Section: Microbiology

Original Research Article

# PREVALENCE AND ANTIBIOTIC RESISTANCE PATTERNS OF STAPHYLOCOCCUS AUREUS ISOLATED FROM CLINICAL SAMPLES IN A TERTIARY CARE HOSPITAL

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## ABSTRACT

**Background:** Staphylococcus aureus is an important cause of community-acquired and hospital-acquired infections, particularly skin, soft tissue, wound, bloodstream and device-associated infections. Methicillin-resistant S. aureus (MRSA) is a major therapeutic challenge because of its resistance to beta-lactam antibiotics and frequent multidrug resistance. Indian data show a continuing burden of MRSA, with multicentric and surveillance studies reporting substantial MRSA prevalence in tertiary care settings. **Materials and Methods:** This hospital-based observational cross-sectional study was conducted in the Department of Microbiology of a tertiary care hospital over 10 months. A total of 100 non-duplicate S. aureus isolates obtained from various clinical samples were included. Isolates were identified by standard microbiological methods, and antimicrobial susceptibility testing was performed by the Kirby–Bauer disc diffusion method. MRSA was detected using cefoxitin disc diffusion. Data were analysed using frequencies, percentages and Chi-square test. **Results:** The highest number of isolates was observed in the 41–60 years age group (38%), with male predominance (62%). Pus was the most common specimen (42%), followed by wound swab (20%) and blood (14%). MRSA accounted for 42% of isolates, while MSSA accounted for 58%. High resistance was observed against penicillin (92%), ciprofloxacin (62%) and erythromycin (58%). All isolates were sensitive to vancomycin and linezolid. No significant association was found between MRSA and gender, age or specimen type. **Conclusion:** The study demonstrated a considerable burden of MRSA among clinical S. aureus isolates, with high resistance to commonly used antibiotics. Routine culture, MRSA screening, local antibiogram preparation and antimicrobial stewardship are essential for effective management.

## INTRODUCTION

Staphylococcus aureus is one of the most important human bacterial pathogens and is responsible for a wide range of community-acquired and hospital-acquired infections. It commonly causes skin and soft tissue infections, wound infections, abscesses, pneumonia, bloodstream infections, osteomyelitis, endocarditis, device-associated infections and surgical site infections. The organism is also a frequent colonizer of the anterior nares and skin, allowing asymptomatic carriage and subsequent transmission among patients, healthcare workers and the hospital environment.[1,2] According to the Centers for Disease Control and Prevention, nearly one-third of people may carry S. aureus in the nose, and methicillin-resistant S. aureus (MRSA) can cause serious clinical conditions such as bloodstream infection, pneumonia, surgical site infection, sepsis and death, particularly in healthcare settings.[1,2]

Antimicrobial resistance has made the management of S. aureus infections increasingly difficult. MRSA is resistant to β-lactam antibiotics and is frequently associated with multidrug resistance, resulting in limited therapeutic options, prolonged hospital stay, increased cost of treatment and higher morbidity and mortality. The World Health Organization included Staphylococcus aureus among important antibiotic-resistant bacterial pathogens in the WHO Bacterial Priority Pathogens List 2024, emphasizing its public health relevance and the need for region-specific


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surveillance and control strategies.[3] Similarly, antimicrobial resistance is recognized as an urgent global public health threat, with resistant infections contributing substantially to mortality and healthcare burden worldwide.[4]

The prevalence of MRSA varies widely across countries, regions, hospitals, patient groups and clinical sample types. In India, MRSA remains a major concern in tertiary care hospitals. A multicentric Indian study by Joshi et al. reported an overall MRSA prevalence of 41% among 26,310 S. aureus isolates, with higher isolation among inpatients and intensive care settings.[5] Pai et al. from Mangalore, South India, found that 29.1% of S. aureus isolates were methicillin resistant and that MRSA isolates showed greater resistance to multiple antibiotics compared with methicillin-sensitive S. aureus (MSSA).[6] A systematic review and meta-analysis from India also reported a high pooled prevalence of MRSA, indicating that resistant S. aureus infection continues to be a significant clinical and microbiological problem in the country.[7]

Recent Indian surveillance data further highlights the growing importance of MRSA. The Indian Council of Medical Research Antimicrobial Resistance Surveillance Network reported that MRSA rates increased steadily over eight years of surveillance, from about 33% in 2017 to nearly 53% in 2024, while vancomycin and teicoplanin retained excellent in-vitro activity against MRSA isolates.[8] This pattern indicates that although glycopeptides and newer anti-MRSA agents remain useful, irrational or excessive use of these reserve antibiotics may increase the risk of reduced susceptibility in the future. Therefore, regular monitoring of antimicrobial susceptibility patterns is essential for guiding empirical therapy and preserving the efficacy of available drugs.

