

# Oxacillin-susceptible mecA-positive *Staphylococcus aureus* (OS-MRSA) isolates: A major concern.

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## INTRODUCTION

- Staphylococcus aureus* is the most frequent cause of infections in the community and in healthcare settings.
- S. aureus with the mecA gene or a minimum inhibitory concentration (MIC) of oxacillin  $\geq 4 \mu\text{g/ml}$  has been associated with MRSA.
- An increasing number of cases of *Staphylococcus aureus* strains that are mecA and PBP2a positive but phenotypically susceptible to oxacillin are being reported worldwide.
- Oxacillin-susceptible mecA positive *Staphylococcus aureus* (OS-MRSA) poses a significant problem as its oxacillin susceptibility contributes to misidentification by traditional susceptibility testing and consequent treatment failure.

## AIM & OBJECTIVE

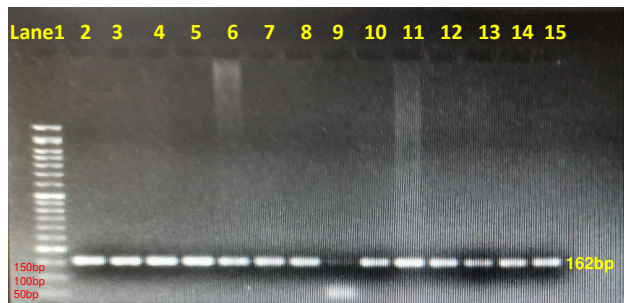
To determine the incidence of oxacillin-susceptible mec A positive *Staphylococcus aureus* (OS-MRSA).

## MATERIALS AND METHOD

A total of 395 MRSA were isolated from various clinical specimens and initial identification was done by using standard microbiological techniques at tertiary care hospital of Mysore, South India. All the isolates were subjected to Kirby-Bauer disc diffusion test using oxacillin  $1 \mu\text{g}$  disk. Oxacillin Minimum Inhibition Concentration (MIC) was determined by automated Vitek2 system. The mecA gene validated the MRSA status of each isolate by PCR amplification method.

## RESULTS

- PCR technique confirmed total of 156 (62.27%) isolates as MRSA out of 395 S. aureus isolates, collected from various clinical samples.(Figure 1)
- Disk diffusion method identified total of 21 isolates were identified as oxacillin sensitive and 15 isolates were oxacillin intermediately sensitive or borderline oxacillin resistant. (Table 1)
- Vitek2 system identified 6 Oxacillin sensitive-MRSA isolates (OS-MRSA) having an oxacillin MIC of  $\leq 2 \mu\text{g/ml}$ , among 156 (mecA-positive) MRSA isolates. (Table 1)
- Three of the mecA positive MRSA isolates were demonstrated as oxacillin sensitive by both disc diffusion and the VITEK2 method.



**Figure 1:** PCR Amplification of mecA gene for MRSA.

Lane 1: 50 bp ladder

Lane 2: Positive Control for mecA gene of MRSA isolates.

Lane 3-15: Positive for mecA gene of MRSA isolates respectively

Oxacillin screen (Disk diffusion method)			Oxacillin MIC (Vitek 2 system)			mecA positive by PCR method
Sensitive	Intermediate Sensitive	Resistant	Sensitive	Intermediate Sensitive	Resistant	
21 (13.46%)	15 (9.61%)	120 (76.92%)	6 (3.84%)	-	150 (96.15%)	156 (63.41%)

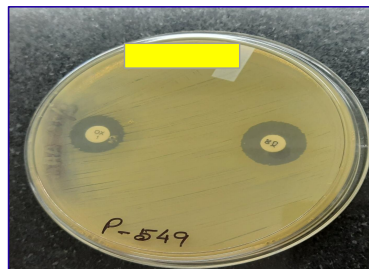
**Table 1:** Showing total number of isolates detected as mecA positive MRSA by PCR and their oxacillin susceptibility result.

