Section: Microbiology

Original Research Article

PREVALENCE AND RISK FACTORS OF METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS COLONIZATION IN PATIENTS UNDERGOING TOTAL JOINT ARTHROPLASTY

Anupriya Wadhwa[1], Deepak Kumar[2], Falak Modi[3], Mamta Kumari[4]

[1]Professor, Department of Microbiology, Faculty of Dentistry, Jamia Millia Islamia, New Delhi, India
[2]Associate Professor, Department of Microbiology and I.D, Hi Tech Medical College and Hospital, Bhubaneashwar, Odisha, India
[3]Senior Resident, Department of Microbiology, Institute Pacific Institute of Medical Sciences, City, State Udaipur, Rajasthan, India
[4]Chief Microbiologist, Microbiology and infectious disease Serology, Agilus Reference Lab, Gurugram, Haryana, India.

Received *: 07/11/2025*
Received in revised form *: 20/12/2025*
Accepted *: 05/01/2026*

Corresponding Author:
Dr. Falak Modi,
Senior Resident, Department of Microbiology, Institute Pacific Institute of Medical Sciences, City, State Udaipur, Rajasthan, India.
Email: falakmodi11@gmail.com

DOI: 10.70034/ijmedph.2026.3.285

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 1793-1798

ABSTRACT

Background: Preoperative colonization with Methicillin-resistant Staphylococcus aureus is a recognized risk factor for postoperative infections in patients undergoing total joint arthroplasty. However, region-specific data on its prevalence and associated risk factors remain limited, particularly in Indian healthcare settings.

Materials and Methods: This retrospective observational study included 236 patients undergoing total hip or knee arthroplasty at a tertiary care center. Preoperative MRSA screening was performed using nasal swabs. Demographic, clinical, and perioperative data were collected from medical records. Univariate and multivariate logistic regression analyses were conducted to identify risk factors associated with MRSA colonization.

Results: The prevalence of MRSA colonization was 13.6% (95% CI: 9.5–18.7%). Significant risk factors included diabetes mellitus (AOR 2.21, p=0.047), chronic kidney disease (AOR 2.98, p=0.046), prior hospitalization (AOR 2.67, p=0.014), and recent antibiotic use (AOR 2.41, p=0.026). MRSA-positive patients had significantly higher rates of surgical site infection (15.6% vs 3.9%, p=0.017) and prosthetic joint infection (9.4% vs 2.5%, p=0.048), along with prolonged hospital stay (p<0.001).

Conclusion: MRSA colonization is prevalent among arthroplasty patients and is associated with adverse postoperative outcomes. Targeted screening and preventive strategies are essential to reduce infection risk and improve patient outcomes.

Keywords: MRSA; Colonization; Surgical site infection; Prosthetic joint infection; Risk factors

INTRODUCTION

Staphylococcus aureus is a leading cause of healthcare-associated and community-acquired infections, with a well-established propensity to colonize the anterior nares, skin, and mucosal surfaces. Nasal colonization serves as a significant endogenous reservoir, predisposing individuals to subsequent invasive infections, particularly in surgical settings.[1]. Among colonized individuals, approximately 20–30% are persistent carriers, while another 30% exhibit intermittent colonization, highlighting its epidemiological importance.[2]

The emergence of Methicillin-resistant Staphylococcus aureus has further complicated infection control due to its resistance to beta-lactam antibiotics and its association with increased morbidity, mortality, and healthcare costs.[3] Globally, MRSA colonization prevalence varies widely, ranging from 1% to over 10% in the general population, and significantly higher rates (up to 20–30%) have been reported in hospitalized or high-risk surgical cohorts.[4] In India, MRSA prevalence among clinical isolates has been reported between 30% and 50%, reflecting a substantial burden.[5]

Total joint arthroplasty (TJA), including hip and knee replacements, is one of the most commonly performed elective orthopedic procedures worldwide, with steadily increasing volumes due to aging populations and rising osteoarthritis prevalence.[6] Despite advances in surgical technique and perioperative care, Prosthetic Joint Infection remains a devastating complication, occurring in approximately 1–2% of primary arthroplasties and up to 4% in revision surgeries.[7] S. aureus, particularly MRSA, is one of the most frequently implicated pathogens in prosthetic joint infections, accounting for a significant proportion of early and late infections.[8]