Clinical sample-based studies show that S. aureus is commonly isolated from pus, wound swabs, blood, respiratory samples, urine and other body fluids. In a tertiary care hospital study from Nepal, S. aureus was recovered from 6.71% of clinical samples, while MRSA accounted for 26.4% of isolates; pus was the major source of MRSA, and high resistance was observed against penicillin, cloxacillin, ciprofloxacin, erythromycin, cephalexin, cotrimoxazole and clindamycin, whereas no vancomycin resistance was detected. Such findings demonstrate that resistance patterns are not uniform and may differ according to geography, antibiotic usage practices, infection control measures and patient load.

Tertiary care hospitals are especially vulnerable to the spread of resistant S. aureus because they manage critically ill patients, post-operative cases, patients with invasive devices, long-duration admissions and frequent antibiotic exposure. Knowledge of the local prevalence and resistance pattern of S. aureus is therefore essential for clinicians, microbiologists and infection control teams. Local antibiogram-based evidence helps in selecting appropriate empirical antibiotics, modifying treatment after culture reports, reducing unnecessary broad-spectrum antibiotic use, and strengthening hospital antibiotic stewardship policies.

Hence, the present study titled “Prevalence and Antibiotic Resistance Patterns of Staphylococcus aureus Isolated from Clinical Samples in a Tertiary Care Hospital” is undertaken to estimate the burden of S. aureus among various clinical samples and to determine its antimicrobial susceptibility profile. The findings of this study will help generate hospital-specific data for empirical treatment guidelines, infection control practices and antimicrobial stewardship interventions.

## MATERIALS AND METHODS

This hospital-based, observational cross-sectional study was conducted in the Department of Microbiology of a tertiary care hospital. The study was include all clinically suspected bacterial infection cases from whom samples are received for aerobic bacterial culture and antimicrobial susceptibility testing. The study design is suitable for estimating the prevalence of Staphylococcus aureus among clinical isolates and for determining its antibiotic resistance pattern from routine diagnostic samples.

The study was carried out over a period of 10 months. All eligible clinical samples received during the study period will be processed as per standard microbiological procedures.

The study population was include patients of all age groups and both sexes attending outpatient departments, inpatient wards, intensive care units and surgical units of the tertiary care hospital, whose clinical samples are sent to the microbiology laboratory for culture and sensitivity testing.

**Inclusion criteria**

All non-duplicate clinical samples showing growth of Staphylococcus aureus was included in the study. Samples may include pus, wound swabs, blood, urine, sputum, endotracheal aspirate, body fluids and other relevant clinical specimens.

**Exclusion criteria**

Repeated isolates from the same patient and same infection episode were excluded to avoid duplication. Poorly collected, leaked, dried, improperly labelled or insufficient samples were also excluded. Samples showing mixed growth suggestive of contamination may be excluded unless clinically significant and properly correlated.

**Sample size**

All eligible Staphylococcus aureus isolates obtained during the study period were included. If a fixed sample size is required, it may be calculated using the formula: $n = Z^2pq / d^2$

Considering an expected MRSA prevalence of 41% as reported in a multicentric Indian study by Joshi et


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al,[5] with 10% absolute precision and 95% confidence level: Therefore, a minimum sample size of approximately 93 Staphylococcus aureus isolates may be considered. To improve reliability, the sample size may be rounded to 100 isolates.

**Collection and transport of samples**

Clinical samples were collected aseptically from the suspected site of infection using sterile containers, sterile swabs or appropriate collection systems. Pus and wound swabs were collected before starting antibiotics whenever possible. Blood samples were collected under strict aseptic precautions and inoculated into blood culture bottles. Urine samples were collected as clean-catch midstream urine in sterile containers. Respiratory samples such as sputum and endotracheal aspirates will be collected in sterile wide-mouthed containers. All samples were transported immediately to the microbiology laboratory and processed without delay.

