

# MICROBIOLOGY OF CHRONIC SUPPURATIVE OTITIS MEDIA: EXPERIENCE AT DERA ISMAIL KHAN

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## ABSTRACT

**Background:** Chronic suppurative otitis media is a common infectious disease. The micro-organisms commonly associated with it and their antibiotic sensitivity pattern is important for its treatment. This study was conducted to identify the common microorganisms involved and their antibiotic sensitivity pattern in patients with chronic suppurative otitis media.

**Material & Methods:** This descriptive study was carried out from January 2011 to August 2011 at Department of ENT, DHQ Teaching Hospital and Microbiology Department, CMH, D.I.Khan. A total of 190 patients with unilateral or bilateral active chronic suppurative otitis media attending the out patient clinic were included in the study. Pus samples were collected from the discharging ears and sent for microbiology.

**Results:** From 190 specimens, 174(91.6%) were positive, and 16(8.4%) culture negative. There were 167(87.9%) bacterial isolates and 7(3.7%) fungi. *Pseudomonas aeruginosa* 80(45.9%) was the dominant isolate, followed by *Staphylococcus aureus* 46(26.4%) including 10 isolates of Methicillin resistant *Staphylococcus aureus* (MRSA). Antibiotic sensitivity pattern of *Pseudomonas aeruginosa* showed that piperacillin/tazobactam was active against 100% isolates of *Pseudomonas aeruginosa* and all *Staphylococcus aureus* except MRSA.

**Conclusion:** *Pseudomonas aeruginosa* is the most common isolate followed by *Staphylococcus aureus* from the culture specimens of chronic otitis media. Both of these are sensitive to tazocin except MRSA. *Pseudomonas aeruginosa* is increasingly becoming more resistant to the commonly used antibiotics like quinolones.

**KEY WORDS:** Chronic suppurative otitis media, Culture and sensitivity, *Pseudomonas aeruginosa*.

## INTRODUCTION

Chronic suppurative otitis media (SOM) is a common infectious disease in both developing and developed countries.<sup>1</sup> It is potentially serious disease and causes a variety of extra-cranial and intracranial complications like meningitis.<sup>2</sup> Chronic suppurative otitis media is defined as an infection of the middle ear that lasts more than 3 months and is accompanied by tympanic membrane perforation.<sup>3</sup> The disease is more common in children belonging to lower socioeconomic group. Most common micro-organisms found in chronic SOM are *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Eshrichia coli*, *Aspergillus* sp and *Candida* sp. But these organisms vary in various geographical areas.<sup>4</sup>

Changes in the microbiological flora following the advent of sophisticated synthetic antibiotics, antiphlogistic and antihistaminic drugs increase the relevance of reappraisal of the modern day bacterial flora in chronic suppurative otitis media.<sup>5</sup>

The study of the micro-organisms commonly associated with chronic suppurative otitis media and their in-vitro antibiotic sensitivity pattern is very pertinent for the clinician to plan a general outline of treatment for the average patient with a chronically discharging ear.

This study was carried out to identify the common microorganisms involved and their antibiotic sensitivity pattern in patients with chronic suppurative otitis media.

## MATERIAL AND METHODS

This study was carried out at outpatient department of ENT, DHQ Teaching Hospital, and Microbiology Department, Combined Military Hospital D.I.Khan, from 1<sup>st</sup> January 2011 to 30<sup>th</sup> August 2011. A total of 190 patients of all age groups and both genders were included. Inclusion criteria consisted of all the patients having discharge from one or both ears for more than 3 months with tympanic membrane perforation. Patients on already treatment, especially in the form of ear drops, within the previous 5-7 days were excluded from the study.

In the protocol followed for culture and sensitivity, pus swabs were taken from the affected ear on a sterile swab in ENT OPD and sent to the Microbiology Department, Combined Military Hospital Dera Ismail Khan without delay. Commercially available pre-packed sterile cotton swabs were used. Samples of discharge were obtained after cleaning the external auditory canal by suction under aseptic condition. Swabs were taken from the deeper part of external auditory canal and were inoculated on MacConkey, Blood, Chocolate and Sabouraud Dextrose agar and incubated aerobically at 37 °C for 24-48 hours. The isolates were identified using colony morphology, gram staining, catalase, coagulase, oxidase and biochemical strips. In case of fungal growth, lactophenol cotton blue was used for final identification.

