ORIGINAL ARTICLE

Prevalence of methicillin-resistant *Staphylococcus aureus* in common pyodermas: A cross-sectional study at Fazaia Medical affiliated teaching hospital Islamabad

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ABSTRACT

Background: Pyodermas are purulent skin infections involving the epidermis, dermis, or hair follicles. *Staphylococcus aureus* is the predominant causative agent, with methicillin-resistant *Staphylococcus aureus* (MRSA) becoming an increasing concern in both hospital and community settings. The aim of the study was to determine the prevalence of MRSA in common pyoderma cases.

Material and Methods: This descriptive cross-sectional study was conducted over six months in the Dermatology Department of Fazaia Medical Affiliated Teaching Hospital, Islamabad. A total of 150 patients with pyodermas were enrolled through non-probability consecutive sampling. Clinical data were recorded, and pus specimens were collected using sterile swabs after saline cleansing. Cultures were performed on nutrient agar, Mannitol salt agar, blood agar, and MacConkey agar. MRSA detection was carried out using the Kirby-Bauer disc diffusion method with Mueller-Hinton agar using cefoxitin discs according to CLSI guidelines.

Results: The mean patient age was 30.58 ± 17.44 years, with 91 (60.67%) males and 59 (39.33%) females. Furuncle (32.67%) and folliculitis (28.67%) were the most common diagnoses. MRSA was isolated in 53 (35.33%) patients. MRSA prevalence was significantly higher in secondary pyodermas (66.7%) versus primary pyodermas (21.9%) ($p<0.001$), in patients with symptoms >10 weeks (66.7%) versus ≤10 weeks (29.4%) ($p<0.001$), and in those with fewer lesions (41.7%) compared to those with more lesions (10%) ($p=0.001$).

Conclusion: The 35.33% MRSA prevalence aligns with other regional studies. The higher detection in secondary and chronic pyodermas highlights its clinical importance.

Keywords: Antimicrobial resistance, Community-acquired infections, Methicillin-resistant *Staphylococcus aureus*, Pyoderma, Skin infections

BACKGROUND

Pyodermas are purulent skin infections involving the epidermis, dermis, or hair follicles. They are broadly categorized into primary pyodermas, which arise on previously healthy skin, and secondary pyodermas, which develop over pre-existing dermatoses such as eczema, ulcers, or insect bites.[1] Common primary pyodermas include impetigo, furuncle, carbuncle, folliculitis, sycosis barbae, and ecthyma.[2]

Staphylococcus aureus is the most frequent etiological agent of pyodermas.[3] It may be either methicillin-sensitive (MSSA) or methicillin-resistant (MRSA). First reported in the 1960s, MRSA was initially associated with nosocomial infections but has now become a significant cause of community-acquired infections.[4] Methicillin resistance is conferred by the mecA gene, which encodes an altered penicillin-binding protein (PBP2a), rendering standard β-lactam antibiotics ineffective.[5] Moreover, MRSA strains often possess additional resistance mechanisms against other antibiotic classes such as macrolides, fluoroquinolones, and aminoglycosides.[6]

MRSA infections are associated with increased morbidity, prolonged hospital stay, and higher healthcare costs compared to MSSA infections.[7] The prevalence of MRSA varies globally. Lower rates are reported in Europe due to stringent infection control policies, whereas Pakistan and neighboring countries have significantly higher rates.[8] Pakistani studies have reported MRSA prevalence ranging between 31.5% and 44.2% in skin infections.[9–11] However, most of the available literature focuses on hospital-based or mixed populations, and there is limited data specifically addressing the burden of MRSA in community-acquired pyodermas presenting to dermatology outpatient

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departments in Pakistan. Additionally, existing studies provide limited insight into the association of MRSA with clinical characteristics such as duration of disease, lesion burden, and type of pyoderma, highlighting an important gap in local evidence.

Therefore, this study was conducted to determine the prevalence of MRSA in patients presenting with common pyodermas at a tertiary care dermatology department and to evaluate its association with key clinical variables, thereby contributing to local data that may help guide empirical antibiotic therapy and antimicrobial stewardship strategies.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted at the Dermatology Department, Fazaia Medical Affiliated Teaching Hospital, Islamabad, over a six-month period from July 1 to December 31, 2022. Ethical approval was obtained from the Hospital Ethics Committee (IRB #PH/DERM/2022/45), and written informed consent was obtained from all participants.

A total of 150 patients aged 12 to 70 years with clinically diagnosed pyodermas were enrolled using non-probability consecutive sampling. The sample size was calculated using the WHO sample size formula, assuming a 44% MRSA prevalence from earlier studies,[9] a 95% confidence level, and an 8% margin of error.