**Processing of clinical samples**

All samples were processed by standard aerobic culture techniques. Specimens will be inoculated on suitable culture media such as blood agar, MacConkey agar and nutrient agar, depending on sample type. Plates were incubated aerobically at 35–37°C for 18–24 hours. Blood culture bottles were incubated and subcultured according to the laboratory protocol. Growth suggestive of Staphylococcus aureus was further identified by colony morphology, Gram staining and biochemical tests.

**Identification of Staphylococcus aureus**

Presumptive identification of Staphylococcus aureus was done based on the presence of golden-yellow or cream-coloured colonies on blood agar, beta-haemolysis in some isolates and Gram-positive cocci arranged in clusters on Gram staining. Confirmation was done using standard biochemical tests, including catalase test, slide and tube coagulase test, DNase test and mannitol fermentation test. Isolates positive for catalase and coagulase were identified as Staphylococcus aureus.

Antimicrobial susceptibility testing

Antimicrobial susceptibility testing was performed by the Kirby–Bauer disc diffusion method on Mueller–Hinton agar. The bacterial suspension were prepared from a pure colony and adjusted to 0.5 McFarland turbidity standard. A sterile swab was used to inoculate the suspension uniformly over the surface of Mueller–Hinton agar. Antibiotic discs were then placed aseptically on the inoculated plate, and the plates were incubated at 35–37°C for 16–18 hours. Zone diameters were measured in millimetres and interpreted as sensitive, intermediate or resistant according to the latest Clinical and Laboratory Standards Institute guidelines.[9,10]

The antibiotic discs to be tested may include penicillin, erythromycin, clindamycin, ciprofloxacin, gentamicin, amikacin, cotrimoxazole, tetracycline, doxycycline, linezolid and other antibiotics according to the hospital antibiotic policy. For serious infections or as per laboratory policy, vancomycin susceptibility should be tested by MIC-based methods because disk diffusion is not recommended for detecting reduced vancomycin susceptibility in S. aureus.[11]

Detection of methicillin-resistant Staphylococcus aureus

Methicillin resistance was detected using the cefoxitin disc diffusion method. A 30 µg cefoxitin disc was placed on Mueller–Hinton agar inoculated with a 0.5 McFarland suspension of the test isolate. After incubation at 35–37°C for 16–18 hours, the zone diameter was measured and interpreted as per CLSI guidelines. Cefoxitin disc diffusion is recommended for routine detection of MRSA and acts as a surrogate marker for mecA-mediated methicillin resistance.[10,12] CDC also recommends cefoxitin disk diffusion and oxacillin/cefoxitin-based methods for phenotypic detection of MRSA, with CLSI M100 used for inoculation and interpretive criteria.[12] Isolates resistant to cefoxitin will be reported as MRSA, while cefoxitin-sensitive isolates will be considered methicillin-sensitive Staphylococcus aureus.

**Detection of inducible clindamycin resistance**

Inducible clindamycin resistance was detected by the D-test among erythromycin-resistant and clindamycin-sensitive S. aureus isolates. Erythromycin and clindamycin discs were placed 15–20 mm apart on Mueller–Hinton agar. After incubation, flattening of the clindamycin zone adjacent to the erythromycin disc, producing a D-shaped zone, were interpreted as positive for inducible clindamycin resistance.

**Quality control**

Quality control was maintained by using standard reference strains. Staphylococcus aureus ATCC 25923 may be used for quality control of disc diffusion testing, and Staphylococcus aureus ATCC 43300 may be used as a positive control for MRSA detection. Culture media, antibiotic discs and biochemical reagents were checked regularly for sterility, performance and expiry dates.

**Data collection**

Relevant demographic and clinical details such as age, sex, inpatient or outpatient status, ward or ICU admission, type of clinical sample and site of infection was recorded in a predesigned proforma. Laboratory details such as type of organism isolated, methicillin resistance status and antibiotic susceptibility profile will also be recorded.

**Statistical Analysis**

Data were entered in Microsoft Excel and analysed using SPSS, Epi Info or any suitable statistical software. Categorical variables were expressed as frequency and percentage. Antibiotic resistance were expressed as the percentage of isolates resistant to each antibiotic. Association between MRSA status and variables such as age group, sex, sample type, inpatient/outpatient status and ward/ICU admission were assessed using the Chi-square test or Fisher's exact test wherever


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applicable. A p-value <0.05 will be considered statistically significant.

