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Original Research Article

Incidence and Management of Post-Arthroplasty Joint Infections

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Abstract:

Introduction: Post-arthroplasty joint infection (PJI) is a serious complication following joint replacement surgeries, associated with significant morbidity, prolonged hospitalization, and increased healthcare costs. Early diagnosis and appropriate management are crucial to optimize functional outcomes and reduce implant failure.

Methods: This prospective observational study was conducted in the Department of Orthopaedics at Burdwan Medical College & Hospital over a period of one year, from May 2022 to May 2023. A total of 50 adult patients undergoing primary or revision total hip and knee arthroplasty were included. Data were collected on patient demographics (age and gender), type of arthroplasty performed, risk factors for post-arthroplasty joint infection, causative organisms, and management approaches. All patients were followed postoperatively to identify the occurrence of joint infections, and appropriate interventions were recorded. The study aimed to analyze the incidence, risk factors, microbial profile, and treatment outcomes of post-arthroplasty infections in this cohort.

Results: In this study of 50 patients undergoing total hip or knee arthroplasty, the majority were aged 60 years or older (60%) and male (56%), with total knee replacement being the most common procedure (70%). Post-arthroplasty joint infections occurred in 8 patients (16%). Diabetes mellitus and prolonged surgery duration (>120 minutes) were significantly associated with infection, while obesity and revision surgery showed a non-significant trend. Staphylococcus aureus was the predominant pathogen (50%), followed by coagulase-negative staphylococci and Gram-negative organisms. Management outcomes demonstrated that two-stage revision arthroplasty achieved 100% infection control, whereas debridement with implant retention was successful in 66.7% of cases.

Conclusion: Post-arthroplasty joint infections, though relatively uncommon, present significant challenges in orthopedic practice. Early recognition and timely intervention tailored to infection type and patient factors are critical to improving outcomes. Multi-disciplinary approaches combining targeted antibiotic therapy and appropriate surgical intervention remain the cornerstone of effective management.

Keywords: Post-arthroplasty infection, joint replacement, PJI, debridement, revision arthroplasty, incidence, management.

Introduction

Prosthetic joint infections (PJIs), also known as periprosthetic joint infections, are among the most serious complications following total joint arthroplasty, including total hip and knee replacements. These infections are associated with increased morbidity, prolonged hospital stays, repeated surgical interventions, and substantial healthcare costs [1,2]. The incidence of PJIs varies depending on factors such as type of joint replacement, patient characteristics, and surgical environment. Reported rates range from 0.25% to 2% for primary joint replacements, while revision arthroplasty carries higher infection rates [3,4].The risk of developing a PJI is influenced by multiple patient- and procedure-related factors. Total knee arthroplasty (TKA) has an estimated infection rate of approximately 1%, whereas total hip arthroplasty (THA) has a slightly lower incidence, around 0.9% . Patient-related risk factors include advanced age, diabetes mellitus, obesity, malnutrition, immunosuppression, and a history of prior joint surgery [5,6]. Procedure-related factors include prolonged operative time, perioperative contamination, poor soft tissue handling, and the use of cementless prostheses [5]. Early identification of high-risk patients is crucial to implement preventive measures and reduce the likelihood of infection. The microbial etiology of PJIs depends largely on the timing of infection. Early infections, which occur within three months post-surgery, are typically caused by virulent organisms such as Staphylococcus aureus, including methicillin-resistant strains (MRSA). Delayed infections, occurring between 3 and 12 months, are often caused by less virulent organisms such as

coagulase-negative Staphylococci or Propionibacterium acnes [7]. Understanding the microbiological profile is essential for tailoring appropriate antibiotic therapy and surgical management strategies.

Accurate and timely diagnosis is critical for the successful management of PJIs. Clinical presentation may include persistent pain, swelling, erythema, warmth around the joint, or drainage from the surgical site. Laboratory investigations include elevated inflammatory markers such as C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and white blood cell counts [8]. Definitive diagnosis often requires joint aspiration and microbiological culture. The Musculoskeletal Infection Society (MSIS) has proposed diagnostic criteria that include the presence of a sinus tract, positive cultures from the joint, or elevated synovial white blood cell counts [9]. Advanced imaging modalities and molecular diagnostic tools are increasingly used to enhance detection, especially in culture-negative cases. Management of PJIs requires a combination of surgical and antimicrobial strategies. Surgical options include debridement with implant retention (DAIR), one-stage revision arthroplasty, and two-stage revision arthroplasty. DAIR is generally indicated for early infections with a stable implant, whereas one- or two-stage revisions are preferred for chronic or resistant infections. Antibiotic therapy is tailored based on culture results, and a multidisciplinary approach involving orthopedic surgeons and infectious disease specialists is recommended to optimize outcomes [10].

