

Prevalence and Antibiotic Susceptibility Pattern of Methicillin Resistant Staphylococcus Aureus (MRSA) Isolated from Pus Specimens in a Tertiary Care Hospital

Manoj Kumar¹, Rinki Kumari², Ashok Kumar Sharma³, Amber Prasad⁴, Kumari Seema⁵

¹Professor and Head of the Department, Department of Microbiology, RIMS, Ranchi. Jharkhand, India

²Post Graduate, Department of Microbiology, RIMS, Ranchi. Jharkhand, India

³Associate Professor, Department of Microbiology, RIMS, Ranchi. Jharkhand, India

^{4,5}Assistant Professor, Department of Microbiology, RIMS, Ranchi. Jharkhand, India

Abstract: *Introduction:* Methicillin-resistant *Staphylococcus aureus* (MRSA) are implicated in serious infections and nosocomial outbreaks. The choices of treatment are reduced, as they are resistant to various antibiotics. The prevalence of MRSA is growing throughout the world and its prevalence varies according to the region. This study was carried out to evaluate the prevalence rate and antibiotic susceptibility pattern of MRSA isolated from pus specimens in a tertiary care hospital, RIMS Ranchi. *Materials and Methods:* The present study was carried out from February 2018 - July 2018 (6 months) in the Department of Microbiology, RIMS, Ranchi. Pus samples received from indoor and out door patients for culture and sensitivity examination and *Staphylococcus aureus* was identified using standard laboratory procedure. Then methicillin resistant strains were detected using ceftiofur(30µg) disc and their antibiotic susceptibility testing was done by Kirby-Bauer disc diffusion method and interpreted as per CLSI 2018 guidelines. *Results:* A total of 309 pus specimen were collected, out of which 224 (72.49%) were culture positive. Of the 224 culture positive pus sample 87(38.84%) were identified as *Staphylococcus aureus*. Of the 87 strain of *Staphylococcus aureus*, 54 (62.06%) were found to be methicillin resistant, while the rest of the 33 Strains were methicillin susceptible. Resistance to other antibiotics were more encountered in methicillin resistant *Staphylococcus aureus* strains (MRSA) when compared with methicillin susceptible *Staphylococcus aureus* (MSSA) strains. However, no *Staphylococcus aureus* isolate was found resistant to linezolid and vancomycin. *Discussion and Conclusion:* It is worrisome that the present study reports an alarmingly high prevalence (62.06%) of MRSA infection. Continuous surveillance of infection and monitoring of antibiotic sensitivity pattern of *Staphylococcus aureus* isolates is required to reduce MRSA prevalence.

Keywords: Methicillin resistant *Staphylococcus aureus*, prevalence, antibiotic susceptibility testing

1. Introduction

Staphylococcus aureus is one of the most common human pathogens with ability to cause a wide range of infection, which may range from minor skin disease to life-threatening infection.^[1] It is one of the common organisms found to be associated with both nosocomial and community acquired infections.^[2] Methicillin-resistant *Staphylococcus aureus* (MRSA) strains were identified as early as 1961 soon after the introduction of methicillin in clinical settings.^[3] MRSA is now one of the commonest bacteria causing nosocomial infection.^[4] Infection due to MRSA are associated with increased morbidity and mortality in hospitalized patients. It also has the potential to cause sudden outbreaks in hospitals.^[5]

Methicillin resistant strain of *Staphylococcus aureus* (MRSA) is increasingly being reported worldwide.^[2] Its prevalence ranges from 23.3% to 73%.^[6]

Antimicrobial resistance of Methicillin-resistant *Staphylococcus aureus* (MRSA) continues to be a problem for clinician. It poses a serious therapeutic problem, leading to prolonged hospital stay and increased health care cost.^[7]

The spread of MRSA in developing countries can have devastating consequences because of lack of infrastructure that can provide bacterial identification and antimicrobial susceptibility and high cost of antibiotic required to treat severe MRSA infections.^[2]

The aim of the study was to evaluate the prevalence and antibiotic susceptibility pattern of MRSA isolated from pus specimens in a tertiary care hospital, RIMS, Ranchi.

