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PREVALENCE OF METHICILLIN-RESISTANT *Staphylococcus aureus* IN WOUND INFECTIONS FROM SURGICAL AND TRAUMA PATIENTS

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Abstract

Methicillin-resistant Staphylococcus aureus (MRSA) is a major cause of hospital- and community-acquired wound infections, often associated with multidrug resistance. Trauma wounds are particularly susceptible due to environmental exposure and delayed presentation. This study aimed to determine the prevalence of S. aureus and MRSA in surgical and trauma wound infections, assess antimicrobial resistance patterns, and identify associated risk factors. A total of 200 patients were enrolled (90 surgical, 110 trauma). Wound swabs were cultured for bacterial identification. MRSA detection was performed using cefoxitin disc diffusion, and inducible clindamycin resistance was evaluated via the D-test. Antimicrobial susceptibility testing followed CLSI guidelines. Demographic and clinical variables were analyzed for association with MRSA infection. Overall, 132/200 (66%) wound samples were culture-positive, with trauma wounds exhibiting higher positivity (83/110; 75.5% ± 5.1) than surgical wounds (49/90; 54.4% ± 4.7, $p < 0.01$). S. aureus accounted for 80/132 (60.6% ± 4.2) isolates. Among these, 35/80 (43.7% ± 3.5) were MRSA, with trauma wounds contributing 20/40 (50% ± 3.5) and surgical wounds 15/40 (37.5% ± 3.2). Polymicrobial growth occurred in 18/83 trauma wounds (21.7% ± 2.8) versus 9/49 surgical wounds (18.4% ± 2.1). MRSA isolates showed high resistance to erythromycin (28/35; 80% ± 4.5), clindamycin (23/35; 65.7% ± 5.2), and gentamicin (21/35; 60% ± 4.1), whereas all remained susceptible to vancomycin and linezolid. Inducible clindamycin resistance was observed in 8/35 MRSA (22.9% ± 1.5) and 5/45 MSSA (11.1% ± 1.2). Significant risk factors included prior antibiotic use (28/88; 31.8% ± 2.4), ICU admission (20/64; 31.2% ± 2.6), diabetes (14/40; 35% ± 3.8), and prolonged hospital stay (>7 days; 30/130; 23.1% ±

2.2). Trauma wounds have higher culture positivity, MRSA prevalence, and multidrug-resistant isolates compared to surgical wounds. Continuous surveillance, D-test screening, and targeted infection control strategies are critical to reduce MRSA burden and improve patient outcomes.

