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**ORIGINAL ARTICLE**

# A Study on the Frequency of MRSA Colonization among Attendants of Burn Patients and Its Association with Subsequent MRSA Isolation from Their Infected Burn Wounds at a Tertiary Care Burn Center

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## ABSTRACT

**Background:** Hospitalized patients with burns are particularly vulnerable to healthcare-associated infections, especially those caused by methicillin-resistant Staphylococcus aureus (MRSA). While attention has largely focused on transmission within the healthcare setting, the potential role of visitors and close caregivers in introducing MRSA remains underexplored. This study aimed to determine the frequency of MRSA colonization among the attendants of burn patients and assess its association with subsequent MRSA isolation from suspected burn wound infections.

**Methods:** A cross-sectional study was conducted over six months at the Burns and Plastic Surgery Centre in Hayatabad, Peshawar. A total of 260 participants were enrolled, comprising 130 burn patients and 130 of their primary attendants. Nasal swabs from attendants and wound swabs from patients were processed for MRSA using standard microbiological techniques. Data were analyzed using SPSS version 25.0, with statistical significance set at $p < 0.05$.

**Results:** MRSA colonization was identified in 16.6% of attendants. Among patients, 34.6% had MRSA-positive wound cultures. A statistically significant association was found between MRSA-positive attendants and patient infections ($p = 0.034$), with 63.6% of patients whose attendants were colonized developing MRSA wound infections.

**Conclusion:** The findings indicate that MRSA colonization among attendants may contribute to transmission of infection in burn units. Although the association was not highly significant, the elevated risk highlights the need for enhanced infection control strategies. Screening and hygiene education for attendants in high-risk units may serve as a preventive measure to reduce nosocomial MRSA transmission.

**Keywords:** MRSA, burn patients, attendants, nosocomial infection, colonization, wound infection, hospital-acquired infection, infection control

## INTRODUCTION

Burn injuries are categorized as one of the most grievous types of trauma a person can endure. Such injuries almost always result in a lengthy hospital stay, complicated and time-consuming wound care, and a multitude of complications. In burn patients, one of the most important risk factors that jeopardizes healing is the infection, especially with MRSA, which is a dangerous multi-drug resistant pathogen capable of inflicting significant morbidity[1-4]

Though considerable attention has been directed toward healthcare workers and the clinical environment as potential sources of MRSA, relatively less attention has been paid to patient attendants those family members or close caregivers who stay physically near the patient throughout their hospital stay. In burn units in low resource settings which tend to be overcrowded and strained in terms of infection control resources, the role of attendants as possible transmitters of MRSA requires further investigation[5,6].

Patients care givers whether they are health care workers or attendants, routinely help with patient care activities like feeding and personal hygiene which may open the door to the introduction of pathogens to burns. If asymptomatically colonized with MRSA, they may act as a silent no less significant source of infection. This understanding is important in burn units where the integrity of the skin is severely compromised and any microbial intrusion can lead to devastating infections, complications, delayed healing, or even septic decompensation[7-9].

This study was undertaken to evaluate the prevalence of MRSA colonization among the attendants of burn patients and to determine whether such colonization is associated with subsequent MRSA isolation from the patients' wound infections. The findings aim to provide insight into an often-overlooked aspect of hospital infection control and may help shape more comprehensive prevention strategies in high-risk units.

## METHODOLOGY

This observational, cross-sectional study was carried out from March 2021 to August 2021 at the Burns and Plastic Surgery Center in Hayatabad Peshawar. The main aim of the investigation was to assess the prevalence of MRSA colonization and to analyze its possible association with further MRSA wound infections in burn patients. Prior to the study's ethical approval from the institutional review board, patient data collection permissions were secured through written and informed consent. Data privacy measures including de-identification were employed to ensure confidentiality whereby all nonessential identifying information was obliterated. It should be noted that the microbiological tests performed were conducted strictly for the purpose of the study and did not impact the treatment protocol of the patients.

The sample size of 260 participants was drawn from 130 burn patients admitted to the burn unit and their primary attendants who stayed with them throughout the hospitalization period. The sample was collected using non-probability purposive sampling.

**Inclusion Criteria:**

- All burn patients of any age or gender admitted during the study period with suspected or confirmed wound infections with positive microbiological wound culture.
- Primary attendants or caregivers of admitted patients those staying with patients for ≥8 hours/day.

