

Periprosthetic Joint Infection: A Prospective Cross-Sectional Study

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Abstract

Background: Periprosthetic joint infection (PJI) remains one of the most serious complications following joint arthroplasty, leading to increased morbidity, prolonged hospitalization, and higher healthcare costs. Early diagnosis and understanding of local epidemiology are essential for improving outcomes.

Objectives: To evaluate the clinical profile, risk factors, microbiological spectrum, and short-term outcomes of patients with periprosthetic joint infection.

Methods: This prospective cross-sectional study was conducted at PMCH over a period of one year (January 2025–December 2025). Thirty patients diagnosed with PJI based on Musculoskeletal Infection Society (MSIS) criteria were included. Demographic data, clinical features, laboratory parameters, microbiological findings, and treatment modalities were analyzed. Statistical analysis was performed using appropriate parametric and non-parametric tests.

Results: The mean age of patients was 62.4 ± 8.9 years, with a male predominance (60%). Knee joint involvement was most common (66.7%). Elevated ESR and CRP were observed in 90% and 93.3% of cases, respectively. *Staphylococcus aureus* was the most frequently isolated organism (40%). Statistically significant associations were found between diabetes mellitus and chronic PJI ($p = 0.03$).

Conclusion: Periprosthetic joint infection is strongly associated with comorbidities such as diabetes and is predominantly caused by gram-positive organisms. Early identification and targeted management based on microbiological profile are crucial to improving outcomes.

Keywords: Periprosthetic joint infection, Arthroplasty, Risk factors, Microbiology

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Introduction

Joint arthroplasty is one of the most successful orthopedic procedures, significantly improving quality of life in patients with degenerative joint diseases [1]. Despite advancements in surgical

techniques and perioperative care, periprosthetic joint infection (PJI) continues to be a devastating complication [2]. The reported incidence of PJI ranges from 0.5% to 2% after primary arthroplasty

and may be higher following revision procedures [3].

PJI is associated with substantial patient morbidity, repeated surgical interventions, prolonged antibiotic therapy, and increased healthcare expenditure [4]. The diagnosis of PJI is challenging due to its heterogeneous presentation, ranging from acute postoperative infections to chronic indolent cases [5]. Several diagnostic criteria have been proposed, with the Musculoskeletal Infection Society (MSIS) criteria being widely accepted [6].

Multiple patient-related and surgery-related risk factors have been implicated in the development of PJI, including advanced age, diabetes mellitus, obesity, prolonged operative time, and immunosuppression [7–9]. The microbiological spectrum of PJI has evolved over time, with gram-positive cocci, particularly *Staphylococcus aureus* and coagulase-negative staphylococci, being the most common pathogens [10,11]. Understanding local epidemiological patterns and risk factors is essential for formulating preventive strategies and optimizing management protocols [12]. However, data from tertiary care centers in developing regions remain limited. Therefore, this study was undertaken to analyze the clinical characteristics, laboratory parameters, microbiological profile, and short-term outcomes of patients with PJI in our institution.

Materials and Methods

Study Design and Setting

This prospective cross-sectional study was conducted in the Department of Orthopedics, PMCH, over a period of one year from January 2025 to December 2025.

Sample Size

A total of 30 patients diagnosed with periprosthetic joint infection were included in the study.

Inclusion Criteria

- Patients aged ≥ 18 years

- Patients with hip or knee arthroplasty
- Diagnosis of PJI based on MSIS criteria

Exclusion Criteria

- Patients with superficial surgical site infection
- Patients unwilling to participate

Data Collection

Demographic variables, comorbidities, clinical presentation, laboratory parameters (ESR, CRP, total leukocyte count), radiological findings, microbiological culture results, and treatment details were recorded.

Statistical Analysis

Continuous variables were expressed as mean \pm standard deviation and compared using Student's t-test. Categorical variables were expressed as frequencies and percentages and compared using the chi-square test or Fisher's exact test as appropriate. A p-value < 0.05 was considered statistically significant.