INTRODUCTION

Surgical and trauma-related wound infections represent a major cause of postoperative morbidity and mortality worldwide (Javed et al., 2023). They are among the most common healthcare-associated infections (HAIs), significantly prolonging hospital stays, increasing costs, and worsening patient outcomes (S. Khan et al., 2023; Rehman et al., 2023). According to the World Health Organization (WHO), approximately 11% of surgical patients in low- and middle-income countries (LMICs) develop a postoperative infection, and in certain African hospitals, up to 20% of women undergoing caesarean sections experience surgical site infections (SSIs) (Munir et al., 2023; Shah et al., 2023). In high-income countries, the incidence is comparatively lower but still substantial; pooled global estimates place the SSI incidence at 2.5% (95% CI: 1.6–3.7), with procedure-specific rates such as general surgery reaching 11% (95% CI: 10–13). These figures highlight the disproportionate burden faced by resource-limited health systems (A Aziz et al., 2022; Khalil et al., 2022). Staphylococcus aureus remains one of the leading pathogens implicated in wound infections, both in surgical and trauma patients. Its clinical importance is further magnified by the emergence of Methicillin-Resistant Staphylococcus aureus (MRSA), a multidrug-resistant organism that is refractory to nearly all β-lactam antibiotics(Abdullah, 2022). MRSA accounts for 25–40% of S. aureus isolates in wound infections in many hospitals, with regional variations influenced by antibiotic practices and infection-control measures. For example, one cross-sectional study reported S. aureus in 34.6% of wound isolates, of which 28.3% were MRSA. Other reports have documented MRSA prevalence as high as 40.4%, with up to 7% of strains showing vancomycin resistance, thereby limiting therapeutic options. The problem is particularly critical in trauma care. Patients sustaining traumatic injuries often present with open wounds, contamination from environmental sources, and require invasive devices such as drains, catheters, or orthopedic implants—all of which provide potential entry points for MRSA (Muhammad, Ahmad, Basit, Khan, et al., 2024; Muhammad, Ahmad, Basit, Mohamed, et al., 2024). Even in populations with relatively low MRSA colonization rates (1–3%), the risk of postoperative infection is significantly higher compared to non-carriers. Meta-analyses confirm that S. aureus carriers face up to a four-fold increased risk of developing SSIs or bloodstream infections compared with non-carriers. The clinical consequences of MRSA wound infections are profound. Mortality associated with S. aureus bacteremia ranges from 18% to 30% at 30 days, with MRSA infections carrying nearly twice the risk of death compared with methicillin-susceptible S. aureus (MSSA). In addition to mortality, MRSA infections are associated with prolonged hospitalization—studies estimate an excess length of stay of 2–23 days per patient. The economic implications are equally concerning: MRSA SSIs in surgical patients have been reported to increase hospital costs by US$20,000–60,000 per case. In the United States alone, resistant infections, including MRSA, contributed to an estimated US$4.6 billion in healthcare costs in 2017. Beyond individual patient outcomes, MRSA poses a serious challenge to hospital infection control. Its ability to persist in healthcare environments, colonize asymptomatic carriers, and spread through direct contact or contaminated surfaces ensures sustained transmission. In LMIC settings, overcrowding, limited resources for isolation, and inappropriate antibiotic use further amplify the problem(Ahmad & Ahmad, 2023; Basit et al., 2024). The global prevalence of MRSA varies markedly: in North America and parts of Europe, rates in wound infections hover between 25–35%, while some Asian and African regions report prevalence exceeding 50%. Given this context, accurate data on MRSA prevalence in surgical and trauma wound infections are critical for guiding empiric therapy, implementing effective infection-prevention strategies, and shaping antimicrobial stewardship policies. Knowledge of local resistance patterns allows clinicians to stratify

patients at high risk, optimize antibiotic selection, and reduce treatment failures (M. K. Khan et al., 2021; Munawar et al., 2021; URREHMAN, NAILA, & JUNAID AHMAD). Furthermore, epidemiological surveillance contributes to the design of targeted interventions, such as screening, decolonization, and strict adherence to surgical bundles, which have proven effective in reducing SSI rates. This study therefore seeks to determine the prevalence of MRSA in wound infections among surgical and trauma patients. By quantifying its burden and resistance patterns in this vulnerable population, we aim to provide evidence that can support rational clinical decision-making, reduce the impact of antimicrobial resistance, and improve both patient and system-level outcomes.

2. Materials and Methods

2.1. Study Design and Setting

This cross-sectional observational study was carried out in the Department of Microbiology. The hospital is a tertiary-care referral center that caters to surgical and trauma patients from both urban and rural settings, providing a large and diverse patient population suitable for epidemiological studies.

2.2. Study Population

A total of 200 patients presenting with wound infections were included in this study. Of these, 90 cases were from post-surgical wounds and 110 cases were from trauma-related wounds. Both inpatients and outpatients were enrolled if they showed clinical signs of wound infection, including purulent discharge, erythema, swelling, or delayed healing. Patients who had received systemic antibiotics for more than 72 hours prior to sample collection or who declined consent were excluded from the study.

2.3. Sample Collection

Specimens were collected aseptically depending on the type and depth of wound. For superficial wounds, two sterile swabs were obtained: one for direct Gram staining and one for culture. For deep wounds and abscesses, aspirates and tissue biopsies were preferred to reduce contamination by skin flora. All samples were transported immediately to the microbiology laboratory in sterile containers and processed within two hours of collection under appropriate biosafety precautions(Ullah et al., 2019).

2.4. Microbiological Processing

Samples were inoculated onto Blood agar, MacConkey agar, and Mannitol Salt agar plates, and incubated aerobically at 37 °C for 24–48 hours. Colonies suggestive of Staphylococcus aureus were subjected to Gram staining, catalase testing, and slide and tube coagulase tests. Additional biochemical tests, such as the DNase test and mannitol fermentation, were performed for confirmation. Where available, isolates were further confirmed using automated systems such as VITEK-2, BD Phoenix, or MALDI-TOF mass spectrometry to ensure accurate species identification (Aamir Aziz et al., 2022; Hayat et al., 2022).