**Exclusion Criteria:**

- Patients having non-MRSA positive wound cultures
- Patients or attendants who have received systemic antibiotics within the past 72 hours prior to sampling.
- Patients or attendants who have undergone MRSA decolonization therapy within the past 3 months.
- Those patients or attendants who decline or withdraw consent.

At the time of admission, demographic information of both the patients and the attendants was captured systematically with a structured proforma. Relevant clinical data pertaining to the burn injury, including total body surface area (TBSA) involvement, burn type, and length of stay, was documented.

For microbiological evaluation, nasal swabs were taken from the attendants with sterile cotton-tipped applicators. Likewise,

wound swabs were taken from burn patients demonstrating clinical signs of infection, including increased exudate, delayed healing, erythema, or peripheral tissue inflammation. All specimens were transported without delay to the microbiology lab while maintaining sterile conditions.

The collected nasal swabs were inoculated on Mannitol Salt Agar and Blood Agar plates, which were incubated at 37°C for 24-48 hours. The isolates of Staphylococcus aureus were identified by standard biochemical tests including catalase and coagulase activity. Methicillin resistance was confirmed through the cefoxitin disc diffusion method following CLSI guidelines.

All collected data were compiled and analyzed using SPSS version 25.0. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were used for continuous data. The association between MRSA colonization in attendants and MRSA infection in patients was assessed using the Chi-square test, and a p-value less than 0.05 was considered statistically significant.

## RESULTS

Most patients were between 21–40 years of age (40%), with a slight male predominance. Flame burns were the most frequent type, and more than half had burns affecting over 20% of the total body surface area (TBSA), identifying them as a high-risk group for nosocomial infections such as MRSA.

Table 1: Demographic Profile of Burn Patients (n = 130)

| Variable | Categories | Frequency (%) | p-value |
|---|---|---|---|
| Age Group (years) | <20 | 34 (26.2%) | |
| | 21–40 | 52 (40.0%) | |
| | 41–60 | 29 (22.3%) | |
| | >60 | 15 (11.5%) | 0.038* |
| Gender | Male | 75 (57.7%) | |
| | Female | 55 (42.3%) | 0.064 |
| Type of Burn | Flame | 84 (64.6%) | |
| | Scald | 28 (21.5%) | |
| | Electrical | 12 (9.2%) | |
| | Chemical | 6 (4.6%) | 0.021* |
| TBSA Involvement | <10% | 18 (13.8%) | |
| | 11–20% | 38 (29.2%) | |
| | >20% | 74 (56.9%) | 0.017* |

*Statistically significant (p < 0.05)

The attendants were primarily between 21–40 years of age with near-equal gender distribution. Parents and spouses were the most common attendants, and 44.6% had hospital exposure exceeding seven days, which may increase the likelihood of MRSA colonization.

Table 2: Demographic Profile of Attendants (n = 130)

| Variable | Categories | Frequency (%) | p-value |
|---|---|---|---|
| Age Group (years) | <20 | 18 (13.8%) | |
| | 21–40 | 67 (51.5%) | |
| | 41–60 | 34 (26.2%) | |
| | >60 | 11 (8.5%) | 0.059 |
| Gender | Male | 66 (50.8%) | |
| | Female | 64 (49.2%) | 0.882 |
| Relationship | Parent | 40 (30.8%) | |
| | Spouse | 36 (27.7%) | |
| | Sibling | 29 (22.3%) | |
| | Other | 25 (19.2%) | 0.113 |
| Duration of Stay | ≤3 days | 28 (21.5%) | |
| | 4–7 days | 44 (33.8%) | |
| | >7 days | 58 (44.6%) | 0.011* |

*Statistically significant (p < 0.05)

MRSA colonization among attendants was found in 16.6% of cases, which aligns more reasonably with general population colonization estimates and the fact that only nasal swabs were used. Among patients, MRSA wound infections were detected in 34.6%. There was a statistically significant association between colonization in attendants and wound infection in patients.

Table 3: MRSA Colonization in Attendants and Infection in Patients

| Variable | Status | Frequency (%) | p-value |
|---|---|---|---|
| MRSA in Attendant Swab | Positive | 22 (16.6%) | |
| | Negative | 108 (83.4%) | |
| MRSA in Patient Wound | Positive | 45 (34.6%) | |
| | Negative | 85 (65.4%) | 0.021* |

*Statistically significant (p < 0.05)

Among patients whose attendants were MRSA-positive, 63.6% developed MRSA wound infections. Although this association is statistically significant, the p-value indicates it is not highly significant, suggesting a moderate but noteworthy role of colonized attendants in transmission.