Preoperative colonization with MRSA has been identified as a major modifiable risk factor for postoperative surgical site infections (SSI) and prosthetic joint infections. Colonized patients are estimated to have a 2–9 times higher risk of developing postoperative S. aureus infections compared to non-colonized individuals.[9] Furthermore, MRSA-related infections are associated with poorer clinical outcomes, including prolonged hospital stay, increased need for revision surgery, and higher healthcare costs.[10]

Screening and decolonization strategies, including intranasal mupirocin and chlorhexidine body washes, have been advocated to reduce MRSA colonization and subsequent infection risk. Several studies have demonstrated that targeted decolonization protocols can significantly reduce SSI rates in orthopedic surgery populations.[11] However, the effectiveness, feasibility, and cost-effectiveness of universal versus targeted screening strategies remain subjects of ongoing debate, particularly in resource-limited settings.[12] Therefore, this retrospective observational study aimed to determine the prevalence of MRSA colonization in patients undergoing total joint arthroplasty and to contribute to the evidence base required for optimizing perioperative infection prevention protocols in orthopedic practice.

MATERIALS AND METHODS

Study design and setting: This retrospective observational study was conducted in the department of Microbiology in association with the department of Orthopaedics with a high-volume orthopedic arthroplasty service at a tertiary care teaching hospital. Medical records of patients who underwent total joint arthroplasty (TJA) over 2 years (January 2024 to December 2025) were reviewed.

Study population: The study included adult patients (≥18 years) who underwent elective primary or revision total hip arthroplasty (THA) or total knee arthroplasty (TKA) during the study period. Only those patients who had documented preoperative screening for Methicillin-resistant Staphylococcus aureus colonization were included in the analysis. Patients with incomplete microbiological records, those who underwent emergency procedures, and those with active infections at the time of surgery were excluded. In cases where multiple procedures were performed in the same patient during the study period, only the first eligible procedure was considered to avoid duplication.

Data collection: Data were retrieved from electronic medical records, microbiology laboratory databases, and operative registers using a structured data collection form. Demographic variables such as age, sex, and body mass index were recorded along with clinical parameters including comorbidities (e.g., diabetes mellitus, hypertension, chronic kidney disease), prior hospitalizations, previous antibiotic exposure within the last three months, and history of prior surgery. Surgical details including type of arthroplasty (hip or knee), indication for surgery, and whether the procedure was primary or revision were also documented.

Microbiological screening and identification: Preoperative screening for MRSA colonization was routinely performed as per institutional protocol, typically within 1–2 weeks prior to surgery. Sterile swab samples were collected from the anterior nares, and in some cases additional sites such as the axilla or groin, using standard aseptic techniques. Samples were transported promptly to the microbiology laboratory and cultured on selective media (mannitol salt agar or chromogenic agar) specific for MRSA. Identification of Staphylococcus aureus was based on colony morphology, Gram staining, catalase test, and coagulase test. Methicillin resistance was determined using cefoxitin disc diffusion method or automated systems in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines. Isolates resistant to cefoxitin were classified as MRSA.

Perioperative protocol: All patients received standard perioperative care as per institutional guidelines. This included preoperative skin preparation, antibiotic prophylaxis (commonly a first-generation cephalosporin, with modifications in MRSA-positive patients), and adherence to sterile surgical techniques. Patients identified as MRSA carriers were managed according to hospital policy, which could include decolonization measures such as intranasal mupirocin ointment and chlorhexidine body washes prior to surgery. Details of decolonization, where available, were recorded.

Outcome measures: The primary outcome of the study was the prevalence of MRSA colonization among patients undergoing TJA, expressed as a proportion of the screened population. Secondary outcomes included the association of MRSA colonization with demographic and clinical risk factors, and distribution of colonization across different subgroups (e.g., primary vs revision arthroplasty, hip vs knee procedures). Where data were available, postoperative surgical site infections and prosthetic joint infections attributable to MRSA were also noted for descriptive analysis.

