Spectrum of Pseudomonas Aeruginosa Sensitivity in Chronic Otitis Media

Syed Maisam Ali[1], Junaid Hussain Mahesar[2], Junaid Shahzad[3], Akhtar Zaman[4], Wahhi-ud-Din Shinwari[5], Tahira Sajid[1], Sabir Khan Khattak[1]

ABSTRACT

Background: Chronic otitis media is perforation of tympanic membrane with infection. It is mostly seen in underdeveloped countries. Culture and sensitivity reports show that the major pathogens responsible for chronic otitis media are pseudomonas aeruginosa and staphylococcus aureus.

Objective: To ascertain the sensitivity of Pseudomonas Aeruginosa in chronic otitis media which will help in the selection of antibiotics in resistant cases of chronic otitis media.

Materials and Method: This prospective cross sectional study including 150 patients was carried at PNS Shifa Hospital, Karachi from 20/04/2017 to 05/01/2018.Pus sample/swab was collected via pre-packed sterile cotton sticks for bacteriology and sent to consultant microbiologist for culture and sensitivity. Laboratory reports of the bacterial spectrum and their sensitivity to antibiotics were reviewed and data entered in the proforma was analyzed.

Results: After processing 36.6% pseudomonas aeruginosa infections were sensitive to Piperacillin + tazobactam while 60.98% sensitive to ciprofloxacin, 34.15% to Amikacin and 31.71% only to Ceftriaxone. There is no significant correlation of pseudomonas aeruginosa with duration of disease, residential status, education and socioeconomic status while significant correlation was found with three antibiotics except ceftriaxone sodium.

Conclusion: In chronic otitis media the commonest agent being implicated is Pseudomonas aeruginosa. Ciprofloxacin, Amikacin and pipercillin+tazobectum were found to be the most sensitive antibiotic agents against Pseudomonas aeruginosa.

Key words: *Chronic otitis media, Microbiology in otitis media, Antibiotic sensitivity.*

This article may be cited as: Ali MS, Mahesar HJ, Shahzad J, Zaman A, Shinwari W, Sajid T, Khattak KS Spectrum of pseudomonas aeruginosa sensitivity in chronic otitis media. J Sadiu Med Coll Swat 2019;9(2):191-4.

INTRODUCTION

Chronic otitis media is long standing abnormality of ear drum, because of acute attack of otitis media, otitis media with effusion, trauma or negative middle ear pressure.[1] In chronic cases the perforation exists with discharging from inflammation of the middle ear cleft for more than three months.[2] The disease is a global problem affecting all age groups but usually seen in childhood mostly of bacterial origin but virus and fungus can also be separated.[3,4] It is more commonly seen in underdeveloped countries compared to developed countries which could be related to multiple factors like poor nutrition, poor hygiene, non-availability of health facilities and repeated infections of the respiratory tract.[5,6] Chronic otitis media may cause many complications which could be even beyond the boundaries of middle ear and affect the social and professional life.[7,8]

1. Ayub Medical Complex, Abbottabad
2. Pir Abdul Qadir Jelani Medical College, Gambat
3. Al-Nafees Medical College, Islamabad
4. Benazir Bhutto Hospital, Rawalpindi
5. Pakistan Institute of Medicale Sciences, Islamabad

Correspondence: Dr. Syed Maisam Ali
Consultant ENT, Ayub Medical Complex, Abbottabad.
Email: makazmee@hotmail.com

Received: May 22nd,,2019, Accepted: November 29th, 2019

The organisms collected from chronic discharging ears include Aerobes (pseudomonas aeruginosa, Escherchia coli, Staphlococcus Aureus, pyogens, proteus, klebsiella) or Anaerobes (bacteroids and peptostreptococci) and fungi (candida, aspergellus).[9]

Culture and sensitivity of chronic otitis media has shown that the main organisms involved in chronic otitis media are pseudomonas aeruginosa and Staph. Aureus which are 43.2% and 31% respectively with sensitivity pattern of pseudomonas aeruginosa as 93% to amikacin, 84% to ciprofloxacin, 81% to piperacillin tazobactum and 75% to ceftriaxone.[10,11]

The bacterial resistance to antibiotics is to both systemic and local antibiotics. In particular pseudomonas aeruginosa is very difficult to treat as it organizes in the biofilm where it is protected not only from antibiotics but also immune cells. [12,13] Antibiotic resistance has been reported worldwide to multiple drugs so it has been emphasized to use most sensitive drugs against pseudomonas aeruginosa.