Preventive strategies play a pivotal role in reducing the incidence of PJIs. Measures include strict aseptic surgical techniques, appropriate perioperative antibiotic prophylaxis, and patient optimization, such as controlling diabetes and improving nutritional status. The use of antibiotic-loaded cement has also been shown to reduce infection rates, particularly in high-risk patients.PJIs remain a significant challenge in joint arthroplasty. Early recognition, accurate diagnosis, and appropriate management are critical to preserving joint function and improving patient outcomes. Continued research into improved diagnostic tools, effective antimicrobial regimens, and preventive strategies is essential to reduce the burden of these infections .

Materials and Methods

Study Design: Prospective observational study.

Place of study

Burdwan Medical College & Hospital in the department of orthopaedics.

Period of study: May 2022 to May 2023 [1 Year]

Study Variables

- Age
- Gender
- Type of Arthroplasty
- Risk Factor
- Organism
- Management Approach

Sample Size: 50 Patients included were adults undergoing primary or revision total hip and knee arthroplasty.

Inclusion Criteria

- Adults undergoing primary or revision total hip or knee arthroplasty.
- Patients who consented to participate in the study.

Exclusion Criteria

- Patients with active systemic infections at the time of surgery.
- Immunocompromised patients (e.g., HIV, long-term steroid therapy).
- Patients with incomplete follow-up or lost to follow-up.
- Patients unwilling to provide informed consent.

Statistical Analysis: Data were collected and entered into a Microsoft Excel spreadsheet and subsequently analyzed using SPSS version 25.0 (IBM Corp., Chicago, IL, USA). Categorical variables, such as incidence of post-arthroplasty infection, were expressed as frequencies and percentages, while continuous variables, including laboratory parameters and duration of hospital stay, were presented as mean ± standard deviation.

Comparative analysis between groups was performed using the Chi-square test or Fisher's exact test for categorical variables and independent or paired t-tests for continuous variables, as appropriate. A p-value of less than 0.05 was considered statistically significant. Graphical representations were created using Microsoft Excel and GraphPad Prism version 5 for better visualization of trends and outcomes.

Result

Table 1: Demographic Profile of Patients (n=50)

	Variable	Number of Patients	Percentage (%)
Age (years)	<60	20	40
	≥60	30	60
Gender	Male	28	56
	Female	22	44
Type of Arthroplasty	Total Knee Replacement	35	70
	Total Hip Replacement	15	30

Table 2: Incidence of Post-Arthroplasty Infection (n=50)

Infection Status	Number of Patients	Percentage (%)
Infection Present	8	16
No Infection	42	84

Table 3: Risk Factors for Post-Arthroplasty Infection

Risk Factor	Infection (n=8)	No Infection (n=42)	p-value
Diabetes Mellitus	5	10	0.038
Obesity (BMI>30)	4	8	0.095
Duration of Surgery >120 min	6	12	0.045
Revision Surgery	3	5	0.21

Table 4: Type of Organism Isolated from Infections

Organism	Number of Patients	Percentage (%)
Staphylococcus aureus	4	50
Coagulase-negative Staphylococci	2	25
Pseudomonas aeruginosa	1	12.5
Escherichia coli	1	12.5

Table 5: Management of Post-Arthroplasty Infection

Management Approach	Number of Patients	Percentage (%)	Outcome (Successful Infection Control)
Debridement + Implant Retention	3	37.5	2/3 (66.7%)
Two-stage Revision Arthroplasty	5	62.5	5/5 (100%)