2. Material and method

The present study was carried out from February 2018 - July 2018 (6 months) in the Department of Microbiology, RIMS, Ranchi. Pus samples received from indoor and out door patients for culture and sensitivity examination and *Staphylococcus aureus* was identified using standard laboratory procedure.^[8] Then methicillin resistant strains were screened by ceftiofur disc and their susceptibility pattern to erythromycin(15µg), clindamycin(2µg), trimethoprim-sulfamethoxazole (25µg), chloramphenicol, tetracycline (30 µg), ciprofloxacin (5 µg), gentamicin(10 µg) vancomycin(30µg), linezolid (30 µg) were done using standard microbiology techniques^[9] and interpreted as per CLSI 2018 guidelines.^[10]

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Data were analyzed using SPSS version 20 software.

3. Result

A total of 309 pus specimen were collected, out of which 224 (72.49%) were culture positive. Of the 224 culture positive pus samples 87(38.84%) were identified as *Staphylococcus aureus*.

Of the 87 strain of *S. aureus*, 54 (62.06%) were found to be methicillin resistant, while the rest of the 33 strains were methicillin susceptible.[Figure 2].Resistance to other antibiotics were more encountered in MRSA strains when compared with methicillin susceptible *staphylococcus aureus* (MSSA) strains shown in Figure 3.

MRSA isolates showed high resistance to erythromycin (79.63%), ciprofloxacin (65%), and gentamicin (57.4%) as compared to other drugs. However no isolate was found resistant to vancomycin or linezolid.

The sensitivities of MRSA strain to various antibiotics were as follows: vancomycin (n=54,100%), linezolid (n=54,100%), chloramphenicol (n=47, 87.04%), tetracycline(n= 41,75.93%), clindamycin (n= 37,68.50%), trimethoprim sulfamethoxazole (61.11%), ciprofloxacin(n=19,35%), gentamicin (n=23,43%) erythromycin(n=11,20.37%).

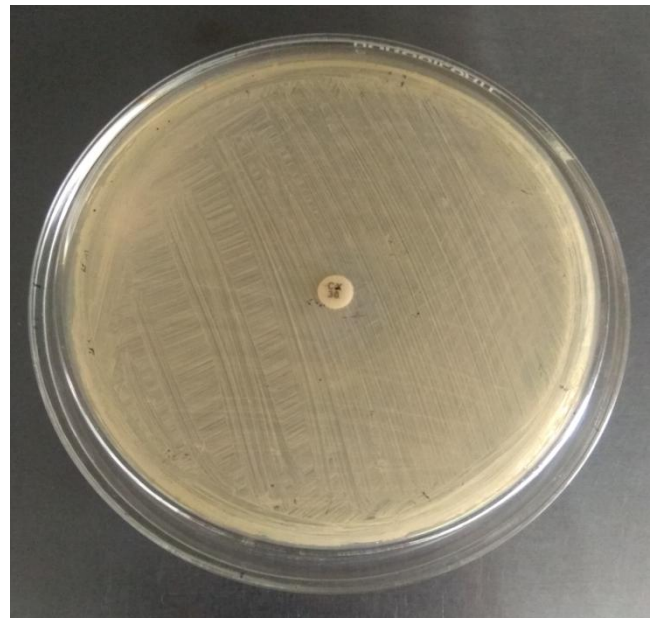


Figure 1: Cefoxitin disc diffusion test showing methicillin resistant *Staphylococcus aureus*

