bacterial isolate from ear discharge followed by Pseudomonas, Proteus Mirabilis, E. coli and Klebsiella, resembling the results of many other studies where Staph aureus was found as predominant pathogen.^{15,21} However in contrast, there are some studies where either Pseudomonas aeruginosa²²⁻²⁴ or Klebsiella spp²⁵ was the commonest bacterial isolate. The presence of Staph aureus may be considered as contaminant from external auditory meatus but still the role of this bacteria as a potential causative microbe could not be eliminated because proper aspiration technique was used for specimen collection. Antimicrobial sensitivity test was conducted for all the bacterial isolates and imipenem was found to be most sensitive drug (against 94% of isolates) followed by ceftriaxone and ciprofloxacin, somewhat resembling the results of a study carried out in Rawalpindi, Pakistan.²⁴ In contrast, some studies reported the susceptibility of other comparable

antibiotics higher than imipenem.^{15,23,26} It is also observed that our reported isolates were less sensitive to ciprofloxacin i.e. 80% as compared to other studies conducted in Bahawalpur (83%), Karachi (85%) and Rawalpindi (96%).^{22,27}

When we compared our findings with other studies done in the past, it was determined that bacteriological profile and their sensitivity pattern has been changing over the period of time. Emergence of antimicrobial resistance is becoming more common for which we strongly recommend nationwide antimicrobial surveillance to identify the right alternative antibiotics along with strict adherence to antibiotic prescribing policy.

CONCLUSION

The study revealed Staph aureus as the most common bacteria isolated from ear discharge of patients with chronic otitis media followed by Pseudomonas, Proteus, E. coli and Klebsiella. Imipenem was the most sensitive antibiotic against majority of the bacterial isolates followed by ceftriaxone and ciprofloxacin.

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REFERENCES

1. Matsuda Y, Matsuda T, Kurita T, Ueda Y, Ito S, Nakashima T. **The Effect of Tympanic Membrane Perforation on Middle Ear Sound Transmission.** Practica Oto-Rhino-Laryngologica. 2009; 102(1):13-20.
2. Wright D, Safranek S. **Treatment of otitis media with perforated tympanic membrane.** Clinical Inquiries, 2009 (MU). 2009.
3. Monasta L, Ronfani L, Marchetti F, Montico M, Brumatti LV, Bavcar A, et al. **Burden of disease caused by otitis media: systematic review and global estimates.** PloS One. 2012; 7(4):e36226.
4. Shaheen MM, Raquib A, Ahmad SM. **Prevalence and associated socio-demographic factors of chronic suppurative otitis media among rural primary school children of Bangladesh.** International Journal of Pediatric Otorhinolaryngology. 2012; 76(8):1201-4.