## RESULTS

**Table 1: Distribution of demographic and specimen distribution among study population**

| Parameters | Frequency | Percentage |
|---|---|---|
| Age | | |
| <20 Years | 12 | 12 |
| 21–40 Years | 34 | 34 |
| 41–60 Years | 38 | 38 |
| >60 Years | 16 | 16 |
| Gender | | |
| Male | 62 | 62 |
| Female | 38 | 38 |
| Location | | |
| Surgical wards | 30 | 30 |
| Medicine wards | 25 | 25 |
| ICU | 20 | 20 |
| Outpatient department | 15 | 15 |
| Obstetrics & Gynaecology | 10 | 10 |
| Specimen | | |
| Pus | 42 | 42 |
| Wound swab | 20 | 20 |
| Blood | 14 | 14 |
| Sputum | 10 | 10 |
| Urine | 8 | 8 |
| Body fluids | 6 | 6 |

[Table 1] shows the demographic profile, hospital location and specimen-wise distribution of the study population. Among 100 Staphylococcus aureus isolates, the highest proportion was observed in the 41–60 years age group, 38%, followed by 21–40 years, 34%. This indicates that infections due to S. aureus were more common among adult and middle-aged patients. Male patients contributed 62% of isolates, while females contributed 38%, showing male predominance in the present study. According to hospital location, the highest number of isolates was from surgical wards, 30%, followed by medicine wards, 25%, and ICU, 20%. This suggests that S. aureus infection was more frequent among admitted patients, especially surgical and critically ill patients. Specimen-wise, pus was the most common source, 42%, followed by wound swabs, 20%, blood, 14%, sputum, 10%, urine, 8%, and body fluids, 6%. This finding supports the known role of S. aureus as an important cause of skin, soft tissue and wound infections. In a multicentric Indian study by Joshi et al., most S. aureus isolates were also obtained from skin and soft tissue infections, followed by bloodstream and respiratory infections, which is comparable with the present findings.

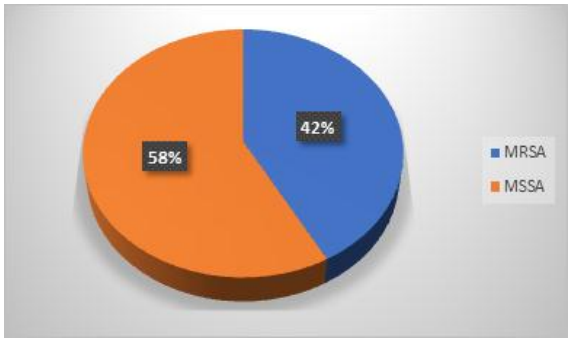


**Figure 1: Prevalence of MRSA and MSSA**

[Figure 1] represents the prevalence of MRSA and MSSA among the 100 S. aureus isolates. In the present study, 42% isolates were methicillin-resistant Staphylococcus aureus and 58% were methicillin-sensitive Staphylococcus aureus. This indicates that nearly two-fifths of the S. aureus isolates showed methicillin resistance, which is clinically important because MRSA is usually resistant to beta-lactam antibiotics and may also show resistance to other commonly used antibiotics. The MRSA prevalence in the present study is very close to the 41% overall MRSA prevalence reported by Joshi et al. in a multicentric Indian study, supporting that MRSA remains a major problem in tertiary care hospitals in India.

[Table 2] presents the antibiotic susceptibility pattern of Staphylococcus aureus isolates. The highest resistance was observed against penicillin, 92%, followed by ciprofloxacin, 62%, erythromycin, 58%, clindamycin, 40%, cotrimoxazole, 36%, gentamicin, 28%, doxycycline, 22%, and amikacin, 18%. Cefoxitin resistance was seen in 42% of isolates, which corresponds to the MRSA rate in the study. The high resistance to penicillin suggests widespread beta-lactamase-mediated resistance among S. aureus isolates, while high resistance to ciprofloxacin and erythromycin indicates reduced usefulness of these antibiotics for empirical therapy. Better sensitivity was observed for amikacin, doxycycline, gentamicin and cotrimoxazole. All isolates were sensitive to linezolid and vancomycin, suggesting that these drugs remain effective reserve options. However, vancomycin susceptibility in S. aureus should preferably be confirmed by MIC-based methods, because CDC states that disk diffusion is not


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recommended for vancomycin susceptibility testing in S. aureus.

