

## Study of Clinical Isolates of Methicillin Resistant Staphylococcus Aureus (MRSA) and its Antibiotic Susceptibility Pattern in Tertiary Care Teaching Hospital

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Conflict of interest: Nil

### Abstract

**Introduction:** Methicillin-resistant Staphylococcus aureus (MRSA) is a resistant organism that heavily contributes to hospital and community-acquired infections worldwide. It spreads very easily from patient to patient, by the hands of health workers, through contaminated objects and by air. MRSA poses a major clinical problem in treatment. So, it is essential to know its antibiotic pattern.

**Material & Methods:** This study was carried out in the department of Microbiology at C. U. Shah Medical College and hospital, Surendranagar. Total 180 samples were included in the study during the period of 1<sup>st</sup> July 2021 to 30<sup>th</sup> June 2022. Identification of isolated organism was done by conventional method using biochemical reactions. Antimicrobial susceptibility testing and MRSA detection was done using VITEK-2 compact system.

**Results:** Methicillin resistant Staphylococcus aureus (MRSA) was seen in 58% of the isolates. The sensitivity profile shows Tigecycline 100%, Nitrofurantoin, Linezolid and Teicoplanin 99%, Vancomycin 95%. Lower sensitivity rates were found for Levofloxacin (7%), Ciprofloxacin and Oxacillin (6%) and cefepime (2%). Inducible clindamycin resistance was found to be 37.5%. Vancomycin sensitivity was 95%, rest 4% was VISA and 1% was VRSA.

**Discussion:** Prevalence of MRSA was found 57.78% from various clinical samples. A similar study done by Fatemeh et al and Kirti et al was reported MRSA prevalence of 63.20% and 33.7% respectively.

**Conclusion:** MRSA were most sensitive to Tigecycline, Linezolid, Tecoplanin, Vancomycin and least sensitive to Oxacillin and cefepime. The knowledge of antibiotic sensitivity pattern of S. aureus will therefore be helpful to get control over the evolving resistance.

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### Introduction

S.aureus is an important pathogen that causes a variety of clinical diseases[1]. As high as 20% of the human population are long-term carriers of S. aureus which can be frequently found in the nose, respiratory tract, on the skin and in the lower reproductive tract of women[2]. Infections with S.aureus are difficult to treat because of evolved resistance to antimicrobial drug. Resistance to methicillin primarily from acquisition of the *mecA* gene which alters penicillin-binding protein (PBP2a) with lower affinity to  $\beta$ -lactam[3]. Recently, new resistance gene *mecC* has also been identified from MRSA isolates from clinical specimens[4].

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a resistant organism that heavily contributes to hospital and community-acquired

infections worldwide[5,6]. The virulence and survival fitness of MRSA contributes to the increased mortality, length of hospital stay and health care costs are increased compare to MSSA[7]. MRSA once confined to hospitals, health care environments and patients frequenting such facilities, has now become a serious problem for communities due to its emergence as a major cause of the community associated infections[8]. In many American and European hospitals, the percentage of MRSA has ranged from 29% to 35% of all clinical isolates[9].

The increasing prevalence of Methicillin resistant among staphylococci is a global problem[10]. In India, the prevalence of MRSA ranges from 40%-70% among S. aureus isolates, with variations observed between hospital and community

Setting[5]. It spreads very easily from patient to patient, by the hands of health workers, through contaminated objects and by air. MRSA poses a major clinical problem in treatment. So, it is essential to know its antibiotic pattern.

**Aim:** To estimate prevalence of Methicillin resistant *Staphylococcus aureus* (MRSA) from various clinical specimens and to determine its antibiotic susceptibility pattern.

**Objectives**

- To isolate and identify *S. aureus* from various clinical samples.
- To detect Methicillin resistant *Staphylococcus aureus*.
- To estimate prevalence of Methicillin resistant *Staphylococcus aureus*(MRSA).
- To determine its antibiotic susceptibility pattern.

**Material and Method**

The ethical clearance for the study was obtained from the Institutional Ethics Committee prior to the study.