## DISCUSSION

- Conventional phenotypic methods based on oxacillin susceptibility can easily misinterpret OS-MRSA as MSSA because OS-MRSA is an oxacillin-susceptible variant of MRSA. It has been noted some contradict in detecting some of the OS-MRSA in the current investigation.
- The present study confirmed total 156 isolates were mecA gene positive by PCR technique, of which 21 isolates were oxacillin sensitive which is similar to the study of Teresa Conceic et al., where 17.7% (n=29/164) were mecA positive OS-MRSA and Sahar Zeinalpour Ahrabi et al., where total 54.54% (36/60) of the S. aureus isolates were mecA positive and 6.25% of the students were OS-MRSA carriers.[1,2]
- In the study of K. Saeed et al., 63 % clinical isolates had oxacillin MIC of  $\leq 0.25 \mu\text{g/ml}$ , for 32.5 % of isolates had oxacillin MIC values between  $\leq 0.25 \mu\text{g/ml}$  to  $\leq 0.5 \mu\text{g/ml}$  and for the remaining of isolates 4.5 % had the MIC ranged between  $\leq 0.5 \mu\text{g/ml}$  and  $\leq 1.5 \mu\text{g/ml}$ . Isolate were tested positive for the mecA gene, confirming OS-MRSA.[3]
- In our study one OS-MRSA isolate showed oxacillin MIC  $2 \mu\text{g/ml}$  and also sensitive by oxacillin disk diffusion method, which is similar to the study of Alexandros Ikonomidis et al., where oxacillin MIC was  $< 2 \mu\text{g/ml}$  for two isolates which were mecA positive.[4] The result of Y. Hososaka et al., also found similar kind of result where out of 437 MRSA isolates, 57 isolates showed oxacillin MIC  $< 2 \mu\text{g/ml}$  of which and 6 strains were found to be mecA-positive by pulse field gel electrophoresis.[5]

## CONCLUSION

This study found isolates with lower oxacillin MICs but OS-MRSA prevalence was relatively lower. Routine laboratory identification of MRSA by using oxacillin disk may sometimes results in false negative MRSA, which may lead to treatment failure due to inaccurate antimicrobial usage. Hence it is important to use better methods to differentiate OS-MRSA from MRSA by combining phenotypic and genotypic methods.



**Figure 1:** Showing disk diffusion test resulting cefoxitin resistant but oxacillin sensitive zone.

## REFERENCES

1. Sahar Zeinalpour Ahrabi, Leila Rahbarnia, Alireza Dehdad, Behrooz Naghili, Mohammad Hossein Ghaffari Agdam and Atefeh Nazari. Incidence of Oxacillin-Susceptible mecA-Positive *Staphylococcus aureus* (OS-MRSA) Isolates and TSST-1 Virulence Factor Among High School Students in Tabriz, Northwest of Iran. Arch Clin Infect Dis. 2019; 14(4):e85341.
2. Teresa Conceic a.o.l., Ce'line Coelh1, Herminia de Lencastre1,2 and Marta Aires-de-Sousa3. Frequent occurrence of oxacillin-susceptible mecA-positive *Staphylococcus aureus* (OS-MRSA) strains in two African countries. J Antimicrob Chemother 2015; 70: 3200-3204.
3. K. Saeed, N. Ahmad, M. Dryden, N. Cortes, P. Marsh, A. Stijar, S. Wyllie, S. Bourne, J. Hemming, C. Jeppesen, S. Green. Oxacillin-susceptible methicillin-resistant *Staphylococcus aureus* OS-MRSA, a hidden resistant mechanism among clinically significant isolates in the Wessex region/UK. CLINICAL AND EPIDEMIOLOGICAL STUDY. 24 May 2014. DOI 10.1007/s15010-014-0641-1.
4. Alexandros Ikonomidis,1 George Michail,1 Afroditi Vasdeki,1 Maria Labrou,1 Vasilis Karavasili, Constantinos Stathopoulos,2 Antonios N. Maniatis,1 and Spyros Pourmaras1\*. In Vitro and In Vivo Evaluations of Oxacillin Efficiency against mecA-Positive Oxacillin-Susceptible *Staphylococcus aureus*. ANTIMICROBIAL AGENTS AND CHEMOTHERAPY. Nov. 2008. Vol. 52. p. 3905-3908.
5. Y. Hososaka, H. Hanaki · H. Endo · Y. Suzuki · T. Nakae · Keisuke Sunakawa Characterization of oxacillin-susceptible mecA-positive *Staphylococcus aureus*: a new type of MRSA. Japanese Society of Chemotherapy and The Japanese Association for Infectious Diseases 2007. 13:79-86. DOI 10.1007/s10156-006-0902-7.