**Table 2: Antibiotic susceptibility pattern of Staphylococcus aureus**

| Antibiotic | Sensitive n (%) | Resistant n (%) |
|---|---|---|
| Penicillin | 8 (8.0) | 92 (92.0) |
| Cefoxitin | 58 (58.0) | 42 (42.0) |
| Erythromycin | 42 (42.0) | 58 (58.0) |
| Clindamycin | 60 (60.0) | 40 (40.0) |
| Ciprofloxacin | 38 (38.0) | 62 (62.0) |
| Gentamicin | 72 (72.0) | 28 (28.0) |
| Amikacin | 82 (82.0) | 18 (18.0) |
| Cotrimoxazole | 64 (64.0) | 36 (36.0) |
| Doxycycline | 78 (78.0) | 22 (22.0) |
| Linezolid | 100 (100.0) | 0 (0.0) |
| Vancomycin* | 100 (100.0) | 0 (0.0) |

**Table 3: Distribution of MRSA according to specimen type**

| Specimen | MRSA (n) | MSSA (n) |
|---|---|---|
| Pus | 20 | 22 |
| Wound swab | 9 | 11 |
| Blood | 6 | 8 |
| Sputum | 4 | 6 |
| Urine | 2 | 6 |
| Body fluids | 1 | 5 |
| Total | 42 | 58 |

[Table 3] shows the distribution of MRSA and MSSA according to specimen type. Among 42 MRSA isolates, the maximum number was isolated from pus samples, 20 cases, followed by wound swabs, 9 cases, blood, 6 cases, sputum, 4 cases, urine, 2 cases, and body fluids, 1 case. Similarly, MSSA was also most commonly isolated from pus and wound swabs. This pattern indicates that both MRSA and MSSA were predominantly associated with wound-related and suppurative infections. The finding is consistent with other Indian data, where MRSA isolates are commonly recovered from pus and wound samples. Lohan et al. also reported that most MRSA isolates in their rural medical college study were obtained from pus samples.

**Table 4: Association between Gender, Age, and specimen with MRSA**

| Parameter | MRSA | MSSA | Chi-square | p-value |
|---|---|---|---|---|
| Gender | | | | |
| Male | 28 | 34 | 0.66 | 0.42 |
| Female | 14 | 24 | | |
| Age | | | | |
| <20 | 3 | 9 | 2.48 | 0.48 |
| 21–40 | 13 | 21 | | |
| 41–60 | 19 | 19 | | |
| >60 | 7 | 9 | | |
| Specimen | | | | |
| Pus | 20 | 22 | 3.91 | 0.56 |
| Wound swab | 9 | 11 | | |
| Blood | 6 | 8 | | |
| Sputum | 4 | 6 | | |
| Urine | 2 | 6 | | |
| Body fluids | 1 | 5 | | |

[Table 4] shows the association of gender, age and specimen type with MRSA status. Among males, 28 isolates were MRSA and 34 were MSSA, while among females, 14 were MRSA and 24 were MSSA. The association between gender and MRSA was not statistically significant, with chi-square value 0.66 and p-value 0.42. Age-wise, MRSA was highest in the 41–60 years age group, 19 cases, followed by 21–40 years, 13 cases. However, the association between age group and MRSA was also not statistically significant, with chi-square value 2.48 and p-value 0.48. Similarly, specimen-wise MRSA was most common in pus samples, but the association between specimen type and MRSA was not statistically significant, with chi-square value 3.91 and p-value 0.56. Therefore, although MRSA was numerically higher among males, middle-aged patients and pus samples, these differences may be due to chance variation in this sample.

## DISCUSSION

Staphylococcus aureus remains one of the most important bacterial pathogens isolated from clinical samples in tertiary care hospitals because of its ability to cause wound infections, skin and soft tissue infections, bloodstream infections, respiratory infections and device-associated infections. In the


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present study, 100 S. aureus isolates were analysed for demographic distribution, specimen-wise distribution, MRSA prevalence and antibiotic resistance pattern. The highest number of isolates was observed in the 41–60 years age group, 38%, followed by 21–40 years, 34%. Male patients contributed 62% of isolates, while females contributed 38%. Surgical wards contributed the maximum number of isolates, 30%, followed by medicine wards, 25%, and ICU, 20%. This indicates that S. aureus infection was more common among adult hospitalized patients, especially those admitted in surgical wards and critical care areas.