The antimicrobial susceptibility testing was performed on Mueller Hinton agar using the modified Kirby-Bauer disc diffusion method. The antibiotics tested were amikacin, gentamicin,

ciprofloxacin, ceftazidime, ceftriaxone, imipenem, augmentin, tazocin (tazobactam/piperacillin), levofloxacin, and vancomycin.

## RESULTS

The age ranged from 6 months to 60 years with the peak age group being 15-25 years (39.5%). Males 118 (62.1%) out-numbered the females (37.9%). Ear discharge was continuous in 70 (36.8%), recurrent in 112 (58.94%), foul smelling in 76 (42%), and blood stained in 40 (21%) patients. Perforation in tympanic membrane was central in 82 (43.15%), marginal in 52 (27.4%), and attic in 50 (26.3%) cases. While 6 (3.15%) patients presented with a discharging mastoid cavity. The degree of hearing loss was mild (26-40db) in 37%, moderate (41-55db) in 45.7%, severe (56-91db) in 14.3%, and profound (91db) in 2.85% cases. Almost all of the patients were from the poor social strata with only 10 % being from the affluent class.

Out of the 190 swabs, 174 showed growth giving an isolation rate of 91.6%. *P. aeruginosa*

**Table 1: Sensitivity pattern of organisms isolated from chronic suppurative otitis media patients.**

Type of organism	Total No. (%)	AK (%)	CAZ (%)	CT (%)	CP (%)	GM (%)	IM (%)	LEV (%)	TZ (%)	AUG (%)	VM (%)
<i>P. aeruginosa</i>	80 (45.9)	64 (76)	70 (83.3)	44 (52)	62 (73.8)	42 (50)	74 (92.5)	71 (88.7)	0 (100)	–	–
<i>S. aureus</i>	36 (20.6)	20 (52.5)	36 (100)	36 (100)	26 (72.2)	20 (52.5)	36 (100)	26 (72.2)	36 (100)	36 (100)	36 (100)
MRSA	10 (5.7)	5 (50)	0	0	2 (20)	0	0	0	0	0	10 (100)
Proteus species	14 (8.0)	12 (75)	10 (62.5)	11 (68.75)	8 (50)	0	12 (75)	10 (71.4)	14 (87.5)	9 (56.3)	–
<i>E. coli</i>	12 (6.8)	10 (83.3)	8 (66.5)	6 (50)	1 (8.3)	6 (50)	10 (83.3)	9 (75)	8 (66.5)	4 (33.3)	–
<i>Citrobacter</i> sp.	5 (2.8)	5 (83.3)	2 (50)	2 (50)	5 (83.3)	4 (66.5)	2 (50)	5 (100)	2	0	–
<i>K. pneumoniae</i>	4 (2.2)	2 (50)	1 (25)	3 (75)	1 (25)	1 (25)	2 (50)	4 (100)	3 (75)	1 (25)	–
Cornybacterium sp.	3 (1.7)	2 (66.6)	2 (66.6)	1 (33.3)	2 (66.6)	1 (33.3)	0	2 (66.6)	0	1 (33.3)	3 (100)
<i>Citrobacter</i> sp.	3 (1.7)	3 (100)	2 (66.6)	2 (66.6)	3 (100)	2 (66.6)	3 (100)	2 (66.6)	3 (100)	2 (66.6)	–
Fungi	7 (3.7)	–	–	–	–	–	–	–	–	–	–
Total	174 (100)	123/174 (70.6)	127/174 (72.9)	98/174 (56.3)	111/174 (63)	76/174 (43.7)	135/174 (71.0)	139/174 (73.1)	146/174 (80)	53/110 (48.1)	49/49 (100)

AK- Amikacin, CAZ- Ceftazidime, CT- Ceftriaxone, CP- Ciprofloxacin, GM-Gentamicin, IM- Imipenem, VM- Vancomycin, TZ- Tazobactum/Piperacillin, LEV- Levofloxacin, AUG-Augmentin



Fig 1: Growth of *Aspergillus flavus* on dextrose agar on day 7.

(45.9%) was the commonest organism followed by *S. aureus* (26.4%). *E.coli* was isolated in 6.3% and *Proteus* sp. in 7.4% cases. *Citrobacter* species and *corynebacterium* species were isolated in occasional patients. *Aspergillus* species accounted for 3.7% of the isolates. The Methicillin Resistant *Staphylococcus Aureus* (MRSA) among *Staphylococcus aureus* isolates was 10 (21.75%). The sensitivity pattern of various isolates against a panel of antibiotics is shown in Table 1.