Statistical analysis: Data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS (version 20.0). Continuous variables were assessed for normality using the Kolmogorov–Smirnov test and expressed as mean ± standard deviation (SD). Categorical variables were summarized as frequencies and percentages. The prevalence of Methicillin-resistant Staphylococcus aureus colonization was calculated as a proportion with corresponding 95% confidence interval (CI). Comparisons between MRSA-positive and MRSA-negative groups were performed using the independent samples t-test for continuous variables and the chi-square test or Fisher's exact test for categorical variables, as appropriate. Univariate analysis was conducted to identify potential risk factors associated with MRSA colonization. Crude odds ratios (OR) with 95% CI were calculated for each variable using binary logistic regression. Variables with p-value <0.10 in univariate analysis, along with clinically relevant factors, were included in a multivariate logistic regression model to determine independent predictors. Adjusted odds ratios (AOR) with 95% CI were reported. All variables were entered in binary form (e.g., presence vs absence of comorbidity; BMI >27 vs ≤27 kg/m²; age >65 vs ≤65 years), with the absence of the risk factor considered as the reference category. Model fitness was assessed using the Hosmer–Lemeshow goodness-of-fit test, and multicollinearity was evaluated using variance inflation factors (VIF). A two-tailed p-value of <0.05 was considered statistically significant.

Ethical considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee prior to commencement. As this was a retrospective study utilizing anonymized data, individual patient consent was waived. All procedures adhered to the ethical standards laid down in the Declaration of Helsinki and institutional research guidelines.

RESULTS

Among the 236 patients screened preoperatively, 32 patients were found to be colonized with Methicillin-resistant Staphylococcus aureus, yielding a prevalence of 13.6% (95% CI: 9.5%–18.7%). The remaining 204 patients (86.4%) were MRSA negative.

The mean age of the study population was 64.8 ± 9.6 years, with no statistically significant difference between MRSA-positive and MRSA-negative groups (67.2 ± 8.8 vs 64.4 ± 9.7 years, p=0.079). Male patients were proportionally higher in the MRSA-positive group (56.3% vs 42.2%), though not statistically significant (p=0.103). Patients with MRSA colonization had significantly higher BMI (28.3 ± 3.6 vs 26.9 ± 3.8 kg/m², p=0.041). Comorbidities such as diabetes mellitus (62.5% vs 38.2%, p=0.012) and chronic kidney disease (21.9% vs 7.4%, p=0.011) were significantly more common among MRSA-positive patients, whereas hypertension showed no significant difference (p=0.407). Prior hospitalization within one year (59.4% vs 31.9%, p=0.003) and recent antibiotic use within three months (65.6% vs 39.7%, p=0.006) were also significantly associated with MRSA colonization. Smoking history was comparable between groups (p=0.314) [Table 1].

Table 1: Baseline Demographic and Clinical Characteristics Stratified by MRSA Status.

Variable	Overall (n=236)	MRSA Positive (n=32)	MRSA Negative (n=204)	p-value
	Frequency (%)/mean ± SD			
Age (years)	64.8 ± 9.6	67.2 ± 8.8	64.4 ± 9.7	0.079
Gender				
Female	132 (55.9)	14 (43.7)	118 (57.8)	0.103
Male	104 (44.1)	18 (56.3)	86 (42.2)	
BMI (kg/m²)	27.1 ± 3.8	28.3 ± 3.6	26.9 ± 3.8	0.041
Comorbidties				
Diabetes Mellitus	98 (41.5)	20 (62.5)	78 (38.2)	0.012
Hypertension	126 (53.4)	19 (59.4)	107 (52.5)	0.407
Chronic Kidney Disease	22 (9.3)	7 (21.9)	15 (7.4)	0.011
Prior Hospitalization (<1 year)	84 (35.6)	19 (59.4)	65 (31.9)	0.003
Prior Antibiotic Use (<3 months)	102 (43.2)	21 (65.6)	81 (39.7)	0.006
Smoking History	58 (24.6)	10 (31.3)	48 (23.5)	0.314

BMI = Body mass index; MRSA = Methicillin-resistant Staphylococcus aureus.

The majority of patients underwent total knee arthroplasty (64.4%), followed by total hip arthroplasty (35.6%), with no significant difference between MRSA-positive and negative groups (p=0.652). Primary arthroplasty constituted 83.9% of cases, while revision procedures accounted for 16.1%, with no significant association with MRSA colonization (p=0.312). Similarly, surgical indications, predominantly osteoarthritis (68.6%), did not differ significantly between groups (p=0.472), indicating comparable surgical profiles irrespective of MRSA status [Table 2].