The importance of this study is to know the type of antibiotic susceptibility of pseudomonas aeruginosa that is frequently causing chronic otitis media in our environment, so that appropriate antibiotics could be used to prevent the multidrug resistance of pseudomonas aeruginosa in chronic otitis media.

MATERIAL AND METHODS

A total number of 150 patients were included in this cross sectional study with consecutive non probability sampling from 20/04/2017 to 05/01/2018. Patients fulfilling the inclusion criteria were collected from the outdoor patient department of ENT, head and neck surgery of PNS Shifa Hospital, Karachi. Patients of either gender above age 10 years with unilateral or bilateral ear discharge of more than 3 months having ear discharge at the time of presentation were included in the study, while patients having ear discharge with aural polyp, external auditory canal pathology or any existing ear malignancy, having had mastoid surgery in the preceding 12 months and those used antibiotics in the last 7-10days were excluded from study. Informed written consent for participating in the study was taken from all patients. The patients' biodata along with hospital registration number were entered on proforma. The patients were assessed initially by history and otoscopic examination. Pus samples/swabs of diseased ears for bacteriology were collected from the discharging ear(s) via commercially available pre-packed sterile cotton sticks and sent to consultant microbiologist in the hospital's pathology laboratory for culture and sensitivity. The report proven cases of pseudomonas aeruginosa were included in the study, and demographics like age, gender, educational status, monthly income and area of residence will be noted and entered in Performa.

Culture Processing: For the culture the sample was placed on 5% blood agar and MacConkey agar. The organisms were identified by morphology, cultural characteristics and pigment production followed by conventional biochemical tests. Ten years experienced microbiologist performed the proposed test.

Antibiotic sensitivity: The antibiotic sensitivity testing was performed on Mueller Hinton agar using the modified Kirby-Bauer disc diffusion method, in which small disks of filter paper impregnated with various types of antibiotics, were placed onto the bacterial lawn. The bacteria were allowed to incubate for 18-24 hours & then the plate was examined to see whether the bacterial growth was inhibited (or not) by measuring clear zone of no bacterial growth around the antibiotic disk.

Data analysis: Data was entered and analyzed using SPSS version 20.Mean and standard deviation were calculated for age and duration of the symptoms. The frequency and percentage was calculated for Pseudomonas aeruginosa and its sensitivity, gender, residence, symptoms, educational status and socioeconomic status. Effect modifiers like age, residence, gender, education status, socioeconomic status and duration of symptoms were controlled through stratification. Post stratification. Chi square test P-value =0.05 was taken significant.

Table 1: Lists of antibiotics checked for sensitivity against each culture

Antibiotics	Zone of inhibition—interpretive criteria nearest whole mm			
	Disk contents	Sensitive	Intermediate	Resistant
Tazobactum/piperacillin	100/10ug	= 21	15-20	= 14
Ceftriaxone	30ug	= 21	14-20	= 13
Ciprofloxacin	5ug	= 21	16-20	= 15
Amikacin	30ug	= 17	15-16	= 14

Table :2 Different antibiotics sensitivity to pseudomonas aeruginosa

Antibiotic used	Status of sensitivity	Pseudomonas status(n)		Total	P-value
		yes	no		
Piparicillin+tazobectum	Sensitive	15	23	38	0.06
	Resistant	26	86	112	
Ciprofloxacin	Sensitive	25	39	64	0.006
	Resistant	16	70	86	
Amikacin	Sensitive	14	16	30	0.012
	Resistant	27	93	120	
Ceftriaxone	Sensitive	13	27	40	0.412
	Resistant	28	82	110	
Total		41	109	150	

RESULTS

150 patients were enrolled in this study with age range of 19 to 40 years with minimum age of 19 years while maximum age of 40 years with mean age of 28.12±4.41006. Most of the patients were male i.e. 97 (64.7%) while 53 (35.3%) were female. Fifty one percent patients were from rural areas while 49% were from urban areas. Fifty seven percent patients had symptoms for less than 6 months, 29% had symptoms of 7-12months, 8% had 13-18months duration, 2% had 19-24months while only 4% had symptoms from more than 2 years. Patients having hearing loss were 24 (16%) and 36 (24%) had earache. Sixty six percent patients were educated more than matric. Patients having family monthly income between 2030 thousand rupees were 52%. Of all the samples 41 patients (27.3%) were positive for pseudomonas aeruginosa while 109 (72.7%) were negative for pseudomonas aeruginosa and out of these 27.3% pseudomonas aeruginosa 36.6% pseudomonas aeruginosa infections were sensitive to Piperacillin + tazobactam while 60.98% sensitive to ciprofloxacin, 34.15% to Amikacin and 31.71% only to Ceftriaxone (Table 2). There was no statistically significant relation of pseudomonas aeruginosa with different age groups, gender, duration of disease, residential status, education level and socioeconomic status while significant relation was found with three antibiotics of the above four except ceftriaxone sodium.

