

# Prevalence and Antimicrobial Susceptibility Pattern of Methicillin-Resistant *Staphylococcus Aureus* (Mrsa) Among Clinical Isolates

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## ABSTRACT

**Methicillin-Resistant *Staphylococcus aureus* (MRSA) is a major healthcare-associated pathogen responsible for significant morbidity, mortality, and antimicrobial resistance worldwide. The present study was conducted to determine the prevalence of MRSA among clinical isolates of *Staphylococcus aureus* and evaluate the effectiveness of routine laboratory diagnostic methods for its detection. A total of 100 clinical specimens were processed using standard microbiological techniques including culture, Gram staining, catalase testing, coagulase testing, and cefoxitin disk diffusion susceptibility testing. Among 50 confirmed *S. aureus* isolates, 22 (44%) were identified as MRSA. High resistance was observed against penicillin, erythromycin, and ciprofloxacin, whereas all MRSA isolates remained susceptible to vancomycin and linezolid. The findings emphasize the importance of early diagnosis, antimicrobial susceptibility testing, and infection control strategies for effective MRSA management.**

**Keywords: MRSA, *Staphylococcus aureus*, Antimicrobial Resistance, Cefoxitin, Vancomycin**

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## INTRODUCTION

*Staphylococcus aureus* is a Gram-positive coccus that colonizes the skin and mucosal surfaces of humans and is capable of causing a wide spectrum of infections ranging from superficial skin infections to severe invasive diseases such as pneumonia, bacteremia, osteomyelitis, endocarditis, and septicemia. The organism possesses numerous virulence factors that facilitate colonization, immune evasion, tissue invasion, and toxin-mediated damage. Because of its adaptability and pathogenic potential, *S. aureus* remains one of the most significant bacterial pathogens encountered in clinical practice.

The emergence of Methicillin-Resistant *Staphylococcus aureus* (MRSA) has become a major global public health concern. MRSA strains possess the *mecA* gene, which encodes an altered penicillin-binding protein (PBP2a) that confers resistance to beta-lactam antibiotics. The increasing prevalence of MRSA has complicated treatment strategies, resulting in prolonged hospitalization, increased healthcare costs, and higher mortality rates. Hospital-acquired MRSA and community-acquired MRSA continue to spread worldwide despite advances in antimicrobial therapy and infection control measures.

Accurate and rapid diagnosis of MRSA is essential for effective patient management and prevention of transmission. Conventional microbiological methods, particularly culture-based identification and cefoxitin disk diffusion testing, continue to play a critical role in routine clinical laboratories, especially in resource-limited settings. Therefore, the present study was undertaken to determine the prevalence of MRSA among clinical isolates of *Staphylococcus aureus* and evaluate its antimicrobial susceptibility profile.

## MATERIALS AND METHODS

The present investigation was conducted as a hospital-based cross-sectional observational study to determine the prevalence of Methicillin-Resistant *Staphylococcus aureus* among clinical isolates and assess routine diagnostic

methods used for its identification. Clinical specimens were collected from patients attending different departments of the hospital and processed in the Department of Microbiology using standard microbiological procedures.

A total of 100 clinical specimens, including pus, wound swabs, sputum, blood, urine, and nasal swabs, were included in the study. Samples were collected aseptically and transported immediately to the microbiology laboratory for processing. Isolation of *Staphylococcus aureus* was carried out using standard culture techniques on appropriate media. Identification was based on colony morphology, Gram staining characteristics, catalase positivity, and coagulase positivity.

Detection of MRSA was performed using the cefoxitin disk diffusion method according to Clinical and Laboratory Standards Institute (CLSI) guidelines. Antimicrobial susceptibility testing was carried out using the Kirby–Bauer disk diffusion technique on Mueller-Hinton agar. Antibiotics tested included penicillin, erythromycin, ciprofloxacin, gentamicin, clindamycin, cotrimoxazole, linezolid, and vancomycin. Results were interpreted according to CLSI recommendations. Quality control measures were maintained throughout the study to ensure reliability and reproducibility of results.