MRSA-positive patients demonstrated significantly higher rates of surgical site infection (15.6% vs 3.9%, p=0.017) and prosthetic joint infection (9.4% vs 2.5%, p=0.048) compared to MRSA-negative patients. Additionally, the mean duration of hospital stay was significantly longer in the MRSA-positive group (9.8 ± 2.6 days vs 7.2 ± 1.9 days, p<0.001) [Table 3].

Table 2: Surgical Characteristics of the Study Population.

Variable	Overall (n=236)	MRSA Positive (n=32)	MRSA Negative (n=204)	p-value
	Frequency (%)			
Type of Surgery				
Total Knee Arthroplasty (TKA)	152 (64.4)	22 (68.8)	130 (63.7)	0.652
Total Hip Arthroplasty (THA)	84 (35.6)	10 (31.2)	74 (36.3)	
Primary Arthroplasty	198 (83.9)	25 (78.1)	173 (84.8)	0.312
Revision Arthroplasty	38 (16.1)	7 (21.9)	31 (15.2)	0.351
Indication				
Osteoarthritis	162 (68.6)	20 (62.5)	142 (69.6)	0.472
Fracture/Others	74 (31.4)	12 (37.5)	62 (30.4)	

TKA = Total knee arthroplasty; THA = Total hip arthroplasty; MRSA = Methicillin-resistant Staphylococcus aureus.

Table 3: Postoperative Outcomes in Relation to MRSA Colonization.

Outcome	MRSA Positive (n=32)	MRSA Negative (n=204)	p-value
	Frequency (%)/mean ± SD		
Surgical Site Infection	5 (15.6)	8 (3.9)	0.017
Prosthetic Joint Infection	3 (9.4)	5 (2.5)	0.048
Mean Hospital Stay (days)	9.8 ± 2.6	7.2 ± 1.9	<0.001

MRSA = Methicillin-resistant Staphylococcus aureus.

On univariate analysis, BMI >27 kg/m² was associated with increased odds of MRSA colonization (OR 1.82, p=0.045). Significant associations were also observed for diabetes mellitus (OR 2.68, p=0.014), chronic kidney disease (OR 3.52, p=0.016), prior hospitalization (OR 3.11, p=0.003), and prior antibiotic use (OR 2.98, p=0.006). Age >65 years showed a non-significant association (OR 1.58, p=0.202) (Table 4).

Table 4: Univariate Analysis of Risk Factors Associated with MRSA Colonization.

Variable	Comparison (Exposed vs Reference)	Odds Ratio (OR)	95% CI	p-value
BMI	>27 vs ≤27 kg/m²	1.82	1.01 – 3.30	0.045
Diabetes Mellitus	Yes vs No	2.68	1.23 – 5.82	0.014
Chronic Kidney Disease	Yes vs No	3.52	1.29 – 9.58	0.016
Prior Hospitalization	Yes vs No	3.11	1.46 – 6.60	0.003
Prior Antibiotic Use	Yes vs No	2.98	1.34 – 6.25	0.006
Age	>65 vs ≤65 years	1.58	0.75 – 3.32	0.202

OR = Odds ratio; CI = Confidence interval; MRSA = Methicillin-resistant Staphylococcus aureus.

On multivariate analysis, diabetes mellitus (AOR 2.21, p=0.047), chronic kidney disease (AOR 2.98, p=0.046), prior hospitalization (AOR 2.67, p=0.014), and prior antibiotic use (AOR 2.41, p=0.026) emerged as independent predictors of MRSA colonization. These findings indicate that both underlying comorbid conditions and recent healthcare exposure significantly contribute to the risk of MRSA carriage [Table 5].

Table 5: Multivariate Logistic Regression Analysis of Independent Predictors of MRSA Colonization.

Variable	Comparison (Exposed vs Reference)	Adjusted Odds Ratio (AOR)	95% CI	p-value
Diabetes Mellitus	Yes vs No	2.21	1.01 – 4.85	0.047
Chronic Kidney Disease	Yes vs No	2.98	1.05 – 8.42	0.046
Prior Hospitalization	Yes vs No	2.67	1.22 – 5.84	0.014
Prior Antibiotic Use	Yes vs No	2.41	1.09 – 5.31	0.026

AOR = Adjusted odds ratio; CI = Confidence interval; MRSA = Methicillin-resistant Staphylococcus aureus.