5. Ologe F, Nwawolo CC. **Chronic suppurative otitis media in school pupils in Nigeria.** East African Medical Journal. 2003; 80(3):130-4.
6. ALHO OP, Jokinen K, Laitakari K, Palokangas J. **Chronic suppurative otitis media and cholesteatoma. Vanishing diseases among Western populations?** Clinical Otolaryngology & Allied Sciences. 1997; 22(4):358-61.
7. Berman S. **Otitis media in developing countries.** Pediatrics. 1995; 96(1):126-31.
8. Wiwanitkit S, Wiwanitkit V. **Pyogenic brain abscess in Thailand.** North American Journal of Medical Sciences. 2012; 4(6):245.
9. Awad OGA-N, Abd El-Kader RM, Mohamed AR. **Risk factors of sensorineural hearing loss in patients with unilateral safe chronic suppurative otitis media.** American Journal of Otolaryngology. 2018; 39(2):88-93.
10. Dobrianskyj FM, Gonçalves ÍRD, Tamaoki Y, Mitre EI, Ribeiro FAQ. **Correlation between sensorineural hearing loss and chronic otorrhea.** Ear, Nose & Throat Journal. 2017; 96(10-11):E43-E6.
11. Jensen RG, Koch A, Homøe P. **The risk of hearing loss in a population with a high prevalence of chronic suppurative otitis media.** International Journal of Pediatric Otorhinolaryngology. 2013; 77(9):1530-5.
12. 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 and Hearing. 2015; 36(3):302.
13. Sharma K, Aggarwal A, Khurana PMS. **Comparison of bacteriology in bilaterally discharging ears in chronic suppurative otitis media.** Indian Journal of Otolaryngology and Head & Neck Surgery. 2010; 62(2):153-7.
14. Hydri AS, Alam MJ, Anwar K. **Causative organisms in chronic suppurative otitis media and their drug sensitivity in a tertiary hospital of Southern Punjab, Pakistan.** Rawal Med J. 2017; 42(2):191-4.
15. Khalil A, Mir A, Jan M, Imran R, Shah G, Latif A. **Prevalence of bacteria in chronic suppurative otitis media patients and their sensitivity patterns against various antibiotics in human population of Gilgit.** Pakistan Journal of Zoology. 2013; 45(6).
16. Forbes B, Sahm D, Weissfeld A. **Bailey and Scott's diagnostic microbiology.** 1068 pp. Mosby Inc., St. Louis, Missouri, USA; 1998.
17. Clinical, Institute LS. **Performance standards for antimicrobial susceptibility testing.** Clinical and Laboratory Standards Institute Wayne, PA; 2017.
18. Argaw-Denboba A, Abejew AA, Mekonnen AG. **Antibiotic-resistant bacteria are major threats of otitis media in Wollo Area, Northeastern Ethiopia: A ten-year retrospective analysis.** International Journal of Microbiology. 2016; 2016.
19. Osazuwa F, Osazuwa E, Osime C, Igharo EA, Imade PE, Lofor P, et al. **Etiologic agents of otitis media in Benin city, Nigeria.** North American Journal of Medical Sciences. 2011; 3(2):95.
20. Tanon-Anoh M, Kacou-Ndouba A, Yoda M, Ette-Akre E, Sanogo D, Kouassi B. **Particularities of bacterial ecology of acute otitis media in an African subtropical country (Cote d'Ivoire).** International Journal of Pediatric Otorhinolaryngology. 2006; 70(5):817-22.
21. 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 Uttarakhand state, India.** North American Journal of Medical Sciences. 2013; 5(4):282.
22. Mansoor T, Musani MA, Khalid G, Kamal M. **Pseudomonas aeruginosa in chronic suppurative otitis media: sensitivity spectrum against various antibiotics in Karachi.** J Ayub Med Coll Abbottabad. 2009; 21(2):120-3.
23. Gül HC, Kurnaz A, Turhan V, Oncül O, Pahsa A. **Microorganisms isolated from middle ear cultures and their antibacterial susceptibility in patients with chronic suppurative otitis media.** Kulak burun bogaz ihtisas dergisi: KBB= Journal of Ear, Nose, and Throat. 2006; 16(4):164-8.
24. Sattar A, Alamgir A, Hussain Z, Sarfraz S, Nasir J. **Bacterial spectrum and their sensitivity pattern in patients of chronic suppurative otitis media.** Journal of the College of Physicians and Surgeons-Pakistan: JCPSP. 2012; 22(2):128-9.
25. Bakari AA, Adoga AA, Afolabi O, Kodiya AM, Ahmad BM. **Pattern of chronic suppurative otitis media at the National Ear Care Centre Kaduna, Nigeria.** Journal of Medicine in the Tropics. 2010; 12(1).
26. Jung H, Lee SK, Cha S-H, Byun JY, Park MS, Yeo SG. **Current bacteriology of chronic otitis media with effusion: high rate of nosocomial infection and decreased antibiotic sensitivity.** Journal of Infection. 2009; 59(5):308-16.

27. Mirza IA, Ali L, Arshad M. **Microbiology of chronic suppurative otitis media-experience at Bahawalpur.** Pakistan Armed Forces Medical Journal. 2008; 58(4):372-6.

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2	Muhammad Saleh Faisal	Manuscript writing.	
3	Ali Zaki	Data collection.	
4	Azam Khan	Statistical analysis and critical review.	
5	Mamoor Khan	Statistical analysis and critical review.	
6	Mohibullah Khan	Study planning.	