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[Original Research Paper]

MRSA PREVALENCE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN A TERTIARY CARE HOSPITAL IN MAHARASHTRA

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Abstract

Introduction: *Staphylococcus aureus* is a common cause of community acquired and health care associated infections. The aim of present study is to assess prevalence of MRSA infections and antimicrobial susceptibility pattern for appropriate management of MRSA infections.

Methodology: This cross-sectional observational study was conducted from June 2021 to June 2022 in Department of Microbiology, Dr SCGMC, Nanded. 3247 clinical specimens were included in our study. The antimicrobial susceptibility of all *Staphylococcus aureus* isolates was determined by Kirby Bauer disc diffusion method as per CLSI guidelines 2022. Methicillin resistance was detected by cefoxitin disc diffusion test.

Results: Out of 752 Staphylococcus aureus isolates, Methicillin resistance was shown by 337(44.8%) isolates. Maximum MRSA isolates were detected from pus specimens 187(55.5%), followed by respiratory infection 79(23.4%), blood stream infection 31(9.2%). Out of 337 MRSA isolates 100% were sensitive to Vancomycin, 93.1% to Linezolid, 58.2% to Gentamycin, 52.2% to Cotrimoxazole, 43.9% to Clindamycin, 12.8% to Amikacin & 12.5% to Erythromycin.

Conclusion: Strict adherence and judiciary use of antimicrobial drugs according to National Treatment Guidelines for Antimicrobial Use in Infectious Diseases is necessary for management of MRSA infections.

Keywords: MRSA, prevalence, management

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INTRODUCTION

Staphylococcus aureus is a common pathogen responsible for both community-acquired and healthcare-associated infections. Methicillin-resistant Staphylococcus aureus (MRSA) emerged as a significant concern following the introduction of methicillin in October 1960. MRSA strains are characterized by the production of a modified penicillin-binding protein, PBP2a, which has a low affinity for methicillin and all β-lactam antibiotics [1]. This resistance is conferred by the mecA gene. Infections caused by MRSA are associated with longer hospital stays and increased healthcare costs. The aim of the present study is to assess the prevalence of MRSA infections and determine their antimicrobial susceptibility patterns to ensure appropriate management and treatment strategies for MRSA infections [2].

MATERIALS AND METHODS

This cross-sectional observational study was conducted from June 2021 to June 2022 in the Department of Microbiology at Dr. SCGMC, Nanded. A total of 3,247 clinical specimens, received from both in-patient and out-patient departments and showing growth on culture media, were included in the study. All specimens, except for urine samples, were cultured on blood agar and MacConkey agar. Urine specimens were cultured using Cysteine Lactose Electrolyte Deficient (CLEA) agar. Staphylococcus aureus was isolated and identified using standard microbiological methods. The antimicrobial susceptibility of all Staphylococcus aureus isolates was determined by the Kirby-Bauer disc diffusion method in accordance with CLSI guidelines 2022. Methicillin resistance was detected using the cefoxitin disc diffusion test.

RESULTS

Out of 752 Staphylococcus aureus isolates, methicillin resistance was observed in 337 isolates, representing 44.8% of the total.

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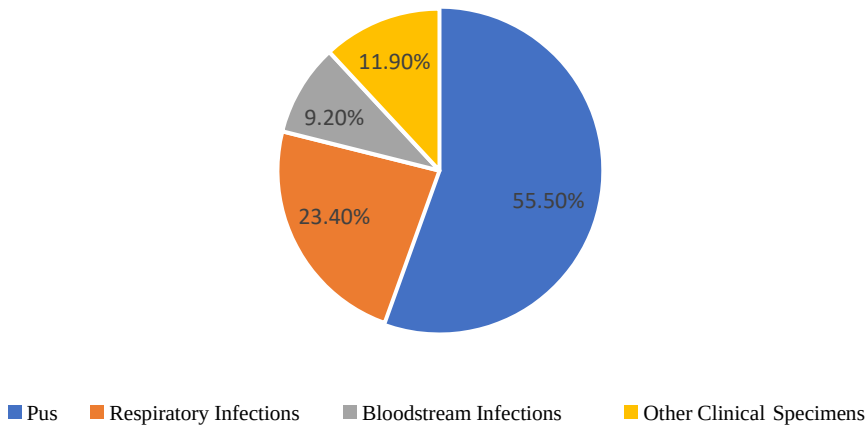
Figure 1 - distribution of MRSA isolates according to clinical specimens (n=337)



The study found that the majority of MRSA isolates were obtained from pus specimens; accounting for 187 isolates (55.5%). This was followed by isolates from respiratory infections, with 79 cases (23.4%), and bloodstream infections, which contributed 31 isolates (9.2%). Additionally, MRSA isolates were detected in 40 specimens (11.9%) from other sources, including urine, ear swabs, ascitic fluid, vaginal swabs, infected tissue, and gastric aspirates.