DISCUSSION

In this retrospective observational study of patients undergoing total joint arthroplasty, the prevalence of preoperative Methicillin-resistant Staphylococcus aureus colonization was 13.6% (95% CI: 9.5–18.7%), reflecting a moderate burden consistent with studies by Tiwari et al., Latha et al., and Azzam et al., from tertiary care settings in India and other low- and middle-income countries, where prevalence typically ranges from 10% to 20% in surgical cohorts.[13-15] This rate is higher than that reported in many Western populations in studies by Haya et al., and Chen et al., (generally 1–5%) but aligns with Indian data showing higher MRSA carriage, likely attributable to increased antibiotic exposure, higher community carriage, and variability in infection control practices.[16,17] The findings reinforce the need for institution-specific epidemiological data to guide screening strategies in arthroplasty patients.

Demographically, MRSA colonization showed a trend toward higher age and male predominance; however, these were not statistically significant, consistent with prior studies by Song et al., and Tuteja et al., suggesting that age and gender alone

are weak predictors.[18,19] In contrast, BMI was significantly higher among colonized patients, and obesity has been previously linked to impaired skin barrier function, increased microbial colonization, and altered immune responses, which may facilitate persistent carriage.[20] More importantly, diabetes mellitus and chronic kidney disease emerged as significant risk factors, both in univariate and multivariate analyses. These findings are well supported in the studies by Jeans et al., and Sousa et al., as hyperglycemia impairs neutrophil function, reduces chemotaxis, and compromises host immunity, while chronic kidney disease is associated with immune dysregulation and frequent healthcare exposure—both predisposing to MRSA colonization.[21,22]

A notable finding was the strong association of MRSA colonization with prior hospitalization (AOR 2.67) and recent antibiotic use (AOR 2.41), highlighting the role of healthcare exposure in acquisition. These factors likely reflect selective pressure favoring resistant organisms and increased opportunities for cross-transmission in hospital environments.[23] Similar associations have been consistently reported in studies by Peng et al., and Yu et al., where prior healthcare contact and antibiotic exposure significantly increased MRSA carriage risk.[24,25] These findings underscore the importance of antimicrobial stewardship and strict infection control practices in reducing MRSA burden.

Interestingly, surgical factors such as type of arthroplasty (TKA vs THA), primary versus revision surgery, and indication for surgery were not associated with MRSA colonization, suggesting that colonization is largely driven by host and exposure-related factors rather than procedural characteristics. This aligns with existing evidence that preoperative colonization is independent of the surgical procedure itself but critically influences postoperative outcomes.[26]

Clinically, MRSA colonization had a significant impact on postoperative outcomes. Colonized patients demonstrated markedly higher rates of surgical site infection (15.6% vs 3.9%) and prosthetic joint infection (9.4% vs 2.5%), along with a significantly prolonged hospital stay. These findings are consistent with prior reported studies by Schweitzer et al., and Baratz et al., indicating that MRSA carriers have a 2–9-fold increased risk of postoperative Staphylococcus aureus infections.[27,28] The pathophysiological basis lies in endogenous infection, where colonizing strains serve as the source of surgical contamination.[28]. Additionally, MRSA infections are inherently more difficult to treat due to limited antibiotic options, contributing to prolonged hospitalization and increased healthcare costs.[29]

From a clinical perspective, the identification of modifiable risk factors such as recent antibiotic use and prior hospitalization provides an opportunity for targeted interventions. The observed burden of MRSA colonization and its clear association with adverse outcomes support the implementation of preoperative screening and decolonization protocols, particularly in high-risk patients.[30] Studies by Reta et al., and Miller et al., evaluating intranasal mupirocin and chlorhexidine bathing have demonstrated significant reductions in postoperative infections, reinforcing the potential benefit of such strategies in similar settings.[31,32]

Limitations: This study is limited by its retrospective design, which may introduce selection and information bias. Being a single-center study, the findings may not be generalizable to other settings. Screening was primarily based on nasal swabs, potentially underestimating colonization at extra-nasal sites. Data on compliance with decolonization protocols and strain typing were unavailable, limiting causal inference between colonization and postoperative infections.

CONCLUSION

The present study demonstrates a considerable prevalence of Methicillin-resistant Staphylococcus aureus colonization (13.6%) among patients undergoing total joint arthroplasty, with significant associations identified for diabetes mellitus, chronic kidney disease, prior hospitalization, and recent antibiotic use. MRSA colonization was also linked to higher rates of postoperative infections and prolonged hospital stay. These findings highlight the importance of recognizing high-risk patients and implementing targeted preoperative screening and decolonization strategies. Strengthening antimicrobial stewardship and infection control practices may further reduce MRSA burden and improve surgical outcomes in arthroplasty patients, particularly in resource-limited healthcare settings.