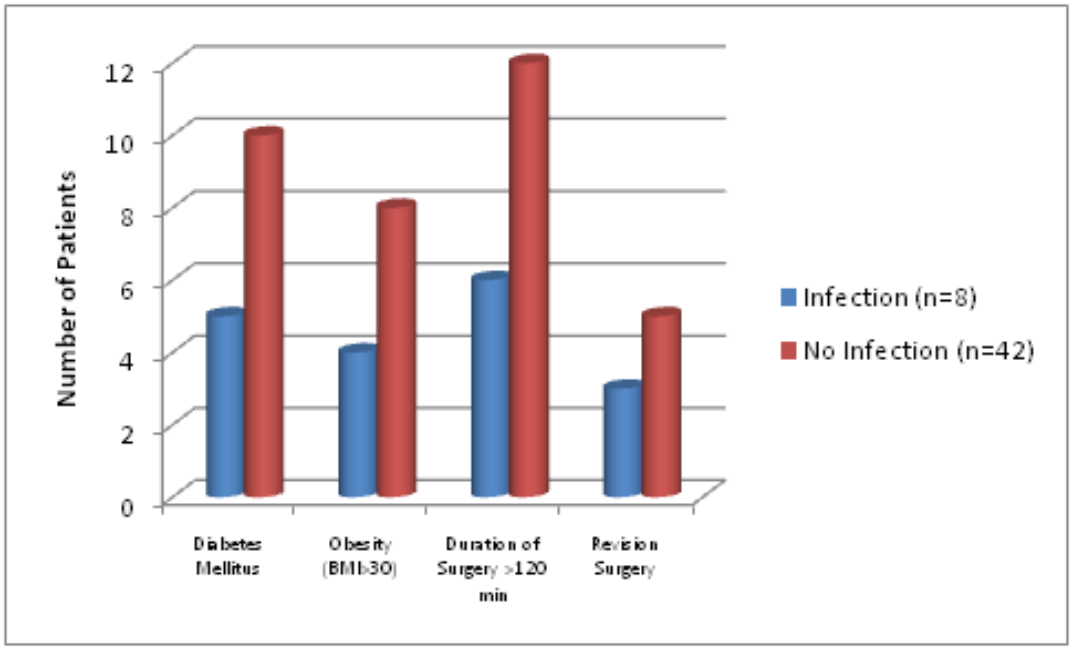

Figure 1: Incidence of Post-Arthroplasty Infection (n=50)

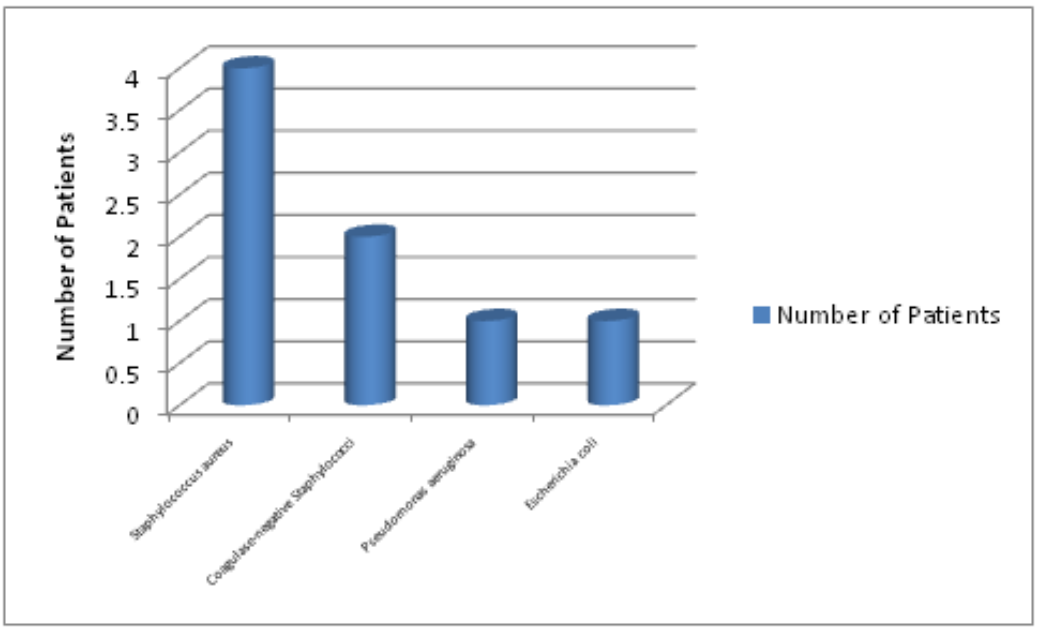

Figure 2: Type of Organism Isolated from Infections

A total of 50 patients were included in the study. The age distribution showed that 20 patients (40%) were younger than 60 years, while 30 patients (60%) were 60 years or older. Regarding gender, 28 patients (56%) were male and 22 patients (44%) were female. In terms of the type of arthroplasty performed, the majority underwent total knee replacement, accounting for 35 patients (70%), whereas total hip replacement was performed in 15 patients (30%).