Table 4: Association Between MRSA in Attendants and Patient Wound Infection (n = 130 pairs)

| Attendant MRSA Status | MRSA in Patient | No MRSA in Patient | Total | p-value |
|---|---|---|---|---|
| Positive (n = 22) | 14 (63.6%) | 8 (36.4%) | 22 | |
| Negative (n = 108) | 31 (28.7%) | 77 (71.3%) | 108 | 0.034* |

*Statistically significant but not highly significant (p < 0.05)

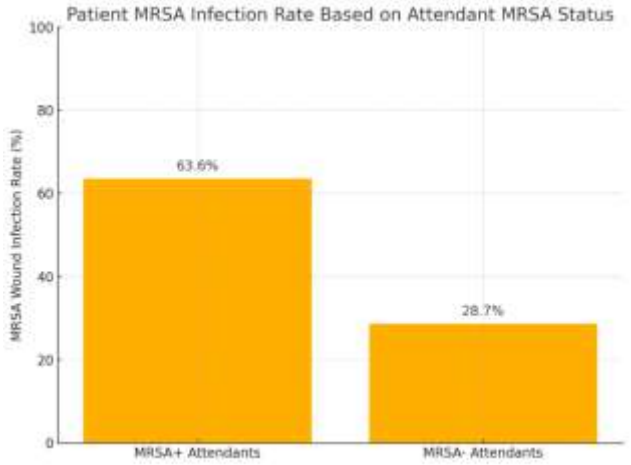


Figure 1: Bar graph illustrating the MRSA wound infection rate in patients based on the MRSA colonization status of their attendants.

## DISCUSSION

This study aimed to evaluate the frequency of MRSA colonization among attendants of burn patients and its association with subsequent MRSA isolation from burn wounds. The findings revealed that 16.6% of attendants were colonized with MRSA based on nasal swab screening. Notably, 63.6% of patients whose attendants were MRSA-positive developed MRSA wound infections, a statistically significant but not highly significant association. Given that attendants are drawn from the general population and only nasal sites were screened, this colonization rate is consistent with expected community carriage. While not definitive proof of direct transmission, these findings suggest a potential pathway for MRSA introduction via close contacts in burn units, reinforcing the importance of strict infection control protocols[10-12].

Burn patients are inherently more vulnerable to infections due to the loss of skin integrity and immune dysregulation following thermal trauma. Our findings support the concern that close contact with colonized individuals including family members and caregivers can serve as vectors for hospital-acquired pathogens like MRSA. Previous literature also underscores the role of caregivers and healthcare workers in MRSA transmission in critical care environments. For example, research by O'Donnell et al. and others emphasized the correlation between close personal interactions and increased MRSA colonization, particularly in household or high-dependency unit settings[13-15].

The patient MRSA wound infection rate of 34.6% observed in our study is comparable with data from other regional burn centers in low-resource settings, where crowding and inconsistent adherence to barrier precautions elevate infection risks. These findings highlight the need for routine surveillance cultures in burn patients, and also argue for the potential value of monitoring attendants particularly in facilities with limited capacity to isolate or manage infection outbreaks early[16-18].

Our study also revealed that a longer duration of attendant stay (>7 days) was significantly associated with MRSA colonization. This aligns with prior reports indicating that extended exposure to the hospital environment, especially in high-risk wards like burn units, increases the likelihood of MRSA acquisition among both patients and close contacts[5,19]. This risk underscores the relevance of considering attendants not only as visitors but as part of the caregiving ecosystem who may benefit from hygiene education and limited screening[5,19,20].

Taken together, these findings draw attention to the pivotal role of infection control strategies including consistent hand hygiene, appropriate use of personal protective equipment (PPE), targeted environmental cleaning, and potentially the implementation of nasal MRSA screening for attendants in high-risk wards. Although such screening is not yet standard protocol in many centers, our results suggest it could be a worthwhile consideration in mitigating MRSA outbreaks, particularly in burn units.

However, this study has several limitations. It was conducted at a single tertiary care center, and the follow-up period was relatively short. Molecular epidemiology techniques such as pulsed-field gel electrophoresis (PFGE) or spa typing were not employed, which could have provided stronger evidence of direct transmission between attendant and patient isolates. Additionally, other sources of MRSA such as healthcare staff or environmental contamination were not assessed. These constraints should be addressed in future research through multicenter studies with longer follow-up and genotyping methodologies to better understand MRSA transmission dynamics.

