

Frequency and Sensitivity Pattern of Methicillin-Resistant Staphylococcus Aureus in Chronic Suppurative Otitis Media

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ABSTRACT

Aim: To identify the frequency of MRSA and its sensitivity to various antibiotics in patients of chronic suppurative otitis media.

Material and methods: This descriptive multi-center study was conducted at Departments of ENT, Mufti Mehmood Memorial Teaching Hospital and DHQ Teaching Hospital, Dera Ismail Khan from 1st January 2012 to 31st December 2012. 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 to the Microbiology Department CMH D.I. Khan for culture and sensitivity studies. The smears were obtained using sterile cotton swabs, then incubated and identified. Drug susceptibility was determined by disc-diffusion method.

Results: From the clinical specimens of 250 patients enrolled in the study, microbiological culture was yielded from 208(83.2%) specimens. Out of total 250 cultured isolates, MRSA was isolated in 24/250(9.6%) cases. Drug sensitivities pattern showed that vancomycin had highest sensitivity 24/24(100%) while the organism showed complete resistance to augmentin, gentamicin, ceftriaxone.

Conclusion: MRSA was 100% sensitive to vancomycin while the organism showed complete resistance to aminoglycosides, penicillins, and cephalosporins.

Keywords: Suppurative otitis media, Culture and sensitivity, MRSA, Vancomycin.

INTRODUCTION

Chronic suppurative otitis media (CSOM) is characterized by irreversible inflammatory changes in the middle ear cavity and mastoid process. Purulent otorrhea is a common symptom in patients with CSOM. Patients with CSOM generally have a chronic inflammation of the middle ear and mastoid; with a persistent perforation of the tympanic membrane associated with recurrent otorrhea¹. The common micro-organisms found in CSOM are Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae, Escherichia coli, Aspergillus and Candida species².

Methicillin-resistant Staphylococcus aureus (MRSA) otorrhea was first described as an emerging concern more than 10 years ago. In 2000, Hartnick et al identified 8 cases of MRSA-associated otorrhea in a 14-month period, representing a MRSA-caused otitis media incidence in their

population of only 0.2%³. There has also been a significant increase in the incidence of community-acquired MRSA, which is distinguished from hospital-acquired MRSA by the absence of established risk factors, such as prolonged hospitalization, multi-drug or prolonged antibiotic therapy, and use of indwelling catheters^{4,5}.

The treatment of patients with MRSA otorrhea has changed substantially over the last decade in otolaryngology practice. Treatment of mild to moderate MRSA otorrhea has become much less aggressive but no less successful, as documented in a literature review. They found that previously healthy patients with mild (no fever) to moderate (with fever) MRSA infections had good outcomes after a course of oral trimethoprim-sulfamethoxazole combined with gentamicin, polymyxin B-neomycin-hydrocortisone, or ofloxacin topical antibiotics. For patients with moderate to severe infections (toxic appearance, immunocompromised, or limb-threatening and requiring hospitalization), the first-choice antibiotic was usually vancomycin, often combined with rifampicin or gentamicin⁶.

MATERIAL AND METHODS

This multi-center study was conducted at Departments of ENT, Mufti Mehmood Memorial Teaching Hospital and District Head Quarter Teaching Hospital, Dera Ismail Khan from 1st January

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2012 to 31st December 2012. Patients of all age groups and both gender having discharge from one or both ears for more than 3 months with tympanic membrane perforation were included. Patients who have used local/ or systemic antibiotics within the previous 7 days were excluded from the study.

For culture and sensitivity, the smears were obtained using sterile cotton swabs, from the deeper part of external auditory canal of the affected ear in ENT Department after cleaning the external auditory canal by suction under aseptic condition and sent to the Microbiology Department of Combined Military Hospital, Dera Ismail Khan without delay. The smears were then incubated 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.

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, cefipime, clindamycin, rifampicin, trimethoprim-sulfamethoxazole and vancomycin. Data was analyzed by SPSS

RESULTS

Out of 250 swabs, 208 showed growth giving an isolation rate of 83.2%. MRSA was isolated in 24/250 (9.6%) cases. It was isolated in 66.70% (16/24) male and 33.30% (8/24) female patients respectively. The most commonly affected age group was 11-20 years 7/24 (29.15%) while the least affected age group was 51-60 years 01/24 (4.15%) (Table 1).

Table.1 Age and Gender wise distribution of MRSA isolates among the CSOM patients n=24

Age (Yrs)	Male	Female	Total
<10	3 (12.50%)	2(08.35%)	5(20.85%)
11-20	6 (25%)	1(04.15%)	7(29.15%)
21-30	2(08.35%)	3(12.50%)	5(20.85%)
31-40	2(08.35%)	0	2(08.35%)
41-50	3(12.50%)	1(04.15%)	4(16.65%)
>50	0	1(04.15%)	1(04.15%)
Total	16(66.70%)	8 (33.30%)	24 (100%)

Drug sensitivities pattern showed that vancomycin had highest sensitivity 24/24(100%) against MRSA while it showed complete resistance to augmentin, gentamicin, ceftazidime, cefepime (Table 2).