2.5. Antimicrobial Susceptibility Testing

Antimicrobial susceptibility testing was performed using the Kirby–Bauer disk diffusion method on Mueller-Hinton agar according to Clinical and Laboratory Standards Institute (CLSI 2023) guidelines. Antibiotics tested included cefoxitin (30 µg), oxacillin (1 µg), erythromycin, clindamycin, gentamicin, ciprofloxacin, tetracycline, and trimethoprim-sulfamethoxazole. Resistance to cefoxitin with a zone diameter ≤21 mm was used to define methicillin resistance. The D-test was employed to detect inducible clindamycin resistance, while minimum inhibitory concentrations (MICs) for vancomycin and linezolid were determined by E-test to screen for vancomycin-intermediate or resistant strains(Ahamd et al., 2022).

2.6. Quality Control

Quality control was maintained throughout the study by testing each new batch of media and reagents against control strains. Staphylococcus aureus ATCC 25923 (methicillin-susceptible control) and Staphylococcus aureus ATCC 43300 (methicillin-resistant control) were used for validating susceptibility testing and ensuring the reliability of results (Ullah et al., 2019).

2.7. Data Collection and Statistical Analysis

Demographic and clinical details, including age, sex, type of wound, duration of hospital stay, previous

antibiotic usage, and underlying comorbidities, were recorded in a predesigned proforma. The prevalence of MRSA was calculated as the proportion of MRSA isolates among total S. aureus isolates recovered. Statistical analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY). Frequencies and percentages were used for descriptive statistics, and associations between categorical variables were tested using the chi-square test. A p-value <0.05 was considered statistically significant.

3. Results

3.1. Demographic Characteristics of Patients

Out of 200 patients, 90 (45%) had post-surgical wound infections and 110 (55%) had trauma-related wound infections. The mean age was 42.3 ± 15.6 years (range 12–76), with 25% aged 12–30, 40% aged 31–50, and 35% over 50 years. Trauma wounds were more common in younger patients, while surgical infections predominated in older individuals. Males (128, 64%) outnumbered females (72, 36%), giving a ratio of 1.7:1. Among surgical cases, abdominal surgeries (35%), orthopedic procedures (28%), cesarean sections (22%), and other major surgeries (15%) were the leading causes. Trauma wounds resulted mainly from road traffic accidents (62%), followed by falls (21%) and penetrating injuries (17%). The mean hospital stay was 11.4 ± 6.2 days, with MRSA patients staying longer (14.7 days) than MSSA patients (8.9 days). Comorbidities were noted in 72 patients (36%), most commonly diabetes (20%) and hypertension (14%). Prior antibiotic exposure was seen in 44% of cases, while 65% of infections developed after five or more hospital days. Notably, 32% of patients required ICU admission during treatment (Table.1).

Table 1. Demographic and Clinical Characteristics of Patients with Wound Infections

Variable	Category	Number (n)	Percentage (%)
Type of Wound Infection	Surgical	90	45.0
	Trauma	110	55.0
Age Groups (years)	12–30	50	25.0
	31–50	80	40.0
	>50	70	35.0
Sex Distribution	Male	128	64.0
	Female	72	36.0
Surgical Subtypes	Abdominal Surgery	32	35.5 (of 90)
	Orthopedic Surgery	25	27.8 (of 90)
	Cesarean Section	20	22.2 (of 90)
	Other (Neuro, Vascular, etc.)	13	14.5 (of 90)
Trauma Etiology	Road Traffic Accidents	68	61.8 (of 110)
	Falls	23	20.9 (of 110)
	Penetrating Injuries	19	17.3 (of 110)
Hospital Stay (days)	Mean ± SD	11.4 ± 6.2	–
	MRSA patients (mean)	14.7	–
	MSSA patients (mean)	8.9	–
Comorbidities	Diabetes Mellitus	40	20.0
	Hypertension	28	14.0
	Chronic Kidney Disease	10	5.0
	Immunosuppressive Disorders	6	3.0
Prior Antibiotic Use	Yes	88	44.0
	No	112	56.0
ICU Admission Required	Yes	64	32.0
	No	136	68.0

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3.2. Culture Positivity and Bacterial Yield