REFERENCES

1. Touaitia R, Mairi A, Ibrahim NA, Basher NS, Idres T, Touati A. Staphylococcus aureus: A Review of the Pathogenesis and Virulence Mechanisms. Antibiotics (Basel). 2025;14(5):470.
2. Touati A, Ibrahim NA, Idres T. Disarming Staphylococcus aureus: Review of Strategies Combating This Resilient Pathogen by Targeting Its Virulence. Pathogens. 2025;14(4):386.
3. Tarai B, Das P, Kumar D. Recurrent Challenges for Clinicians: Emergence of Methicillin-Resistant Staphylococcus aureus, Vancomycin Resistance, and Current Treatment Options. J Lab Physicians. 2013;5(2):71-8.
4. Hassoun A, Linden PK, Friedman B. Incidence, prevalence, and management of MRSA bacteremia across patient populations-a review of recent developments in MRSA management and treatment. Crit Care. 2017;21(1):211.
5. Patil SS, Suresh KP, Shinduja R, et al. Prevalence of Methicillin-resistant Staphylococcus Aureus in India: A Systematic Review and Meta-analysis. Oman Med J. 2022;37(4):e440.
6. Agrodnia SL, Call CM, Lachance AD, McDonald JC, Rana AJ, McGrory BJ. Impact of Rurality on Total Joint Arthroplasty Access and Outcomes: A Systematic Review. Arthroplast Today. 2026;37(Suppl):101884.