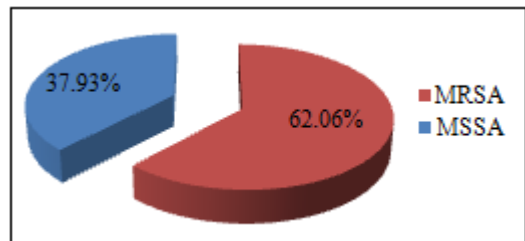


Figure 2: Prevalance of MRSA among pus isolates of *Staphylococcus aureus*

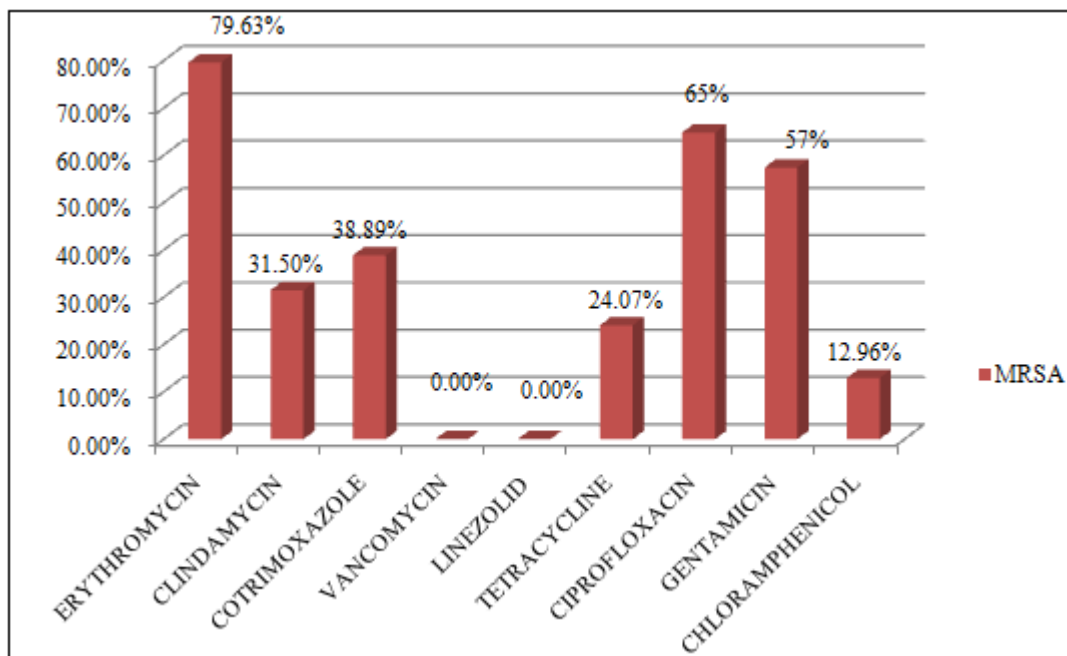


Figure 3: Resistance pattern of methicillin resistant *Staphylococcus aureus* (MRSA) isolates