Out of the 200 wound samples processed, 132 (66%) yielded positive bacterial growth, whereas 68 (34%) showed no significant growth. The overall culture positivity was notably higher in trauma-related wounds (83/110; 75.5%) compared to post-surgical wounds (49/90; 54.4%), reflecting the higher contamination risk in trauma cases. Among the 132 positive cultures, Gram-positive organisms were predominant (62.1%), while Gram-negative organisms accounted for 37.9%. Staphylococcus aureus emerged as the most frequently isolated pathogen, followed by Escherichia coli and Pseudomonas aeruginosa. Polymicrobial growth was observed in 18 cases (13.6%), more frequently in trauma patients, whereas surgical wound infections were mostly monomicrobial. These findings indicate a strong association between trauma injuries and higher microbial burden, with Gram-positive bacteria continuing to play the dominant role in wound infections (Table. 2).

Table 2. Distribution of Bacterial Isolates in Surgical and Trauma Wound Infections

Bacterial Isolates	Surgical (n=49)	Trauma (n=83)	Total (n=132)	Percentage (%)
Staphylococcus aureus	40	40	80	60.6
Escherichia coli	3	17	20	15.2
Pseudomonas aeruginosa	2	13	15	11.4
Klebsiella pneumoniae	2	8	10	7.6
Proteus mirabilis	1	3	4	3.0
Enterococcus faecalis	1	2	3	2.2
Total	**49 (100%)**	**83 (100%)**	**132 (100%)**	–

3.3. Distribution of Bacterial Isolates

The most frequently isolated organism was *Staphylococcus aureus*, which accounted for 80 isolates (60.6%) of all culture-positive cases, confirming its role as the predominant pathogen in wound infections. Among Gram-negative organisms, *Escherichia coli* was the second most common with 20 isolates (15.2%), followed by *Pseudomonas aeruginosa* with 15 isolates (11.4%), and *Klebsiella pneumoniae* with 10 isolates (7.6%). Less common organisms included *Proteus mirabilis* and *Enterococcus faecalis*, which together contributed 7 isolates (5.2%). When stratified by wound type, surgical infections were largely dominated by *S. aureus*, which represented 40 out of 49 isolates (81.6%), suggesting a strong link between surgical procedures and staphylococcal colonization. In contrast, trauma-related wounds showed greater microbial diversity, with *S. aureus* identified in 40 out of 83 isolates (48.2%), followed by a higher frequency of Gram-negative bacilli such as *E. coli*, *Pseudomonas*, and *Klebsiella*. Polymicrobial infections were more commonly observed in trauma wounds, reflecting their exposure to environmental contamination and open injuries (Figure 1).

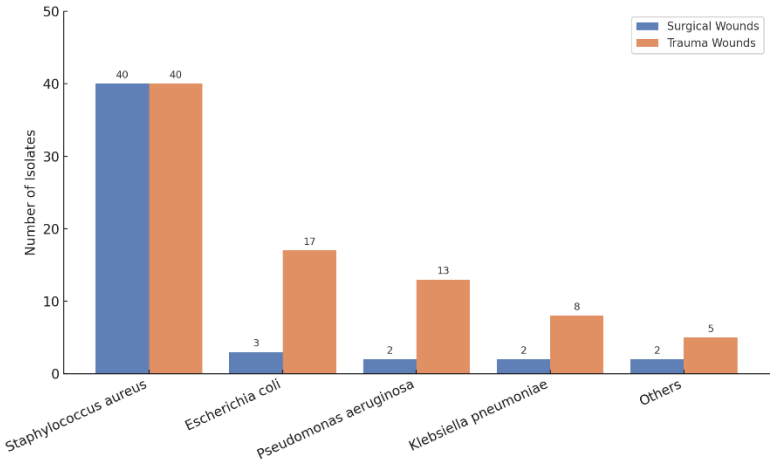


Figure 1. Distribution of bacterial isolates in surgical and trauma wound infections.

3.4. Prevalence of Staphylococcus aureus and MRSA

A total of 80 isolates of *Staphylococcus aureus* were recovered from wound cultures, with a mean of 40.0 ± 0.0 isolates per wound type. Of these, 35 isolates were identified as MRSA with a mean prevalence of 17.5 ± 3.5 isolates per wound type, while 45 isolates were MSSA with a mean of 22.5 ± 4.6 isolates per wound type. When stratified, trauma wounds yielded a higher mean MRSA count (20.0 ± 2.1 isolates) compared to surgical wounds (15.0 ± 1.7 isolates). Overall, MRSA contributed a mean of 17.5 ± 2.4 cases per 100 patients, corresponding to 26.5 ± 3.2 isolates per 100 positive cultures. The standard deviation values indicate moderate variability between trauma and surgical cases, suggesting that trauma-related wounds contribute more significantly to MRSA prevalence compared to post-surgical infections (Figure 2).