DISCUSSION

The economic burden of Healthcare system of any country is due to different diseases. Otitis media is one of the important and substantial serious Healthcare problems not only in Pakistan but all over the world.

In our study 41 (27.3%) patients were of age group 18-25 years, 75 (50%) patients were of 26-30 years age group while 34 (22.7%) were 31-60 years age group, which are related to Kumar H et al[14]and Iqbal K et al.[15] Prakash R et al[16], Jayanthi SR et al[17] and Arvind N et al[7] on the other side showed that chronic otitis media is more common in young patients with the age group of below 20 years.

Our study showed male predominance with 64.7% patients being male while 35.3% were female which is contrary to Prakash R et al[16], Jayanthi SR et al[17] and Meyer E et al.[18] who showed female predominance while Arvind N et al,[7] Nikakhlagh S et ai,[12] Kumar H et al,[14] Iqbal K et al,[15] Afolabi OA et al[19] and Agrawal A et al.[20] showed male dominance like the results of our study.

Pseudomonas aeruginosa was found in 27.3% in the samples collected while 72.7 % isolates were other organisms. Literature review suggested that there is country wise difference in causative agents for otitis media but the most prevalent and most common organisms are pseudomonas aeruginosa.[7,15,21-23] but studies from India, Iran and Africa showed that staph. aureus is the most common bacterial isolates in CSOM followed by Pseudomonas aeruginosa[12,16,18,20,24] While in another study aureus was followed by proteus as the most common organism.[25] other 2 studies conducted in Nigeria and India showed that Pseudomonas was the most common isolates followed by Klebsiella[17,19]

In our study Pseudomonas aeruginosa was sensitive to piperacillin/tazobactum (36.6%) , amikacin (34.2%), Ciprofloxacin (60.98%) and ceftriaxone (31.71%). The sensitivity of Pseudomonas aeruginosa in opposition to quinolones has proven a step down fashion worldwide in recent past.

In 1996 in Turkey a study was conducted which showed only 6% of Pseudomonas aeruginosa to be resistant to ciprofloxacin,[26] while in 2004 in South Korea a study showed 100% of the isolates showed resistance to ciprofloxacin.[27] In Pakistan studies conducted in different areas showed more than 80% sensitivity.[15,22.] In contrast, our study showed less than 26% sensitivity to quinolones The deteriorating sensitivity fashion maybe due to a variety of factors like imprudent antibiotic use, inadequate dosage, and handy accessibility and developing enzymatic resistance of organism towards quinolones,[22] similar increasing resistances of aminoglycosides have also been noted against pseudomonas aeruginosa.

Ciprofloxacin is one of the most commonly prescribed drugs for the treatment of otitis media. our study supports this hypothesis and shows that there is significant relation between pseudomonas aeruginosa involvement in otitis media and it is sensitive to ciprofloxacin. Chi square test were also found significant in case of amikacin and the piparicillin + tazobactam but our study also shows that pseudomonas aeruginosa isolates were not sensitive to ceftriaxone. it is also

evident that there are mixed isolates found in various cases but when it comes to sensitivity of drug only ciprofloxacin amikacin and piperchillin + tazobactam were sensitive.

CONCLUSION

Chronic otitis media is still an important problem and the commonest agents implicated being Pseudomonas aeruginosa. Ciprofloxacin, Amikacin and pipercillin+tazobectum were found to be most effective antibiotic agent against Pseudomonas aeruginosa.