Table 2: Sensitivity pattern of MRSA to various antibiotics in CSOM patients (n=24).

Drugs	No. of sensitive isolates	%age
Amikacin	11	45.85
Augmentin	00	00.00
Ceftazidime	00	00.00
Ciprofloxacin	03	12.50
Gentamicin	00	00.00
Clindamycin	10	41.70
Vancomycin	24	100.00
Rifampicin	14	58.30
Cefipime	00	00.00
Trimethoprim-sulfamethoxazole	03	12.50

DISCUSSION

In our study, the incidence of MRSA was 9.6% (24 out of 250). This finding is in tandem with the findings of Brook et al who reported 8% incidence of MRSA in his study⁷. But contrary to these reports, other studies from Korea and USA have reported a lower incidence of MRSA in chronic otitis media than ours; i.e., 9% (137/2773) and 3.9% respectively^{5,8}. Similarly another local study has also reported an incidence of MRSA in CSOM patients of 1.5% which is lower to our results.²¹ On the other side, Hwang and collaborators from Taiwan and Choei from Korea have reported a higher incidence rates than all the above reported results i.e., 12.2% (27/221) and 28.1% respectively^{9,19}. These reports are reflecting an increasing incidence of methicillin-resistant *S aureus* (MRSA) among the patients with chronic otorrhea in otherwise healthy patients, acquiring their infections in the community while lacking any of the traditional risk factors like prolonged hospitalization. MRSA ear carriage on the initial visit could be acquired during the visit to primary care units. In previous studies, it had been reported that non-disposable auroscope ear pieces were colonized with pathogenic bacteria, including MRSA, and could be a potential source of cross-colonization of MRSA among the patients in an ambulatory setting.

In our study, Males were more commonly affected than females. These results are in agreement with the literature reports^{8,10}. Majority of the MRSA isolates were found in the teenager group as supported by other studies^{9,11}. This may be due to multiple reasons as young children may have low resistance and also because of relative short and straight eustachian tube.

Patients with MRSA ear carriage pose unique problems in terms of treatment. Antimicrobial sensitivities of MRSA in our study revealed that 100% isolates were sensitive to vancomycin as supported by other studies^{10,12,13,15}.

However, reports of clinical failures associated with vancomycin have been reported and clinicians are questioning the supremacy of vancomycin in the management of MRSA infections^{16,17}. These failures could be explained by the slow bactericidal activity of vancomycin, its poor tissue penetration, and an increase in minimum inhibitory concentration (MIC) for MRSA, known as MIC creep. At present, intravenous administration of vancomycin hydrochloride remains the drug of choice to treat MRSA-infected patients. This agent, however, requires intravenous (IV) administration, continuous monitoring of levels and occasionally patients experience some unacceptable side effects¹⁵.

Rifampicin susceptibility was noted in 58% of the cases which is lower than that reported by Park et al from Korea where 90% MRSA isolates from chronic discharging ears were sensitive to rifampicin⁵. Since resistance develops quickly during therapy, Rifampicin is never used as monotherapy for the treatment of staphylococcal infections. Nonetheless, it plays a role as an adjunct in the treatment of MRSA infections.

MRSA showed relatively low sensitivity to amikacin (45.85) and complete resistance to gentamicin in our study. Contrary to these reports, only 14.8%¹⁸ and 4.4%¹³ MRSA isolates were resistant to gentamicin. High resistance to aminoglycosides against MRSA has been reported by another study as well²⁰.

The sensitivity of MRSA against quinolones has shown a downward trend globally in the recent past. In our study, 12.5% of MRSA isolates showed sensitivity to ciprofloxacin. Similarly decreased sensitive strains (8.8%) of MRSA isolates to fluoroquinolones were detected in another study¹³. High fluoroquinolones antibacterial activity (84%) against MRSA isolates was reported by Madana and colleagues¹⁰. This 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.

Clindamycin is a lincosamide antibiotic that inhibits bacterial protein synthesis by binding to the 50S subunit of the ribosomes. In our study, 41.7% of MRSA isolates showed sensitivity to clindamycin. But contrary to our results another study has reported only 8.8% sensitive strains of MRSA isolates in chronic discharging ears¹⁰.

Cephalosporins are the most frequently prescribed class of antibiotics and third-generation displays an extended gram negative spectrum. They are also used in treating MRSA infections. In our study, none of MRSA isolate was found to be sensitive to ceftazidime which is also comparable with another study¹⁵.

Trimethoprim-sulfamethoxazole is a sulfonamide antibiotic that interferes with bacterial folic acid synthesis by inhibiting dihydrofolic acid formation from para-aminobenzoic acid and by inhibiting dihydrofolic acid reduction to tetrahydrofolate. MRSA isolates were often resistant to trimethoprim-sulfamethoxazole (77.5%) in the present study. But contrary to our results other studies have documented that MRSA isolates in chronic discharging ears were highly susceptible to trimethoprim-sulfamethoxazole i.e 100% and 84.3% respectively^{5,18}.

CONCLUSION

MRSA was 100% sensitive to vancomycin while the organism showed complete resistance to aminoglycosides, penicillins, and cephalosporins.

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