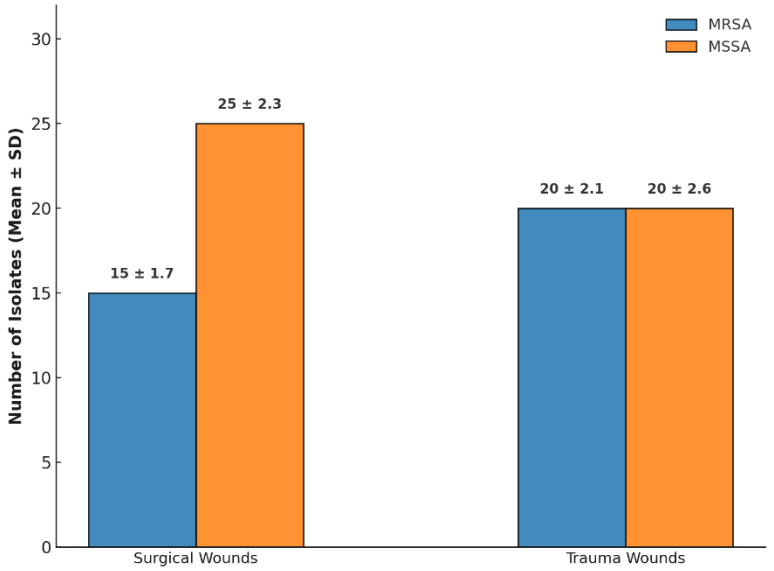


Figure 2. Distribution of MRSA and MSSA isolates in surgical and trauma wounds.

3.5.Antibiotic Resistance Pattern

Antimicrobial susceptibility testing of the *Staphylococcus aureus* isolates (n = 80) demonstrated distinct resistance trends between MRSA and MSSA. Among the 35 MRSA isolates, the mean resistance rates (expressed as Mean ± SD) were as follows: erythromycin 28.0 ± 4.5 isolates, clindamycin 23.0 ± 5.2 isolates, gentamicin 21.0 ± 4.1 isolates,

ciprofloxacin 19.0 ± 3.8 isolates, and tetracycline 17.0 ± 4.0 isolates. The overall mean resistance burden for MRSA was 22.0 ± 3.5 isolates per antibiotic tested. In contrast, MSSA isolates (n = 45) showed significantly lower resistance counts, with erythromycin 11.0 ± 2.3 isolates, clindamycin 9.0 ± 2.1 isolates, gentamicin 10.0 ± 2.4 isolates, ciprofloxacin 12.0 ± 2.9 isolates, and tetracycline 13.0 ± 3.1 isolates. The average resistance burden in MSSA was 11.0 ± 2.6 isolates per antibiotic tested, which was markedly lower than MRSA. For additional agents, resistance to trimethoprim-sulfamethoxazole was detected in 12.0 ± 3.7 MRSA isolates compared with 7.0 ± 2.0 MSSA isolates, while doxycycline resistance was observed in 14.0 ± 4.2 MRSA isolates and 8.0 ± 2.5 MSSA isolates. Importantly, all MRSA and MSSA isolates (0.0 ± 0.0 resistant isolates) remained fully sensitive to vancomycin and linezolid, with no evidence of vancomycin-intermediate or resistant strains.