Results

A total of 30 patients diagnosed with periprosthetic joint infection were included in the final analysis. The results are presented under demographic characteristics, clinical presentation, laboratory parameters, microbiological profile, and statistical associations. All tables and figures are cited sequentially in the text.

Demographic Characteristics

The baseline demographic details of the study population are summarized in **Table 1**. The mean age of patients was 62.4 ± 8.9 years (range: 45–78 years). Males constituted 60% ($n = 18$) of the cohort, while females accounted for 40% ($n = 12$). Knee joint involvement was more common than hip joint involvement, observed in 66.7% ($n = 20$) and 33.3% ($n = 10$) of patients, respectively. Diabetes mellitus was present in 46.7% ($n = 14$) of patients.

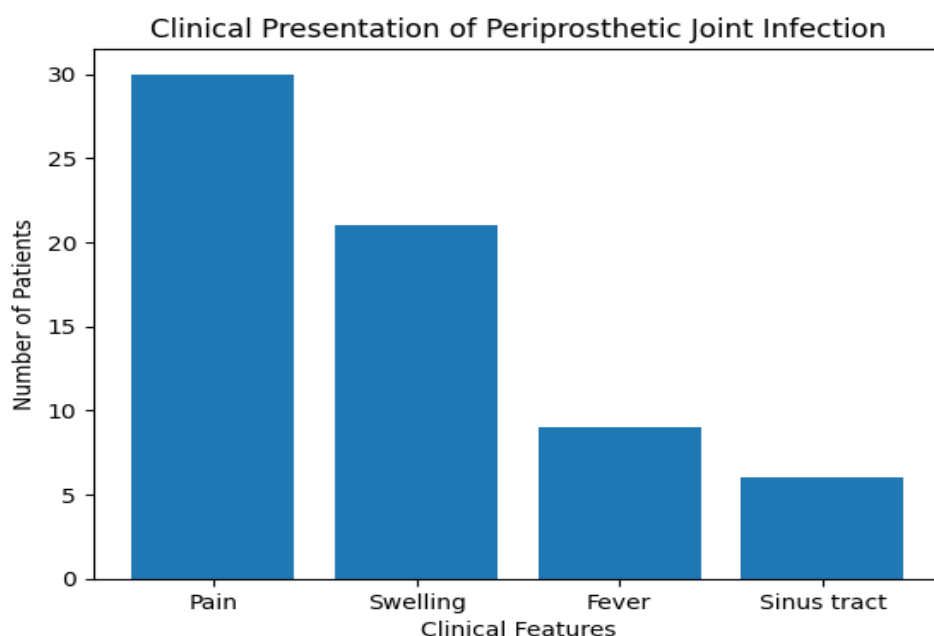
Table 1: Demographic and Clinical Characteristics of the Study Population (n = 30)

Variable	Number (%) / Mean \pm SD
Age (years)	62.4 \pm 8.9
Male	18 (60%)
Female	12 (40%)
Knee prosthesis	20 (66.7%)
Hip prosthesis	10 (33.3%)
Diabetes mellitus	14 (46.7%)
Hypertension	11 (36.7%)
Obesity (BMI \geq 30 kg/m ²)	9 (30%)

Clinical Presentation

Pain around the operated joint was the most common presenting symptom and was reported by all patients (100%). Joint swelling and local warmth were observed in

21 patients (70%). Sinus tract formation was noted in 6 patients (20%), while fever was present in 9 patients (30%). The distribution of clinical features is illustrated in **Figure 1**.

**Figure 1: Clinical presentation of patients with periprosthetic joint infection.**

Laboratory Parameters

Raised inflammatory markers were observed in the majority of cases. Elevated erythrocyte sedimentation rate (ESR $>$ 30 mm/hr) was noted in 27 patients (90%), and elevated C-reactive protein (CRP $>$ 10

mg/L) was found in 28 patients (93.3%). The mean ESR was 48.6 \pm 15.2 mm/hr and the mean CRP level was 36.4 \pm 18.7 mg/L. Total leukocyte count (TLC $>$ 11,000 cells/mm³) was elevated in 18 patients (60%). These findings are summarized in **Table 2**.