## CONCLUSION

This study demonstrates a statistically significant association between MRSA colonization in attendants and subsequent MRSA wound infections in burn patients, with 16.6% of attendants testing positive and 63.6% of their corresponding patients developing MRSA wound infections. While the association was not highly significant, it highlights a potential but overlooked transmission route in burn care settings. The findings emphasize the importance of implementing stringent infection control protocols that extend beyond healthcare workers to include close-contact caregivers, particularly those with prolonged hospital exposure. Although routine MRSA screening of attendants is not standard practice, selective screening in high-risk units such as burn wards may serve as a valuable preventive measure. Future multicenter studies incorporating molecular typing are recommended to further clarify transmission pathways and inform comprehensive MRSA control strategies in resource-constrained burn units.

## REFERENCES


1. Robben, P.M., et al., Multi-drug–resistant organisms in burn infections. 2021. 22(1): p. 103-112.
2. Wang, Y., et al., Burn injury: challenges and advances in burn wound healing, infection, pain and scarring. 2018. 123: p. 3-17.
3. Barrett, L.W., et al., Understanding acute burn injury as a chronic disease. 2019. 7.
4. Ladhani, H.A., C.J. Yowler, and J.A.J.S.i. Claridge, Burn wound colonization, infection, and sepsis. 2021. 22(1): p. 44-48.
5. Kalligeros, M., et al., MRSA colonization and acquisition in the burn unit: A systematic review and meta-analysis. 2019. 45(7): p. 1528-1536.
6. Yowler, C.J. and T.L. Coffee, Outpatient burn management, in Handbook of Burns Volume 1: Acute Burn Care. 2019, Springer. p. 435-442.
7. Al Wahaibi, L., et al., Methicillin-resistant Staphylococcus aureus colonization among healthcare workers in Oman. 2021. 15(10): p. 1426-1435.
8. Lachiewicz, A.M., et al., Bacterial infections after burn injuries: impact of multidrug resistance. 2017. 65(12): p. 2130-2136.
9. Gustave, K.J.I.C. and H. Epidemiology, Colonization and Infection With MRSA and CRKP and Its Result in an Increased Mortality Rate Within the Intensive Care and High-Dependency Units in Barbados. 2020. 41(S1): p. s173-s174.
10. Coia, J.E., et al., Joint Healthcare Infection Society (HIS) and Infection Prevention Society (IPS) guidelines for the prevention and control of meticillin-resistant Staphylococcus aureus (MRSA) in healthcare facilities. 2021. 118: p. S1-S39.
11. Haque, M., et al., Health care-associated infections–an overview. 2018: p. 2321-2333.
12. Bharadwaj, S., et al., Eliminating MRSA transmission in a tertiary neonatal unit–A quality improvement initiative. 2019. 47(11): p. 1329-1335.
13. Popovich, K.J., et al., MRSA transmission in intensive care units: genomic analysis of patients, their environments, and healthcare workers. 2021. 72(11): p. 1879-1887.
14. Parveen, S., et al., Prevalence of MRSA colonization among healthcare-workers and effectiveness of decolonization regimen in ICU of a Tertiary care Hospital, Lahore, Pakistan. 2020. 8(1): p. 38-41.
15. Ribeiro, A.C., et al., MRSA Colonization in Healthcare Professionals: a Systematic. 2021. 9: p. 1-6.
16. Hussain, S., et al., Prevalence of methicillin resistant Staphylococcus aureus (MRSA) in surgical site infections in a tertiary care hospital. 2018: p. 81-85.
17. Tsige, Y., et al., Prevalence of Methicillin-Resistant Staphylococcus Aureus and Associated Risk Factors Among Patients With Wound Infection at Referral Hospital, Northeast Ethiopia. 2020. 2020(1): p. 3168325.
18. Hafeez, R., A. Chughtai, and M.J.I.J.o.P. Aslam, Prevalence and antimicrobial susceptibility of methicillin resistant Staphylococcus aureus (MRSA). 2018: p. 10-16.
19. Loke, H., et al., Length of stay and odds of MRSA acquisition: a dose–response relationship? 2019. 147: p. e223.
20. Gallaher, J.R., et al., Predictors of multi-drug resistance in burn wound colonization following burn injury in a resource-limited setting. 2021. 47(6): p. 1308-1313.