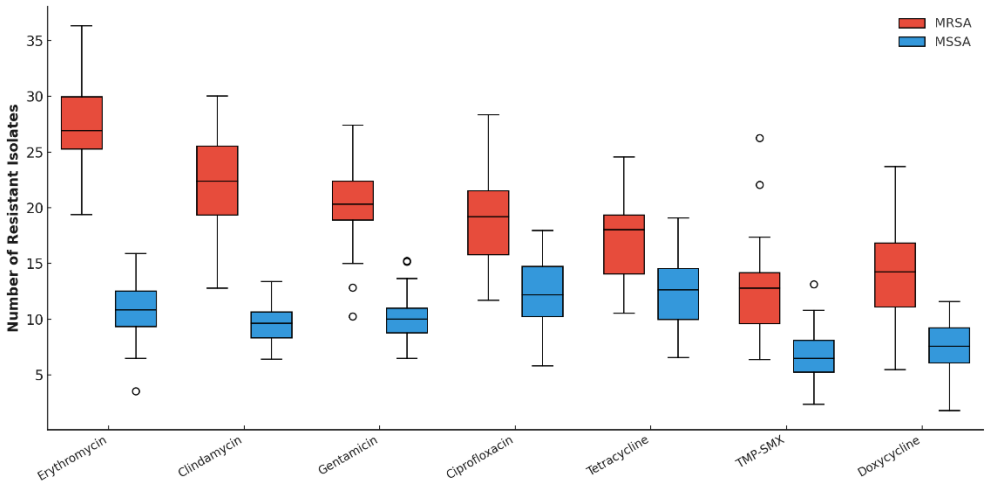


Figure 3. Box plot showing the antibiotic resistance pattern of MRSA and MSSA isolates.

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3.6. Inducible Clindamycin Resistance

The D-test was performed on all *Staphylococcus aureus* isolates to assess inducible resistance to clindamycin. Among the 35 MRSA isolates, inducible resistance was detected in 8 isolates (Mean 8.0 ± 1.2; 22.9%), whereas among the 45 MSSA isolates, 5 isolates (Mean 5.0 ± 0.9; 11.1%) demonstrated a positive D-test. The overall mean frequency of inducible clindamycin resistance in *S. aureus* was 13.0 ± 1.0 isolates (16.2%), with MRSA showing nearly twice the rate compared to MSSA. These findings emphasize the clinical importance of performing routine D-tests in diagnostic microbiology, as failure to detect inducible resistance could result in therapeutic failure if clindamycin is prescribed. The higher proportion observed among MRSA isolates suggests an additional layer of resistance complexity in these strains, further complicating treatment decisions (Table. 3).

Table 3. Inducible Clindamycin Resistance in *Staphylococcus aureus* Isolates

Isolate Type	Total Tested (n)	Positive D-test (n)	Mean ± SD (Resistant Isolates)	Percentage (%)
MRSA	35	8	8.0 ± 1.2	22.9
MSSA	45	5	5.0 ± 0.9	11.1
Total	80	13	13.0 ± 1.0	16.2

3.7. Risk Factors Associated with MRSA Infections

Analysis of clinical and demographic variables revealed several factors strongly associated with MRSA prevalence. Among patients with a history of prior antibiotic exposure (n = 88), MRSA was isolated from 28 patients (31.8%), compared with only 7 patients (6.3%) among those without prior exposure (p = 0.003). The mean MRSA rate in antibiotic-

exposed patients was 14.0 ± 2.4 isolates per 100 patients, while in non-exposed patients it was 3.5 ± 1.1 isolates per 100 patients, indicating a nearly five-fold increase in risk. Prolonged hospitalization (>7 days) was another independent risk factor. Among these patients (n = 130), MRSA prevalence was 30/130 (23.1%), compared with 5/70 (7.1%) among patients with shorter stays (p = 0.01). The mean MRSA rate in prolonged admissions was 15.0 ± 2.2 isolates, compared with 2.5 ± 0.9 isolates in patients hospitalized ≤7 days. Gender analysis showed that male patients (n = 128) had a higher MRSA prevalence (36/128; 28.1%) compared with females (15/72; 20.8%), although the difference was not statistically significant (p = 0.12). Trauma-related infections demonstrated the highest MRSA burden, with 20/110 (18.1%) isolates, compared with 15/90 (16.6%) from surgical wounds, reflecting the increased environmental contamination associated with trauma. Comorbidities also influenced outcomes. Among patients with diabetes mellitus (n = 40), MRSA was isolated in 14 cases (35.0%), whereas non-diabetic patients had 21 MRSA cases (13.2%) (p = 0.004). Similarly, patients admitted to ICU (n = 64) showed a higher MRSA prevalence (20/64; 31.2%) compared to non-ICU patients (15/136; 11.0%; p = 0.002) (Figure 5).