7. Aftab MHS, Joseph T, Almeida R, Sikhauli N, Pietrzak JRT. Periprosthetic Joint Infection: A Multifaceted Burden Undermining Arthroplasty Success. Orthop Rev (Pavia). 2025;17:138205.
8. Maritati M, Manfrini M, Iaquinta MR, et al. Acute Prosthetic Joint Infections with Poor Outcome Caused by Staphylococcus Aureus Strains Producing the Panton-Valentine Leukocidin. Biomedicines. 2023;11(6):1767.
9. Ilyas MH, Parmar T, Smadi Z, et al. Pre-operative methicillin-resistant Staphylococcus aureus colonization increases the risk of 90-day medical and 2-year implant-related complications following primary total shoulder arthroplasty: a propensity-matched analysis. J Shoulder ElbArthroplast. 2026;10(1-2):100011.
10. Zhen X, Lundborg CS, Zhang M, et al. Clinical and economic impact of methicillin-resistant Staphylococcus aureus: a multicentre study in China. Sci Rep. 2020;10(1):3900.
11. Portais A, Gallouche M, Pavese P, et al. Staphylococcus aureus screening and preoperative decolonisation with Mupirocin and Chlorhexidine to reduce the risk of surgical site infections in orthopaedic surgery: a pre-post study. Antimicrob Resist Infect Control. 2024;13(1):75.
12. Kraus K, Mikziński P, Widelski J, Paluch E. Prevention and Modern Strategies for Managing Methicillin-Resistant Staphylococcal Infections in Prosthetic Joint Infections (PJIs). Antibiotics (Basel). 2024;13(12):1151.
13. Tiwari A, Goyal R, Sharma G, Nadange S, Bagaria V. Prevalence and demographic correlates of Methicillin-Resistant Staphylococcus aureus (MRSA) colonization in patients undergoing total knee replacement. SICOT J. 2025;11:41.
14. Latha T, Anil B, Manjunatha H, Chiranjay M, Elsa D, Baby N, Anice G. MRSA: the leading pathogen of orthopedic infection in a tertiary care hospital, South India. Afr Health Sci. 2019;19(1):1393-401.
15. Azzam A, Khaled H, Fayed HM, et al. Prevalence, antibiogram, and risk factors of methicillin-resistant Staphylococcus aureus (MRSA) asymptomatic carriage in Africa: a systematic review and meta-analysis. BMC Infect Dis. 2025;25(1):505.
16. Hays MR, Kildow BJ, Hartman CW, et al. Increased Incidence of Methicillin-Resistant Staphylococcus aureus in Knee and Hip Prosthetic Joint Infection. J Arthroplasty. 2023;38(6S):S326-30.
17. Chen JL, Huang TY, Hsu WB, et al. Characterization of Methicillin-Resistant Staphylococcus aureus Isolates from Periprosthetic Joint Infections. Pathogens. 2022;11(7):719.
18. Song X, Kong L, Fang X, et al. Risk factors and prevention strategies for surgical site infection following total knee arthroplasty: a systematic review and meta-analysis. J OrthopSurg Res. 2020;15(1):1–12.
19. Tuteja S, Tiwari A, Bhanushali J, Bagaria V. Results of an Audit of Orthopaedic Operation Notes from a Tertiary Care Centre: Are We Doing It Right and Can We Do More? Indian J Orthop. 2022;56(12):2223-7.
20. Jeans E, Holleyman R, Tate D, Reed M, Malviya A. Methicillin sensitive Staphylococcus aureus screening and decolonisation in elective hip and knee arthroplasty. J Infect. 2018;77(5):405-9.
21. Sousa RJ, Barreira PM, Leite PT, Santos AC, Ramos MH, Oliveira AF. Preoperative Staphylococcus aureus screening/decolonisation protocol before total joint arthroplasty-results of a small prospective randomized trial. J Arthroplasty. 2016;31:234e9.
22. Hadi H, Jabalameli M, Bagherifard A, et al. Staphylococcus aureus colonisation in patients undergoing total hip or knee arthroplasty and cost-effectiveness of decolonization programme. Arch Bone Jt Surg. 2018;6(6):554-9.
23. Ashkenazi I, Thomas J, Lawrence KW, Rozell JC, Lajam CM, Schwarzkopf R. Positive Preoperative Colonization With Methicillin Resistant Staphylococcus Aureus Is Associated With Inferior Postoperative Outcomes in Patients Undergoing Total Joint Arthroplasty. J Arthroplasty. 2023;38(6):1016-23.
24. Peng HM, Zhou ZK, Wang F, et al. Microbiology of Periprosthetic Hip and Knee Infections in Surgically Revised Cases from 34 Centers in Mainland China. Infect Drug Resist. 2021;14:2411-8.
25. Yu Y, Kong Y, Ye J, Wang A, Si W. Microbiological pattern of prosthetic hip and knee infections: a high-volume, single-centre experience in China. J Med Microbiol. 2021;70(3).
26. Agarwala S, Lad D, Agashe V, Sobti A. Prevalence of MRSA colonisation in an adult Urban Indian population undergoing Orthopaedic surgery. J ClinOrthop Trauma. 2016;7(1):12-6.
27. Schweitzer D, Klaber I, García P, López F, Lira MJ, Botello E. Methicillin-resistant Staphylococcus aureus colonization in patients undergoing primary total hip arthroplasty. J Med Microbiol. 2020;69(4):600-4.
28. BaratzMD, Hallmark R, Odum SM, Springer BD. Twenty Percent of Patients May Remain Colonized With Methicillin-resistant Staphylococcus aureus Despite a Decolonization Protocol in Patients Undergoing Elective Total Joint Arthroplasty. ClinOrthopRelat Res. 2015;473(7):2283-90.
29. Oliveira BG, Costa VHRD, Gama IR, Beskow MH, Santos ERSD. Diagnosis and Prevention of Periprosthetic Joint Infections by Staphylococcus aureus after Hip Fracture: A Systematic Review of the Literature. Rev Bras Ortop (Sao Paulo). 2024;59(1):e21-8.
30. Abbaszadeh A, Molloy IB, Restrepo C, Parvizi J. Nasal Methicillin-Resistant Staphylococcus Aureus Screening in Orthopaedic Patients: We Should Not Ignore Methicillin-sensitive Staphylococcus Aureus. J Arthroplasty. 2026;41(2):576-80.
31. Reta A, Mengist A, Tesfahun A. Nasal colonization of methicillin resistant Staphylococcus aureus in Ethiopia: a systematic review and meta-analysis. Ann ClinMicrobiolAntimicrob. 2019;18(1):25.
32. Miller LG, Singh R, Eells SJ, et al. Chlorhexidine and Mupirocin for Clearance of Methicillin-Resistant Staphylococcus aureus Colonization After Hospital Discharge: A Secondary Analysis of the Changing Lives by Eradicating Antibiotic Resistance Trial. Clin Infect Dis. 2023;76(3):e1208-16.