In the present study, pus was the most common clinical specimen, accounting for 42% of isolates, followed by wound swab, 20%, blood, 14%, sputum, 10%, urine, 8%, and body fluids, 6%. This finding supports the well-known role of S. aureus as a major cause of suppurative, wound-related and soft tissue infections. Similar findings were reported by the Indian Council of Medical Research Antimicrobial Resistance Surveillance Network, where most S. aureus isolates were obtained from superficial infections, followed by bloodstream and deep infections.[13] Lohan et al. also reported that most MRSA isolates in their North Indian rural medical college study were obtained from pus samples.[14] Thus, the predominance of pus and wound samples in the present study is consistent with Indian hospital-based observations.

The prevalence of MRSA in the present study was 42%, while MSSA accounted for 58% of isolates. This show that nearly two-fifths of S. aureus isolates was methicillin resistant, which is clinically important because MRSA strains are resistant to most beta-lactam antibiotics and are frequently associated with multidrug resistance. The present MRSA prevalence is very close to the multicentric Indian study by Joshi et al., who reported an overall MRSA prevalence of 41% among S. aureus isolates collected from 15 tertiary care centres across India [5]. Similarly, Arora et al. reported MRSA prevalence of 46% in a tertiary care hospital, which is slightly higher than the present study.[15] However, Pai et al. from Mangalore reported a lower MRSA prevalence of 29.1%,[16] while Lohan et al. reported an overall MRSA prevalence of 33.7% over three years.[14] A systematic review and meta-analysis by Patil et al. estimated the pooled MRSA prevalence in India as 37% during 2015–2020.[17] Therefore, the MRSA prevalence of 42% in the present study is within the reported Indian range and indicates a moderately high burden of MRSA in the hospital setting.

The antibiotic susceptibility pattern in the present study showed very high resistance to penicillin, 92%, followed by ciprofloxacin, 62%, erythromycin, 58%, clindamycin, 40%, cotrimoxazole, 36%, gentamicin, 28%, doxycycline, 22%, and amikacin, 18%. Cefoxitin resistance was observed in 42% of isolates, corresponding to MRSA prevalence. All isolates were susceptible to linezolid and vancomycin. The very high resistance to penicillin is expected because beta-lactamase production is common among S. aureus isolates. Similar high resistance to commonly used antibiotics has been reported in Indian studies. Pai et al. observed that MRSA isolates showed greater resistance to multiple antibiotics compared with MSSA, and 40–50% of MRSA isolates were resistant to erythromycin, gentamicin and chloramphenicol.[16] The present study also showed considerable resistance to erythromycin and ciprofloxacin, suggesting that these drugs may not be reliable choices for empirical therapy without culture and sensitivity testing.

In the present study, ciprofloxacin resistance was 62%, indicating poor activity of fluoroquinolones against S. aureus. This finding is comparable with recent Indian surveillance data showing that susceptibility to ciprofloxacin and other commonly used antibiotics is lower in MRSA than MSSA.[13] Das et al. from West Bengal also reported poor ciprofloxacin activity against both healthcare-associated and community-associated MRSA isolates, especially in healthcare-associated MRSA.[18] The high resistance to ciprofloxacin in the present study may be due to frequent empirical use of fluoroquinolones in hospital and community practice. Therefore, ciprofloxacin should be used cautiously and preferably only after susceptibility confirmation.