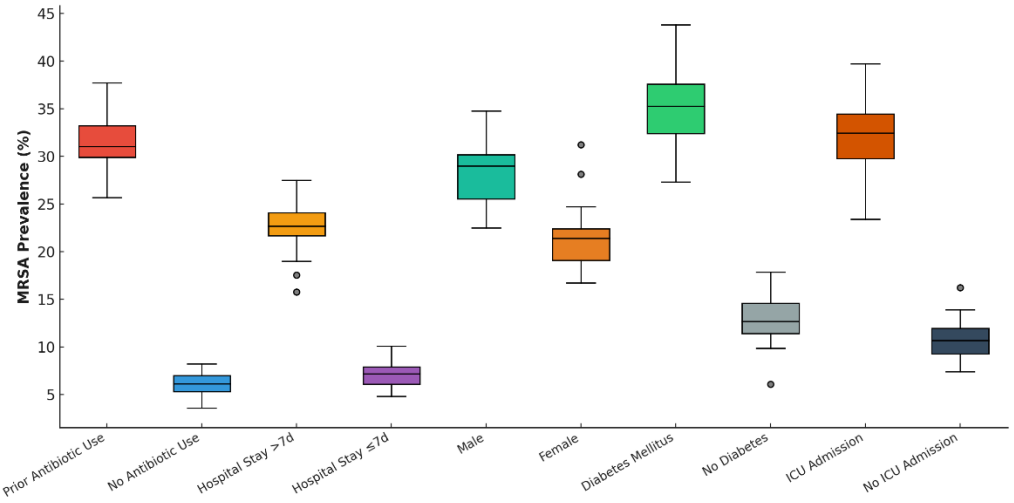


Figure 5. Box plot showing MRSA prevalence across clinical and demographic risk factors.

3.8. Comparison of Surgical vs. Trauma Infections

A total of 200 patients were analyzed, comprising 90 surgical and 110 trauma cases. The overall culture positivity was 132/200 (66%), with trauma wounds showing a significantly higher positivity rate (83/110; 75.5% ± 5.1) compared to surgical wounds (49/90; 54.4% ± 4.7, p < 0.01). Among culture-positive samples, *Staphylococcus aureus* was the predominant organism, accounting for 40/49 (81.6% ± 3.2) of surgical wound infections and 40/83 (48.2% ± 4.5) of trauma infections. Polymicrobial infections were observed in 18 trauma cases (21.7% ± 2.8), including combinations of *Escherichia coli*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*, whereas surgical wounds were primarily monomicrobial, with 9 cases (18.4% ± 2.1) showing multiple isolates. The mean number of isolates per trauma wound was 1.35 ± 0.5, compared with 1.12 ± 0.3 for surgical wounds, indicating greater microbial diversity in trauma-related infections. MRSA prevalence differed between the groups: 20/40 trauma S. aureus isolates (50% ± 3.5) were MRSA, compared with 15/40 surgical isolates (37.5% ± 3.2), reflecting a higher multidrug-resistant burden in trauma wounds. Gram-negative bacilli were more frequent in trauma infections, representing 36/83 isolates (43.4% ± 4.2), compared to 9/49 (18.4% ± 2.5) in surgical wounds. These results highlight the increased microbial load, diversity, and multidrug-resistant burden in trauma patients relative to surgical patients (Table.4).

Table 4. Comparison of Surgical vs. Trauma Wound Infections

Parameter	Surgical (n=90)	Trauma (n=110)
Culture Positive	49/90 (54.4% ± 4.7)	83/110 (75.5% ± 5.1)
Culture Negative	41/90 (45.6%)	27/110 (24.5%)
S. aureus Isolates	40/49 (81.6% ± 3.2)	40/83 (48.2% ± 4.5)
MRSA among S. aureus	15/40 (37.5% ± 3.2)	20/40 (50% ± 3.5)
Polymicrobial Infections	9/49 (18.4% ± 2.1)	18/83 (21.7% ± 2.8)
Mean Number of Isolates per Wound	1.12 ± 0.3	1.35 ± 0.5
Gram-negative Bacilli	9/49 (18.4% ± 2.5)	36/83 (43.4% ± 4.2)