Patients with signs of pyoderma (e.g., pustules, abscesses, erosions) were included, while those with recent antibiotic use (within the last two weeks), immunocompromising conditions (e.g., HIV, malignancy, uncontrolled diabetes), or who refused consent were excluded.

Detailed demographic and clinical information, including age, gender, type of pyoderma, number of lesions, anatomical site, and duration of disease, were recorded using a structured proforma after thorough clinical examination. Pus swabs were collected aseptically after saline cleansing. One swab was used for Gram staining and another for bacterial culture. Samples were inoculated onto nutrient agar, Mannitol salt agar, blood agar, and MacConkey agar, and incubated at 37°C for 24 hours. Nutrient agar was used as a general-purpose medium to support the growth of non-fastidious organisms and to enhance the recovery of bacterial isolates in conjunction with selective and differential media, in accordance with standard microbiological practices.

Identification of *Staphylococcus aureus* was confirmed using Gram staining and coagulase testing. MRSA detection was performed using the Kirby-Bauer disc diffusion method on Mueller-Hinton agar, employing oxacillin (1 µg) and cefoxitin (30 µg) discs, as per CLSI guidelines.[12] Cefoxitin disc diffusion was considered the primary method for phenotypic detection of MRSA as recommended by CLSI, while oxacillin was used as an adjunct to enhance detection accuracy and allow comparison with earlier methodologies reported in literature. Antibiotic susceptibility testing was done using the Clinical and Laboratory Standards Institute (CLSI) 2021 protocol.[12]

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 22. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages.

The association between MRSA positivity and clinical variables was assessed using the Chi-square test. Normality of continuous variables was evaluated using the Shapiro–Wilk test, and a p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 150 patients were enrolled in the study with a male predominance (60.7%) (Table-I). Furuncle was the most common diagnosis, followed by folliculitis and impetigo (Table-II). Most cases were primary pyodermas, while a smaller proportion comprised secondary pyodermas (Table-II). The majority of patients had disease duration ≤10 weeks and ≤6 lesions (Table-II). Methicillin-resistant *Staphylococcus aureus* (MRSA) was isolated in 53 (35.3%) patients, while methicillin-sensitive *Staphylococcus aureus (MSSA)* was identified in 97 (64.7%) patients (Figure-I). The association between MRSA positivity and clinical characteristics is presented in Table-III. MRSA positivity was significantly higher in patients with a disease duration of >10 weeks (66.7%) compared to those with ≤10 weeks (29.4%) ($p < 0.001$). Similarly, MRSA was more frequently observed in patients with ≤6 lesions (41.7%) compared to those with >6 lesions (10%) ($p = 0.001$). A statistically significant association was also observed between MRSA and type of pyoderma, with higher positivity in secondary pyodermas (66.7%) compared to primary pyodermas (21.9%) ($p < 0.001$).

Table-I: Demographic characteristics of study participants (n=150).

Characteristic	Frequency (%)
Age (years)	
Mean ± SD	30.58±17.44
Gender	
Male	91 (60.67%)
Female	59 (39.33%)

Table-II: Clinical characteristics of study participants (n=150).

Characteristic	**Frequency (%)**
Diagnosis	
Furuncle	49 (32.67%)
Folliculitis	43 (28.67%)
Impetigo	21 (14.00%)
Ecthyma	15 (10.00%)
Carbuncle	8 (5.33%)
Secondary pyodermas	14 (9.33%)
Type of Pyoderma	
Primary	105 (70.00%)
Secondary	45 (30.00%)
Duration of Complaint	
≤10 weeks	126 (84.00%)
>10 weeks	24 (16.00%)
Mean Duration	7.44 ± 3.15
Number of Lesions	
≤6	120 (80.00%)
>6	30 (20.00%)
Mean number of lesions	3.48 ± 3.35

Table-III: Association of MRSA positivity with clinical characteristics (n=150)

Characteristic	MRSA Positive (n=53) (%)	MSSA (n=97) (%)	p-value
Duration of Complaint			<0.001
≤10 weeks	37 (29.4%)	89 (70.6%)	
>10 weeks	16 (66.7%)	8 (33.3%)	
Number of Lesions			0.001
≤6	50 (41.7%)	70 (58.3%)	
>6	3 (10.0%)	27 (90.0%)	
Type of Pyoderma			<0.001
Primary	23 (21.9%)	82 (78.1%)	
Secondary	30 (66.7%)	15 (33.3%)	
Diagnosis			<0.001
Furuncle	17 (34.7%)	32 (65.3%)	
Folliculitis	10 (23.3%)	33 (76.7%)	
Impetigo	5 (23.8%)	16 (76.2%)	