## RESULTS AND DISCUSSION

### 3.1 Distribution of Clinical Specimens

A total of 100 clinical specimens were collected and processed during the study period. The specimens included pus, wound swabs, sputum, blood, urine, and nasal swabs. Pus samples represented the largest proportion of specimens received, reflecting the frequent involvement of *Staphylococcus aureus* in wound and soft tissue infections.

**Table 1. Distribution of Clinical Specimens**

Sample Type	Number	Percentage (%)
Pus	40	40
Wound Swab	25	25
Sputum	15	15
Blood	10	10
Urine	5	5
Nasal Swab	5	5
Total	100	100

### 3.2 Isolation of *Staphylococcus aureus*

Among the 100 clinical specimens processed, 50 isolates were confirmed as *Staphylococcus aureus* through microbiological and biochemical characterization, indicating an isolation rate of 50%.

**Table 2. Isolation of *Staphylococcus aureus***

Result	Number	Percentage (%)
Positive for <i>S. aureus</i>	50	50
Negative	50	50
Total	100	100

### 3.3 Prevalence of MRSA

Among the confirmed *Staphylococcus aureus* isolates, 22 isolates were identified as MRSA using cefoxitin disk diffusion testing. The prevalence of MRSA was 44%, whereas methicillin-sensitive *Staphylococcus aureus* (MSSA) accounted for 56% of isolates.

**Table 3. Prevalence of MRSA**

Isolate Type	Number	Percentage (%)
MRSA	22	44
MSSA	28	56
Total	50	100

### 3.4 Gender-wise Distribution of MRSA Cases

Gender-wise analysis demonstrated that male patients accounted for the majority of MRSA cases.

**Table 4. Gender-wise Distribution of MRSA Cases**

Gender	Number	Percentage (%)
Male	14	63.64
Female	8	36.36
Total	22	100

### 3.5 Age-wise Distribution of MRSA Cases

The highest prevalence of MRSA was observed among patients aged 41–60 years, followed by those aged 21–40 years.

**Table 5. Age-wise Distribution of MRSA Cases**

Age Group (Years)	Number	Percentage (%)
0–20	2	9.09
21–40	7	31.82
41–60	9	40.91
>60	4	18.18
Total	22	100

### 3.6 Antibiotic Susceptibility Pattern of MRSA Isolates

Antimicrobial susceptibility testing demonstrated complete resistance to penicillin among all MRSA isolates. High resistance rates were also observed against erythromycin and ciprofloxacin. However, all isolates remained susceptible to linezolid and vancomycin.

**Table 6. Antibiotic Susceptibility Pattern of MRSA Isolates**

Antibiotic	Sensitive (%)	Resistant (%)
Penicillin	0	100
Erythromycin	31.8	68.2
Ciprofloxacin	36.4	63.6
Gentamicin	54.5	45.5
Clindamycin	63.6	36.4
Cotrimoxazole	59.1	40.9
Linezolid	100	0
Vancomycin	100	0

The findings highlight the growing challenge of multidrug resistance among MRSA isolates. The high prevalence of methicillin resistance and resistance to commonly prescribed antibiotics emphasizes the necessity of routine antimicrobial susceptibility testing, surveillance programs, antimicrobial stewardship, and strict infection control measures. The study further confirms that cefoxitin disk diffusion remains a reliable and cost-effective method for MRSA detection in routine clinical laboratories.

## CONCLUSION

The present study demonstrated that MRSA continues to represent a significant clinical and public health concern. Among 100 clinical specimens analyzed, 50 isolates were identified as *Staphylococcus aureus*, of which 44% were confirmed as MRSA. The study revealed a substantial burden of methicillin resistance among clinical isolates and highlighted the predominance of MRSA among male patients and individuals aged 41–60 years. Antimicrobial susceptibility testing showed complete resistance to penicillin and high resistance to erythromycin and ciprofloxacin, while vancomycin and linezolid remained highly effective against all isolates.

The findings indicate that routine microbiological methods, particularly culture combined with cefoxitin disk diffusion testing, provide reliable and cost-effective detection of MRSA. Continuous surveillance, antimicrobial stewardship programs, rational antibiotic prescribing, and strict infection control measures are essential to reduce the spread of resistant strains and improve clinical outcomes.

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