The present study showed better susceptibility to amikacin, 82%, doxycycline, 78%, gentamicin, 72%, and cotrimoxazole, 64%. These findings suggest that some older and relatively inexpensive antibiotics may still have useful activity against selected S. aureus infections, depending on susceptibility reports. However, resistance was still present, particularly among MRSA isolates, and therefore empirical use should be guided by local antibiogram data. ICMR surveillance also emphasized that susceptibility to erythromycin, clindamycin, ciprofloxacin and cotrimoxazole is generally more evident in MSSA than MRSA, which supports the need to differentiate MRSA from MSSA before deciding therapy.[13]

In the present study, all S. aureus isolates were susceptible to vancomycin and linezolid. This finding is similar to several Indian studies. Das et al. reported 100% susceptibility of MRSA isolates to vancomycin, linezolid and teicoplanin in a tertiary care hospital in West Bengal.[18] Trivedi et al. also reported that MRSA isolates were most sensitive to vancomycin, followed by teicoplanin and linezolid.[19] The ICMR 2024 report also documented that vancomycin and teicoplanin showed excellent in-vitro activity, nearly 100%, against MRSA isolates, while linezolid resistance was rare.[13] However, these reserve drugs should not be used indiscriminately. Vancomycin should preferably be monitored by MIC testing in serious MRSA infections, especially bacteremia, because reduced susceptibility or heteroresistant


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vancomycin-intermediate S. aureus may lead to treatment failure.[13]

Specimen-wise distribution of MRSA in the present study showed that pus was the commonest source, with 20 MRSA isolates, followed by wound swab, 9, blood, 6, sputum, 4, urine, 2, and body fluids, 1. This observation again confirms that MRSA is strongly associated with wound and suppurative infections. Similar findings were reported by Lohan et al., where most MRSA isolates were obtained from pus samples.[14]

Patil et al. also reported that among 100 MRSA isolates, pus was the most common clinical specimen, accounting for 41% of isolates.[9] The high recovery of MRSA from pus and wound swabs in the present study highlights the need for strict wound care practices, hand hygiene, aseptic dressing techniques and screening of high-risk surgical patients.

The association between gender and MRSA was not statistically significant in the present study. MRSA was isolated from 28 males and 14 females, with chi-square value 0.66 and p-value 0.42. Similarly, age-wise MRSA was highest in the 41–60 years age group, but the association was not statistically significant, with chi-square value 2.48 and p-value 0.48. Specimen-wise, MRSA was most common in pus samples, but the association between specimen type and MRSA was also not statistically significant, with chi-square value 3.91 and p-value 0.56. These findings suggest that although MRSA was numerically higher among males, middle-aged patients and pus samples, the differences were not strong enough to prove a statistically significant association. The lack of significance may be due to the relatively small sample size of 100 isolates.

## CONCLUSION

The present study showed that Staphylococcus aureus was most commonly isolated from pus and wound-related specimens, indicating its important role in skin, soft tissue and surgical site infections. The prevalence of MRSA was 42%, which is close to the multicentric the higher occurrence of isolates from surgical wards and ICU highlights the need for strict infection control practices, especially in high-risk hospital areas.

The study also demonstrated high resistance to penicillin, ciprofloxacin and erythromycin, while all isolates were susceptible to vancomycin and linezolid. This finding supports recent Indian surveillance observations that anti-MRSA drugs such as vancomycin, teicoplanin and linezolid continue to show excellent activity against MRSA isolates. However, these reserve antibiotics should be used judiciously to prevent emergence of further resistance. Routine culture and sensitivity testing, MRSA screening by cefoxitin disc diffusion, preparation of a local antibiogram, rational antibiotic use and strengthening of antimicrobial stewardship are essential for effective management and control of S. aureus infections in tertiary care hospitals.