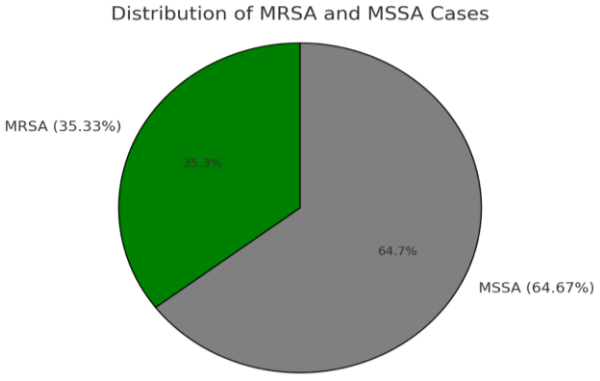

Figure-I: Overall prevalence of MRSA among study participants (n=150).

DISCUSSION

The present study evaluated the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in patients with pyodermas and its association with clinical characteristics. The overall prevalence of MRSA was found to be 35.3%, indicating a substantial burden of resistant infections in the studied population. A significant association was observed between MRSA positivity and disease duration, number of lesions, and type of pyoderma.

The prevalence of MRSA observed in this study (35.3%) is comparable to findings from other regional studies. Previous studies conducted in Pakistan have reported MRSA prevalence ranging from 31% to 44% in skin and soft tissue infections. [9-11,15] Similar trends have been observed in other developing countries, where a higher burden of MRSA is attributed to widespread and often irrational use of antibiotics, lack of strict infection control practices, and limited antimicrobial stewardship programs.[6,8] In contrast, relatively lower prevalence rates have been reported in developed countries due to better infection control measures and antibiotic regulation.[16]

Furuncle and folliculitis were the most frequently diagnosed conditions in this study, which is consistent with findings reported in adult dermatology literature.[13 17] In contrast, pediatric studies often identify impetigo as the most common presentation.[14 20] This variation highlights the influence of age-related factors and hygiene practices on the clinical spectrum of pyodermas.

In the present study, a significant association was observed between MRSA positivity and clinical variables such as duration of disease, number of lesions, and type of pyoderma. Higher MRSA prevalence in patients with longer disease duration may be attributed to prolonged bacterial colonization and increased likelihood of prior antibiotic exposure, leading to selection of resistant strains. Similarly, the higher frequency of MRSA in secondary pyodermas may be due to disruption of the skin barrier and underlying dermatoses, which facilitate colonization by resistant organisms. These findings are consistent with previous studies that have reported similar associations between MRSA and chronic or complicated skin infections.[18 19]

Given the relatively high prevalence of MRSA observed in this study, empirical coverage for MRSA may be considered in selected clinical scenarios, particularly in patients with chronic, recurrent, or secondary pyodermas.

RECOMMENDATIONS

Based on the findings of this study, it is recommended that clinicians consider the possibility of MRSA in patients presenting with chronic, recurrent, or secondary pyodermas. Culture and sensitivity testing should be encouraged in selected cases to guide appropriate antibiotic therapy. Additionally, rational use of antibiotics and implementation of antimicrobial stewardship practices are essential to limit the emergence of resistant strains.

LIMITATIONS

This study has certain limitations. Being a single-center study with a relatively small sample size, the findings may not be generalizable to the wider population. Additionally, detailed quantitative analysis of antimicrobial susceptibility patterns was limited, as data were primarily presented in qualitative form. Further multicenter studies with larger sample sizes and detailed susceptibility profiling are recommended to validate these findings.

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CONCLUSION

The present study demonstrates a considerable prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) among patients with pyodermas, highlighting its emerging clinical significance. MRSA was significantly associated with longer disease duration, secondary pyodermas, and specific clinical characteristics. These findings highlight the clinical importance of MRSA in pyoderma patients and support the use of culture-based evaluation in selected cases to facilitate appropriate management.

CONFLICT OF INTEREST

None

GRANT SUPPORT & FINANCIAL DISCLOSURE

Declared none

AUTHOR CONTRIBUTION

Nadia Ghazanfar: Substantial contributions to study design, acquisition of data, manuscript drafting or reviewing it critical for important intellectual content, has given final approval of the version to be published.

Muneeza Rizwan: Substantial contributions to acquisition of data, critical review of manuscript, has given final approval of the version to be published

Sajida Bibi: Study concept, design, and data analysis, drafting and critical review, has given final approval of the version to be published

Maryam Rassul: Substantial contributions to acquisition of data, review and formatting, has given final approval of the version to be published

Musafir Ali: Data collection and tabulation, technical support, has given final approval of the version to be published.

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