Out of the 50 patients included in the study, 8 patients (16%) developed post-arthroplasty joint infections, while the remaining 42 patients (84%) did not experience any infection.

Among the 8 patients who developed infections, 5 (62.5%) had diabetes mellitus compared to 10 (23.8%) in the non-infected group, which was statistically significant ($p = 0.038$). Obesity (BMI >30) was observed in 4 infected patients (50%) versus 8 non-infected patients (19%), but this difference did not reach statistical significance ($p = 0.095$). Prolonged surgery duration (>120 minutes) was noted in 6 infected patients (75%) compared to 12 non-infected patients (28.6%), showing a significant association with infection ($p = 0.045$). Revision surgeries were performed in 3 infected patients (37.5%) versus 5 non-infected patients (11.9%), which was not statistically significant ($p = 0.21$).

Among the 8 patients who developed post-arthroplasty joint infections, Staphylococcus aureus was the most commonly isolated organism, identified in 4 patients (50%). Coagulase-negative Staphylococci were isolated in 2 patients (25%), while Pseudomonas aeruginosa and Escherichia coli were each found in 1 patient (12.5%).

Of the 8 patients with post-arthroplasty joint infections, 3 patients (37.5%) were managed with debridement and implant retention, achieving successful infection control in 2 out of 3 cases (66.7%). The remaining 5 patients (62.5%) underwent two-stage revision arthroplasty, with all cases (100%) achieving successful eradication of infection.

Discussion

In this study, the overall incidence of post-arthroplasty joint infection (PJI) was 16%, which is relatively higher than rates reported in large registry-based studies, where the incidence of PJI after primary total knee or hip arthroplasty generally ranges between 0.5% and 2% [1,2]. This difference may be attributed to variations in patient comorbidities, surgical techniques, perioperative care, and sample size. Similar findings were reported by Zeng et al., who observed an infection rate of 1.5% following total hip arthroplasty, emphasizing the increased risk in patients with multiple comorbidities [3]. Our demographic analysis showed a predominance of older patients (≥60 years, 60%) and a higher proportion of males (56%). Age and male gender have been suggested as potential risk factors in some studies, though findings are inconsistent [4]. Total knee arthroplasty was the most commonly performed procedure (70%) in our cohort, consistent with the higher global frequency of knee replacements compared to hip replacements [5].

Among identified risk factors, diabetes mellitus and prolonged surgery duration (>120 minutes) were significantly associated with PJI in our study, with p-values of 0.038 and 0.045, respectively. Diabetes has been consistently reported as a major risk factor for infection due to impaired immunity and microvascular complications [6]. Prolonged operative

time increases exposure to potential contaminants and tissue trauma, which has been corroborated by Soriano et al., who found a higher risk of infection in surgeries exceeding two hours. Although obesity and revision surgery were more common in the infected group, these did not reach statistical significance, possibly due to the small sample size. Bernard et al. reported similar trends where obesity was a contributory factor but not independently predictive of infection [7].

Microbiological analysis revealed that Staphylococcus aureus was the predominant pathogen (50%), followed by coagulase-negative staphylococci (25%), and Gram-negative organisms (Pseudomonas aeruginosa and Escherichia coli, 12.5% each). This aligns with findings from Osmon et al., who noted that Gram-positive cocci, particularly Staphylococcus aureus and coagulase-negative staphylococci, account for the majority of PJIs [8].