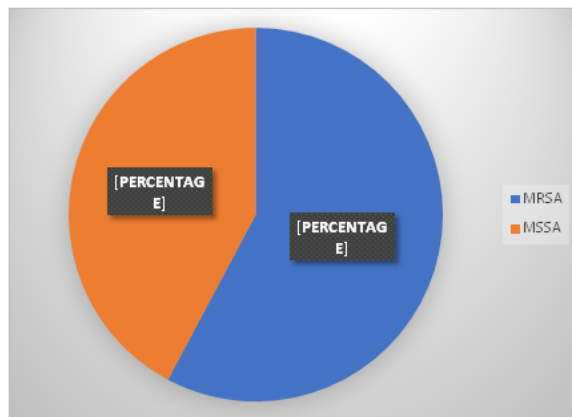
This study was carried out in the department of Microbiology at C. U. Shah Medical College and hospital, Surendranagar. Total 180 samples were included in the study during the period of 1<sup>st</sup> July 2021 to 30<sup>th</sup> June 2022. Clinical samples were processed for microbiological examination as per standard laboratory guidelines[11].

The samples were examined microscopically and isolation was done on MacConkey agar and Blood agar using four flame method. Identification of isolated organism was done by conventional method using biochemical reaction like catalase and coagulase.

Antimicrobial susceptibility testing and MRSA detection was done using VITEK-2 compact system. Data was analysed using Microsoft excel.

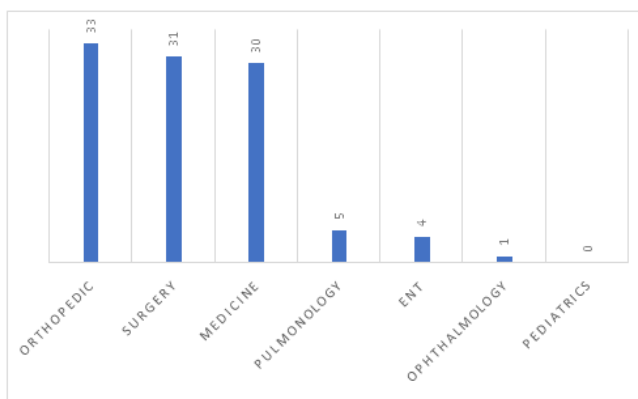
**Results**

Total 180 isolates of *S.aureus* were obtained from various clinical samples received in microbiology department during the period of July 2021 to June 2022.



**Figure 1: MRSA among S.aureus**

Out of total 180 *S.aureus* isolated from clinical samples, 104 (58%) were MRSA.



**Figure 2: Clinical department wise distribution of MRSA**

Figure 2 shows clinical department wise distribution of MRSA

Out of total 104 MRSA isolates, Maximum number of isolates were from orthopedics (n=33), followed by Surgery (n=31), Medicine (n=30).

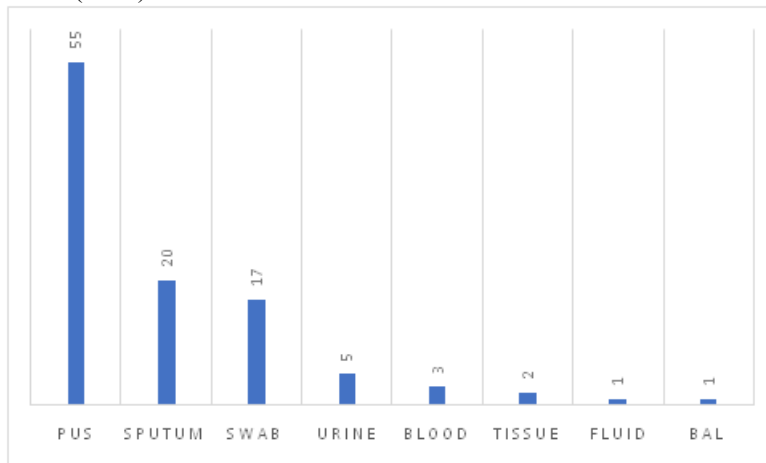


Figure 3: Sample wise distribution of MRSA

Figure 3 shows sample wise distribution of MRSA

Out of total 104 MRSA isolates, Maximum samples of Pus (n= 55), followed by Sputum (n=20) and Swab (n=17).