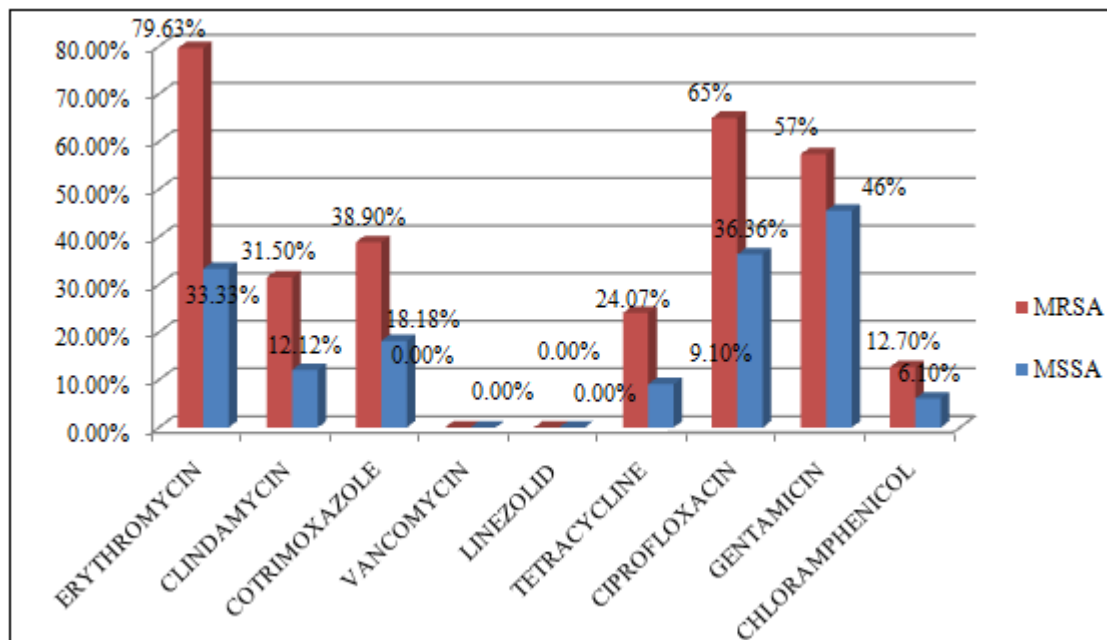


Figure 4: Comparison of Antibiotic resistant Pattern of MRSA & MSSA

4. Discussion

It is worrisome that the present study reports an alarmingly high prevalence of MRSA infection. 62.06 % of the isolated *Staphylococcus aureus* strains were found to be MRSA in the present study which correlate with a study carried out by Jasmin Halim Hussain et al^[2]. Jasmin Halim Hussain et al had screened the antimicrobial susceptibility pattern of *Staphylococcus aureus*, they isolated 80 strains in which 53(66.25%) strains were found to be methicillin resistant which correlate with the present study. High prevalence of MRSA among pus samples was also reported by Tiwari et al in 71.20% of isolates.^[11]

According to a different study carried out by Srinivasan et al^[5] and Tesring et al,^[12] the prevalence rate was 33.3% and 38.14% and in the study of Joshi S et al.^[13], Arora S et al^[1], Majumder et al^[4], Anupurba S et al^[14] and Tiwari HK et al^[15], the prevalence rates were 41% ,46%, 52.9%,54.8% and 59.3% respectively.

This variation in MRSA prevalence might be because of several factors like efficacy of infection control practices, healthcare facilities and antibiotic usage that vary from hospital to hospital.

MRSA isolates showed a higher resistance to ciprofloxacin, erythromycin, co-trimoxazole, gentamicin and clindamycin compared to MSSA isolates. Similar observation was also reported in a study carried by Arunava Kali et al^[16]. Majumder D et al. also reported that coexisting resistance to different antibiotics was significantly higher in MRSA strain in comparison to MSSA strains.^[4]

This study revealed that all MRSA isolates were 100% sensitive to vancomycin and linezolid. This is in accordance with other studies^[1,15,17,18]. However, vancomycin-intermediate and vancomycin-resistant *Staphylococcus aureus* (VISA and VRSA) strains have been reported recently from various parts of the country.^[19]

MRSA on surgical wards is becoming increasingly common especially in critically ill patients who have spent prolonged periods on the intensive care units^[20,21].

5. Conclusion

The emergence of drug resistant MRSA is worrisome in the present therapeutic scenario especially in developing countries. In order to control the emergence of resistance strains, proper antibiotic policy is must in all health care system and these policies must be followed strictly. So that judicious use of antibiotics can be assured and unnecessary and over exposure to the drugs can be avoided. In this study vancomycin and linezolid was found to be 100% susceptible. However, the emergence of resistance to these antibiotics has also been recorded in some studies. Therefore these drugs should be used very cautiously or else the threat of drug resistance will increase. These drugs use should be limited to those cases where they are clearly needed.

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