Table 1 - Distribution of MRSA isolates according to Department (n=337)

Name of Department	No. of MRSA isolates
Surgery Ward	110(32.6%)
Medicine Ward	28(8.3%)
Obstetrics and Gynecology Ward	39(11.6%)
Pulmonary Medicine Ward	27(8%)
Orthopedic Ward	22(6.5%)
Pediatrics Ward	9 (2.7%)
ENT Ward	6 (1.8%)
ICU	61(18.1%)
OPD	35(10.4%)
Total	**337(100%)**

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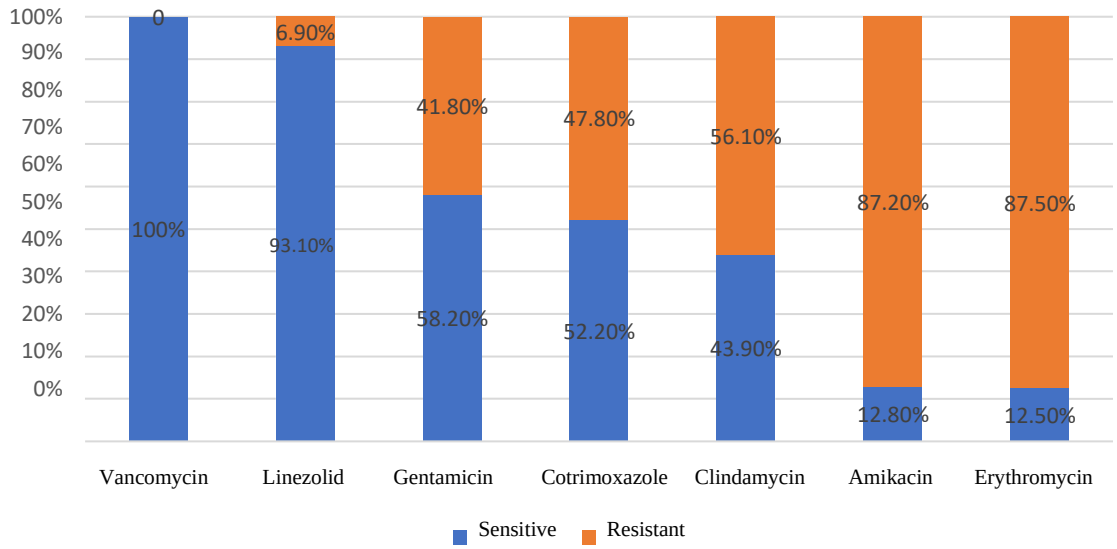
Figure2-AntimicrobialSusceptiblityPatternofMRSA (n=337)



Among the 337 MRSA isolates tested, all isolates were sensitive to Vancomycin, and 93.1% were sensitive to Linezolid. Sensitivity to Gentamicin was observed in 58.2% of isolates, while 52.2% were sensitive to Cotrimoxazole. Clindamycin was effective against 43.9% of the isolates. However, resistance was notable for several antibiotics: 87.2% of isolates were resistant to Amikacin, 87.5% to Erythromycin, 56.1% to Clindamycin, and 47.8% to Cotrimoxazole. Gentamicin and Amikacin showed significant resistance rates, with 41.8% and 87.2% of isolates being resistant, respectively. This susceptibility profile underscores the continued effectiveness of Vancomycin and Linezolid in treating MRSA infections, while highlighting growing resistance to several other commonly used antibiotics.

DISCUSSION

The prevalence of MRSA in the present study is 44.8%. In comparison, a study by Krishna Tiwari et al. at a tertiary care hospital in North India reported an MRSA prevalence of 38.4%. In this study, MRSA was predominantly isolated from pus specimens (55.5%) and respiratory infections (23.4%). Similarly, Krishna Tiwari et al. found 42.2% of MRSA isolates from pus specimens and 34.6% from respiratory infections. Joshi Sangeeta et al. reported 40% of MRSA isolates from pus specimens and 41% from respiratory infections [3].

In contrast, the present study found that 9.2% of MRSA isolates were from bloodstream

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infections, whereas Krishna Tiwari et al. and Joshi Sangeeta et al. reported 34.8% and 48%, respectively, from bloodstream infections [4].

Regarding the distribution of MRSA isolates across different hospital wards, the present study found 32.6% in the surgery ward, 18.1% in the intensive care unit, 8.3% in the medicine ward, 11.6% in obstetrics and gynecology, 6.5% in the orthopedic ward, and 2.7% in the pediatric ward. Kirti Lohan et al. reported 25.9% of MRSA isolates from the surgery ward, 24.6% from the intensive care unit, 11.1% from the medicine ward, 9.9% from obstetrics and gynecology, 23.4% from the orthopedic ward, and 4.9% from the pediatric ward [5].

In terms of antimicrobial susceptibility, 100% of MRSA isolates in the present study were sensitive to Vancomycin, 93.1% to Linezolid, 58.2% to Gentamicin, 52.2% to Cotrimoxazole, 43.9% to Clindamycin, and 12.5% to Erythromycin. Joshi Sangeeta et al. also reported 100% sensitivity to Vancomycin and Linezolid, but only 41.7% sensitivity to Gentamicin, 44.4% to Cotrimoxazole, 53.4% to Clindamycin, and 29.2% to Erythromycin [6]. MRSA is a serious complication in Hospital and needs to be addressed at all levels in hospital infection control. [7-10]

CONCLUSION

Our study observed a significant prevalence of MRSA, highlighting the urgent need for stringent adherence to antimicrobial stewardship. It is crucial to follow the National Treatment Guidelines for Antimicrobial Use in Infectious Diseases to manage MRSA infections effectively. The over-the-counter use of antibiotics and the irrational use of antibiotics for veterinary purposes should be strictly avoided to help mitigate the risk of developing antibiotic resistance. Implementing these measures will be essential in controlling MRSA and improving treatment outcomes.

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