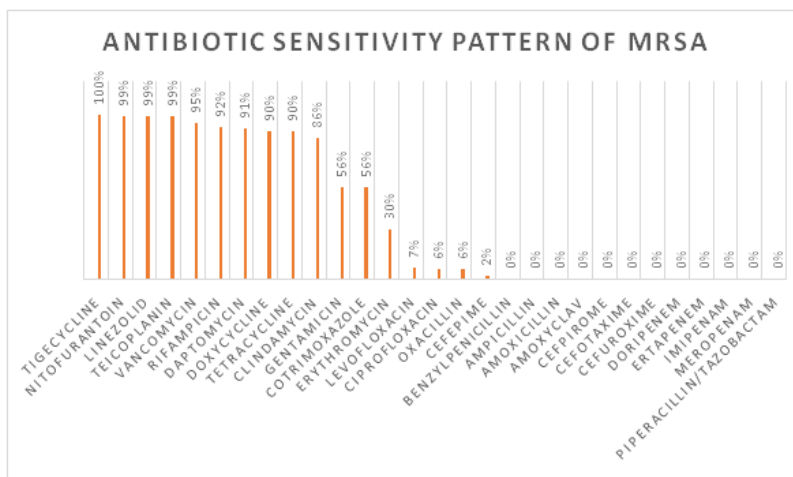


Figure 4: Antibiotic Sensitivity pattern of MRSA

**Figure 4 shows ABST pattern of MRSA**

The Sensitivity profile shows Tigecycline (100%), Nitrofurantoin, Linezolid and Teicoplanin (99%), Vancomycin (95%), Rifampicin (92%), Daptomycin (91%), Doxycycline and Tetracyclin (90%) and Clindamycin (86%). The lower sensitivity were found for Levofloxacin(7%),Ciprofloxacin and Oxacillin(6%) and cefepime (2%). Inducible clindamycin resistance was found to be 37.5% . Vancomycin sensitivity was 95%, rest 4% was VISA and 1% was VRSA.

**Discussion**

Most of the Staphylococcus isolates now showing multidrug resistance to commonly used antimicrobial agents. Emergence of methicillin resistant in S.aureus is major health problem in throughout the world. At present, many countries report that MRSA strains account for about 25-50%

of infectious S. aureus in hospital.[3] In India, the prevalence of MRSA ranges from 40%-70% among S. aureus isolates, with variations observed between hospital and community Setting.[5]

In present study, prevalence of MRSA was found 57.78% from various clinical samples. Whereas an earlier study done in same hospital had shown a 34.4%[12].

A similar study done by Fatemeh et al [13] had a slightly higher prevalence 63.20% was found. In contrast a study done by Kirti et al[14] had found lower prevalence 33.7%.

The prevalence of MRSA isolates in present study 57.78% might be due to prolonged antibiotic treatment, long hospital stay and also patient to patient transmission of MRSA via contaminated hands or contaminated equipments could be a possibility. The Sensitivity profile shows Tigecycline (100%), Nitrofurantoin, Linezolid and

Teicoplanin (99%), Vancomycin (95%), Rifampicin (92%), Daptomycin (91%), Doxycycline and Tetracyclin (90%) and Clindamycin (86%). The lower sensitivity were found for Levofloxacin (7%), Ciprofloxacin and Oxacillin(6%) and cefepime(2%).

A similar study done by Hare Krishna et al<sup>(9)</sup> had found Vancomycin (99.67%), Amikacin (58.47%), Tobramycin (46.51%) and Gentamicin (44.19%). The lower sensitivity were found for norfloxacin(10%), chloramphenicol(8%), Cotrimoxazole(4%) and Penicillin(3%). In present study, Inducible clindamycin resistant was found 37.50% from MRSA isolates. In present study, Vancomycin sensitivity was 95%, rest 4% was VISA and 1% was VRSA. This could be due to selective antibiotic pressure and overuse of these antibiotics. The lower resistance was noted to Tigecycline, Teicoplanin and Linezolid, the reason could be because it is kept reserved for the resistant strains.

### Conclusion

Out of 180 *S. aureus*, 104 were methicillin resistant *S. aureus* and 76 were methicillin sensitive *S. aureus*. The maximum number of samples were received from orthopedic department followed by Surgery and medicine. Most common sample received was pus followed by sputum and swab. MRSA were most sensitive to Tigecycline, Linezolid, Tecoplanin, Vancomycin and least sensitive to Oxacillin and cefepime. The knowledge of antibiotic sensitivity pattern of *S. aureus* will therefore be helpful to get control over the evolving resistance.

**Recommendations:** In order to control the rise in MRSA isolates, it is recommended that certain steps should be followed in the Hospital:

1. Infection control practices like hand hygiene and keeping cuts and wounds clean and covered until healed.
2. MRSA screening.
3. Formation of Antibiotic policy.

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