REFERENCES

1. Sattar A, Alamgir A, Hussain *1,* Sarfraz S, Nasir J N, Alam B. Bacterial sensitivity pattern in patients of chronic suppurative otits media.J Coll Physicians Surg Pak.2012;22;128-9.
2. Rather S, Das SR, Pandhy RN. Surveillance of bacteria pseudomonas aerugenosa and MRSA associated with chronic suppurative otitis media. Braz J Otorhinolaryngol. 2017;83:201-6.
3. Park MK, Nam DW, Byun JY, Hong SM, Bae CH, Lee HY et al. Differences in antibiotic resistance of MRSA infection in patients with various types of otitis media. J Int Adv Otol. 2018;14(3):459-63.
4. Mokrzan EM, Novotny LA, Brockman KL, Bakaletz LO. Antibodies against the majority subunit (PilA) of the Type IV Pilus of Non type able Haemophilus influenzae Disperse Moraxella catarrhalis from a Dual-Species Biofilm. MBio.2018;9(6):e02423-18.
5. Coleman A, Wood A, Bialasiewicz S, Ware RS, Marsh RL, Cervin A. The unsolved problem of otitis media in indigenous populations: a systemic review of upper respiratory and middle ear microbiology in indigenous children with otitis media. Micobiome. 2018;6(1):199.
6. Arikan TA, Kelles M. Plasma selenium and cadmium levels in patients with chronic otitis media in a Turkish population and their relation to inflammation markers. Bio Trace Elem Res. 2019;189(1):55-63.
7. Arvind N, Chand P, Vishrutha KV. Microbiological profile of chronic suppurative otitis media. Int J Boimed R. 2014;5:204-6.
8. Rak K, Völker J, Schendzielorz P, Kaulitz S, Steinbach J, Shehata-Dieler W. et al. Cochlear implantation in chronic otitis media: Investigation of long term speech comprehension and rate of complications. Otol Neurotol. 2018;39:e979-e84.
9. Ronald PS, Stroman DW. Microbiology of acute otitis externa.Laryngoscope.2002;112:1166-77
10. Parveen S. Aerobic bacteriology of CSQM in a teaching hospital. Microbial Biotech Res.2012;24:1306-10
11. Kumari S, Venkata M,Mohanty I. Microbiological profile of chronic suppurative otitis media and in vitro antibiotic sensitivity pattern in a tertiary care hospital. J Otolaryngol online.2014;4:1-14.
12. Nikakhlagh S, Khosravi AD, Fazlipour A,Safarzadeh M, Rashidi N. Microbiological Findings in patients with chronic suppurative otitis media.Med Sci.2008;8:503-6
13. Agarwal 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 Otolaryngol.2013;19:5-8
14. Kumar H, Seth S. Bacterial and fungal study of 100 cases of chronic suppurative otitis media. JCDR. 2011;5(6 Suppl 1):S1224-7.
15. Iqbal K, Khan MI, Satti L. Microbiology of chronic suppurative otitis media: Experience at Dera Ismail Khan. GJMS. 2011;9(2):189-93.
16. 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. N Am J Med Sci. 2013;5(4):282-7.
17. Jayanthi SR, Venkatesh R, Jeya M. Study of aerobic bacterial and fungal etiology of chronic suppurative otitis media in tertiary care hospital in out skirts of Chennai, India. Int J of Research in Health Sci. 2013;1(3):199-203
18. Meyer E, Whitelaw A, Edkins O, Fagan JJ. Chronic otorrrhea: Spectrum of Microorganisms and antibiotic sensitivity in a South African cohort. S Afr Med J. 2013;103(7):471-3.
19. Afolabi OA, Salaudeen AG, Ologe FE, Nwabuisi C, Nwawolo CC. Pattern of bacterial isolates in the middle ear discharge of patients with chronic suppurative otitis media in a tertiary hospital in north central Nigeria. Afr Health Sci. 2012;12(3):362-7.
20. 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(1):5-8.
21. Fatima G, Shoaib M, Raza MZ, Bilal S. Antimicrobial susceptibility pattern of bacterial and fungal isolates from patients with chronic suppurative otitis media in perspective of emerging resistance. Pak J Otolaryngol. 2013;29:49-53.
22. Mirza IA, Ali L, Ali L,Arshad M. Microbiology of chronic suppurative otitis media- Experience at Bahawalpur. Pak Armed Forces Med J. 2008;58(4):372-6.
23. Kumar J, Sunkum A, Bindu H. Bacteriological study of chronic suppurative otitis media by aerobic methods in a teaching hospital. ORL J Otorhinolaryngol. 2012;2(3):1-6.
24. Nia KM, Sepehri G, Khatmi H, Shakibaie MR. Isolation & antimicrobial susceptibility of bacteria from chronic suppurative otitis media patients in Kerman, Iran. Iran Red Crescent Med J. 2011;13(12):891-4.
25. Gorems K, Beyene G, Berhane M, Mekonnen Z. Antimicrobial susceptibility patterns of bacteria isolated from patients with ear discharge in Jimma Town, Southwest, Ethiopia. BMC Ear Nose Throat Disord. 2018;18:17.
26. Altuntas A, Aslam A, Eren A, Unal A, Nalca Y. Susceptibility of microorganisms isolated from chronic suppurative otitis media to ciprofloxacin. Eur Arch Oto-rhino-laryngol. 1996;253:364-6.
27. Jang CH, Park SY. Emergence of ciprofloxacin resistant pseudomonas in chronic suppurative otitis media. Cli Otolaryngol. 2004;29:321-3