The presence of Gram-negative organisms, although less frequent, highlights the need for broad-spectrum empiric antibiotic coverage until culture results are available. Regarding management, two-stage revision arthroplasty was associated with a 100% success rate in infection control, while debridement with implant retention achieved 66.7% success. This outcome is consistent with existing literature, which emphasizes that two-stage revision remains the gold standard for chronic or resistant infections, whereas debridement with retention is suitable primarily for early-onset infections with stable implants [9,10]. The success of infection eradication in our cohort reinforces the importance of timely surgical intervention tailored to infection chronicity and microbial profile. In conclusion, our study highlights a higher-than-expected incidence of post-arthroplasty joint infections, with diabetes mellitus and prolonged surgical duration identified as significant risk factors. The microbiological spectrum and management outcomes align with published data, supporting a multidisciplinary approach for optimal patient care. Preventive strategies, including perioperative glycemic control, minimized operative time, and adherence to aseptic technique, remain crucial to reducing the burden of PJIs

Conclusion

Post-arthroplasty joint infections remain a significant complication following total hip and knee arthroplasty, with an incidence of 16% in this study. Diabetes mellitus and prolonged surgical duration were identified as significant risk factors, while obesity and revision surgery showed a trend toward increased risk. Staphylococcus aureus was the most commonly isolated pathogen, followed by coagulase-negative staphylococci and Gram-negative organisms. Management outcomes demonstrated that two-stage revision arthroplasty achieved 100% infection control, whereas debridement with implant retention was moderately effective. The importance of early identification of high-risk patients, meticulous surgical technique, timely intervention, and a multidisciplinary approach to optimize outcomes and minimize the burden of post-arthroplasty joint infections.

References

1. Sandiford NA. The burden of prosthetic joint infection (PJI). Ann Joint. 2021;6:24.
2. Ma T, et al. Incidence of periprosthetic joint infection after primary total knee arthroplasty: a meta-analysis. J Orthop Surg Res. 2024;19(1):1.
3. Zeng ZJ, et al. Incidence of periprosthetic joint infection after primary total hip arthroplasty: a meta-analysis. J Orthop Surg Res. 2023;18(1):1.
4. Weinstein EJ, et al. Incidence of prosthetic joint infection after total knee arthroplasty. JAMA Netw Open. 2023;6(5):e2312549.
5. Hu X, et al. Diagnosis and management of prosthetic joint infection. Clin Infect Dis. 2007;56(1):e1–e10.
6. Karachalios T, et al. Management strategies for prosthetic joint infection. J Bone Joint Surg Am. 2021;103(4):e1.
7. Pellegrini A, et al. Classification and management options for prosthetic joint infection. Ann Joint. 2022;7:18.
8. Soriano A, et al. Treatment of acute post-surgical infection of joint arthroplasty. J Antimicrob Chemother. 2006;57(4):711–716.
9. Osmon DR, et al. Diagnosis and management of prosthetic joint infection: clinical practice guidelines by the Infectious Diseases Society of America. Clin Infect Dis. 2012;56(1):e1–e25.
10. Bernard L, et al. Antibiotic therapy for 6 or 12 weeks for prosthetic joint infection. N Engl J Med. 2021;384(15):1427–1437.
11. Ayoade F, et al. Periprosthetic Joint Infection. StatPearls. 2023.
12. Bongartz T, et al. Incidence and Risk Factors of Prosthetic Joint Infection. J Bone Joint Surg Br. 2008;90(10):1275–1281.
13. Carender CN, et al. The Absolute versus Relative Risk of Periprosthetic Joint Infection. Arthroplasty Today. 2024;20:45–52.
14. Franceschini M, et al. Two-stage revision: indications, techniques and results. Ann Joint. 2022;7:18.
15. Hayta A, et al. Mid- to Long-Term Outcomes of Two-Stage Revision Arthroplasty. J Clin Med. 2025;14(2):547.
16. Lübbeke A, et al. Body mass and weight thresholds for increased prosthetic joint infec-

tion risk. Clin Orthop Relat Res. 2015;473(11):3514–3522.
17. Piuzzi NS, et al. Outcomes following planned two-stage exchange for prosthetic joint infection. Arch Orthop Trauma Surg. 2025;145:1123–1132.
18. Senel A, et al. Clinical and Radiological Outcomes of Two-Stage Revision Knee Arthroplasty in Infected Primary Knee Arthroplasty. Istanbul Med J. 2023;24(5):350–357.
19. Shin KH, et al. Greater Risk of Periprosthetic Joint Infection Associated with Patient Comorbidities. J Clin Med. 2024;13(11):3046.
20. Vasarhelyi EM, et al. Survivorship and Outcomes of Two-Stage Revision for Prosthetic Joint Infection. Arthroplasty Today. 2024;25:78–86.