## DISCUSSION

Chronic SOM is still a challenging problem in developing and under developed countries, owing to its high incidence (6.3%) and high mortality (36%) for economical, social and medical reasons.<sup>6</sup> The mainstay of treatment for uncomplicated CSOM is two fold: meticulous aural toilet and instillation of a topical antimicrobial agent. The therapeutic use of antibiotics is usually started empirically prior to results of microbiological culture. Selection of any antibiotic is influenced by its efficacy, resistance of bacteria, safety, risk of toxicity and cost.

In our study, CSOM was found mostly in children and young adults. Same results were obtained in India and Nigeria.<sup>7,8</sup> This may be due to multiple reasons as young children and infants may have low resistance and also because of relative short and straight eustachian tube. Males were more commonly affected than females and it is also supported by a local study.<sup>6</sup> One of the study reports almost equal distribution between gender (male 54% and female 46%).<sup>9</sup> About half of our patients had foul smelling ear discharge at the time of presentation. The reason may be acute exacerbation of ongoing chronic infective process in the middle ear.

Majority of isolates in our study were aerobes. This correlates well with other studies.<sup>10,11</sup> In



Fig.2: *Pseudomonas aeruginosa* strain showing sensitivity only to Tazobactem-Piperacillin.

our study, *Pseudomonas aeruginosa* was the commonest isolate followed by *Staphylococcus aureus*. This is also supported by literature.<sup>1,12-16</sup> but few studies showed *Staphylococcus aureus* to be the commonest.<sup>17,18</sup> Contrary to other studies<sup>15,19</sup> which showed that anaerobes were isolated in significant numbers of patients, we were not able to isolate any anaerobe in our study although specimens were cultured for this purpose. The possible reasons may be that majority of our patients were referred from peripheral health care facilities where they were given systemic and topical antibiotics leading to elimination of anaerobes by the time samples were collected for this study. Any delay in transfer of the sample will result in non-growth of anaerobes which may be the probable reason of not isolating anaerobes in this study.

Our study showed that fungi were only 3.7% of the total isolates. All of them were of *Aspergillus* species, same is observed in few other local studies.<sup>1,17</sup> They are only commensal therefore, do not require treatment.

Antimicrobial sensitivities of *P. aeruginosa* in our study revealed that 100% isolates were sensitive to tazobactam/piperacillin while 92.5 % of isolates were sensitive to imipenem and 88.7% to levofloxacin. On the other hand 76 % were sensitive to amikacin and only 50% to gentamicin. This is also supported by another local study.<sup>9</sup> The sensitivity of *P. aeruginosa* against quinolones has shown a downward trend globally in the recent past. A study carried out in Turkey in 1996 revealed only 6% of *P. aeruginosa* isolates to be resistant to ciprofloxacin,<sup>20</sup> where as in South Korea in a study carried out in 2004 ciprofloxacin resistance was noted in 100% of isolates.<sup>21</sup> Other local studies revealed that more than 90% isolates were sensitive to ciprofloxacin.<sup>1,2,6,17</sup> The declining sensitivity trend may be due to number of factors including

injudicious use, inappropriate dosage, and easy accessibility and developing enzymatic resistance of organism against quinolones. Similar differences have been noted in literature regarding activity of aminoglycosides against *Paeruginosa*.<sup>6,22,23</sup>

*Staphylococcus aureus* (other than MRSA), the second most common isolate in our study, was 100% sensitive to tazocin, 72.2 % to levofloxacin, and 52% to amikacin. The susceptibility pattern of *Staphylococcus aureus* found in our study against most of the antibiotics is almost consistent with the one reported in few other local studies.<sup>1,2,6</sup>

We had only 6.5% MRSA positive isolates in our study, while two studies from Karachi, Pakistan have claimed 38% isolates.<sup>17,24</sup> Hwang, s study from Taiwan had 13.7% incidence of MRSA.<sup>25</sup> Since all the patients reported as out-patients, it was assumed that the infection was community acquired.

## CONCLUSION

*Pseudomonas aeruginosa* was 100% sensitive to tazobactem/piperacillin. *Pseudomonas aeruginosa* is increasingly becoming more resistant to the common drugs like quinolones. *Pseudomonas aeruginosa* is the most common isolate followed by *Staphylococcus aureus* from the culture specimens of chronic otitis media. Both of these are sensitive to tazobactem/piperacillin except Methicilin resistant staphylococci. *Pseudomonas aeruginosa* is increasingly becoming more resistant to the commonly used antibiotics like quinolones. Vancomycin is 100% effective against MRSA.

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Picture showing the ancient fort "Qala Bala Hissar" at Peshawar, Pakistan