## REFERENCES


1. Centers for Disease Control and Prevention. Methicillin-resistant *Staphylococcus aureus* (MRSA) basics [Internet]. Atlanta: CDC; 2025 Jun 26 [cited 2026 Jul 6]. Available from: https://www.cdc.gov/mrsa/about/index.html.
2. Centers for Disease Control and Prevention. Clinical overview of methicillin-resistant Staphylococcus aureus (MRSA) in healthcare settings [Internet]. Atlanta: CDC; 2025 Jun 27 [cited 2026 Jul 6]. Available from: https://www.cdc.gov/mrsa/hcp/clinical-overview/index.html
3. World Health Organization. WHO bacterial priority pathogens list, 2024: bacterial pathogens of public health importance to guide research, development and strategies to prevent and control antimicrobial resistance [Internet]. Geneva: World Health Organization; 2024 May 17 [cited 2026 Jul 6]. Available from: https://www.who.int/publications/i/item/9789240093461
4. Indian Council of Medical Research. Antimicrobial Resistance Research and Surveillance Network: annual report 2024 [Internet]. New Delhi: Indian Council of Medical Research; 2024 [cited 2026 Jul 6]. Available from: https://www.icmr.gov.in/icmrobject/uploads/Report/1763981012_icmramrsnannualreport2024.pdf
5. Joshi S, Ray P, Manchanda V, Bajaj J, Chitnis DS, Gautam V, et al. Methicillin resistant Staphylococcus aureus (MRSA) in India: prevalence and susceptibility pattern. Indian J Med Res. 2013;137(2):363-9. PMID: 23563381.
6. Pai V, Rao VI, Rao SP. Prevalence and antimicrobial susceptibility pattern of methicillin-resistant Staphylococcus aureus isolates at a tertiary care hospital in Mangalore, South India. J Lab Physicians. 2010;2(2):82-4. doi:10.4103/0974-2727.72155.
7. Patil SS, Suresh KP, Jayaramu GM, Gopal N, Roy P, Amachawadi RG. Prevalence of methicillin-resistant Staphylococcus aureus in India: a systematic review and meta-analysis. Oman Med J. 2022;37(4):e389. doi:10.5001/omj.2022.41. PMID: 35949712.
8. Adhikari P, Shrestha R, Shrestha S, Rai JR, Amatya R. Prevalence, antimicrobial susceptibility pattern and multidrug resistance of methicillin-resistant Staphylococcus aureus isolated from clinical samples at a tertiary care teaching hospital: an observational, cross-sectional study from the Himalayan country, Nepal. BMJ Open. 2023;13(5):e067384. doi:10.1136/bmjopen-2022-067384. PMID: 37164471.
9. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing. 35th ed. CLSI supplement M100. Wayne, PA: Clinical and Laboratory Standards Institute; 2025.
10. Schuetz AN, Reyes S, Humphries RM, Bobenchik AM, Campeau S, Chaturvedi V, et al. Overview of changes in the Clinical and Laboratory Standards Institute performance standards for antimicrobial susceptibility testing, M100, 35th edition, 2025. J Clin Microbiol. 2025.
11. Centers for Disease Control and Prevention. Laboratory testing for vancomycin-resistant Staphylococcus aureus [Internet]. Atlanta: CDC; 2024 Apr 15 [cited 2026 Jul 6]. Available from: https://www.cdc.gov/staphylococcus-aureus/php/laboratories/index.html
12. Centers for Disease Control and Prevention. Laboratory testing for methicillin-resistant Staphylococcus aureus [Internet]. Atlanta: CDC; 2025 Jun 27 [cited 2026 Jul 6]. Available from: https://www.cdc.gov/mrsa/php/laboratories/index.html
13. Indian Council of Medical Research. Antimicrobial Resistance Research and Surveillance Network: annual report 2024. New Delhi: Indian Council of Medical Research; 2024.
14. Lohan K, Sangwan J, Mane P, Lathwal S. Prevalence pattern of MRSA from a rural medical college of North India: a




ISSN (O): 2687-5365; ISSN (P): 2753-6556

cause of concern. J Family Med Prim Care. 2021;10(2):752-7.
15. Arora S, Devi P, Arora U, Devi B. Prevalence of methicillin-resistant Staphylococcus aureus in a tertiary care hospital in northern India. J Lab Physicians. 2010;2(2):78-81.
16. Pai V, Rao VI, Rao SP. Prevalence and antimicrobial susceptibility pattern of methicillin-resistant Staphylococcus aureus isolates at a tertiary care hospital in Mangalore, South India. J Lab Physicians. 2010;2(2):82-4. doi:10.4103/0974-2727.72155.
17. Patil SS, Suresh KP, Jayaramu GM, Gopal N, Roy P, Amachawadi RG. Prevalence of methicillin-resistant Staphylococcus aureus in India: a systematic review and meta-analysis. Oman Med J. 2022;37(4):e389. doi:10.5001/omj.2022.41.
18. Das M. A comparative study of prevalence and antimicrobial susceptibility pattern of clinical isolates of healthcare-associated and community-associated methicillin-resistant Staphylococcus aureus in a tertiary care hospital of West Bengal. Eur J Cardiovasc Med. 2024.
19. Trivedi N, Patel N, Parmar D, Vyas K. The prevalence of methicillin resistant Staphylococcus aureus isolated from clinical samples in a tertiary care hospital. Gujarat J Med Sci. 2025;80(1):63-8.


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