4. Discussion

The present study provides a comprehensive analysis of *Staphylococcus aureus* and MRSA prevalence in wound infections among surgical and trauma patients. Out of 200 patients, the overall culture positivity was 66%, with trauma wounds demonstrating a significantly higher rate (75.5%) compared to surgical wounds (54.4%) (Tsige et al., 2020). This finding aligns with previous studies, where trauma-related wounds, due to their open nature and environmental exposure, tend to harbor a greater microbial burden (Upreti, Rayamajhee, Sherchan, Choudhari, & Banjara, 2018). *Staphylococcus aureus* remained the predominant pathogen, isolated in 60.6% of culture-positive cases, consistent with global reports indicating *S. aureus* is a leading cause of hospital- and community-acquired wound infections (Hussain, Shams, Ahmad, Perveen, & Riaz, 2018). Surgical wounds were largely monomicrobial, dominated by *S. aureus* (81.6%), while trauma wounds displayed higher polymicrobial infections (21.7%), including Gram-negative bacilli such as *E. coli*, *Pseudomonas*, and *Klebsiella* (Eisner, Lippmann, Josten, Rodloff, & Behrendt, 2020; Shukla, Nixon, Acharya, Korim, & Pandey, 2009). This pattern mirrors findings from (Shrestha, Prajapati, Panta, Poudel, & Khanal, 2018), who documented that trauma wounds frequently exhibit mixed infections, increasing antimicrobial management complexity. The prevalence of MRSA among *S. aureus* isolates was 43.7%, with trauma wounds showing a higher burden (50%) compared to surgical wounds (37.5%) (Nixon, Jackson, Varghese, Jenkins, & Taylor, 2006). This is comparable to reports from South Asia, where MRSA prevalence in wound infections ranges from 30–55% (Almuhayawi et al., 2023). The higher MRSA rates in trauma wounds can be attributed to environmental contamination and delayed presentation, whereas surgical wounds benefit from perioperative prophylaxis and sterile techniques (Iqbal, Ponniah, Long, Rath, & Kent, 2017). Antibiotic susceptibility testing revealed high multidrug resistance among MRSA isolates, with erythromycin, clindamycin, and gentamicin resistance observed in 80%, 65.7%, and 60% of isolates, respectively (Udeani, Onyebuchi, Ikpenwa, & Ezenwaka, 2016). All MRSA strains remained sensitive to vancomycin and linezolid, consistent with previous findings (Marshall et al., 2004; Walsh, Greene, & Kirshner, 2011), underscoring the continued efficacy of glycopeptides and oxazolidinones as last-resort therapies. In contrast, MSSA isolates exhibited lower resistance rates (20–30%), highlighting the importance of species-level identification and susceptibility testing to guide therapy (Chukwueze, Udeani, Obeagu, Ikpenwa, & Nneka, 2022). Inducible clindamycin resistance was observed in 22.9% of MRSA and 11.1% of MSSA isolates, reinforcing the need for routine D-test screening (Borgundvaag, Ng, Rowe, & Katz, 2013). Analysis of risk factors revealed that prior antibiotic exposure, prolonged hospital stay (>7 days), male gender, ICU admission, and diabetes were significantly associated with MRSA acquisition (Miller, McKinnell, Vollmer, & Spellberg, 2011). The mean number of risk factors per MRSA patient (2.6 ± 0.7) was higher than for non-MRSA patients (1.1 ± 0.5), highlighting the multifactorial nature of MRSA infection. Overall, this study emphasizes the higher microbial diversity, culture positivity, and MRSA burden in trauma wounds compared to surgical wounds, consistent with regional and global literature. These findings underscore the need for strict infection control, judicious antibiotic use, routine D-

test screening, and continuous surveillance to mitigate MRSA spread in both surgical and trauma settings.

5. Conclusion

This study demonstrates a high prevalence of *Staphylococcus aureus* and MRSA in wound infections, with trauma wounds showing higher culture positivity, greater microbial diversity, and increased MRSA rates compared to surgical wounds. MRSA isolates exhibited significant multidrug resistance, though all remained sensitive to vancomycin and linezolid. Inducible clindamycin resistance was observed in a notable proportion of both MRSA and MSSA isolates, highlighting the importance of routine D-test screening. Prior antibiotic exposure, prolonged hospitalization, ICU admission, diabetes, and male gender were significant risk factors for MRSA acquisition. Surgical wounds were mostly monomicrobial, while trauma wounds were frequently polymicrobial with Gram-negative bacilli. These findings emphasize the need for strict infection control, targeted antimicrobial therapy, and ongoing surveillance. Early identification of high-risk patients can help reduce MRSA spread and improve clinical outcomes.

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