Table 2: Laboratory Parameters of the Study Population

Parameter	Mean \pm SD	Elevated n (%)
ESR (mm/hr)	48.6 \pm 15.2	27 (90%)
CRP (mg/L)	36.4 \pm 18.7	28 (93.3%)
TLC (cells/mm ³)	11,200 \pm 2,300	18 (60%)

Microbiological Profile

Culture positivity was observed in 25 patients (83.3%), while 5 patients (16.7%) had culture-negative infections. *Staphylococcus aureus* was the most frequently isolated organism, identified in

12 patients (40%). Coagulase-negative staphylococci were isolated in 8 patients (26.7%). Gram-negative organisms included *Escherichia coli* in 3 patients (10%) and *Pseudomonas aeruginosa* in 2 patients (6.7%). The microbiological distribution is shown in **Figure 2**.

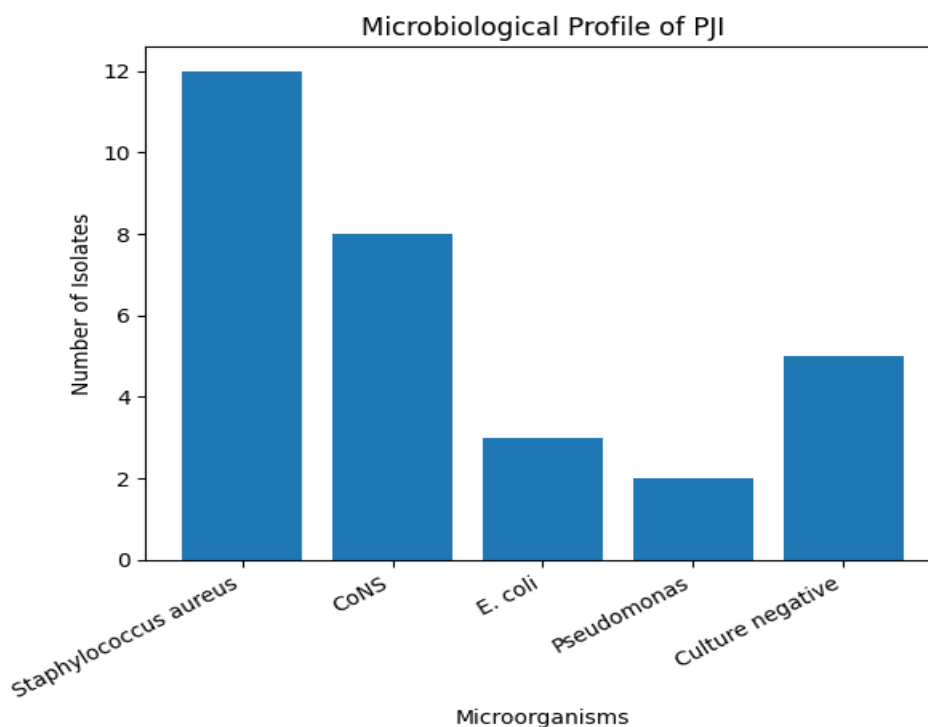


Figure 2: Distribution of microorganisms isolated in periprosthetic joint infection.

Association Between Diabetes Mellitus and Type of PJI

Based on symptom duration, 13 patients (43.3%) were classified as acute PJI and 17 patients (56.7%) as chronic PJI. Diabetes

mellitus was present in 10 patients with chronic PJI and in 4 patients with acute PJI. A statistically significant association was observed between diabetes mellitus and chronic periprosthetic joint infection ($\chi^2 = 4.72, p = 0.03$), as shown in **Table 3**.

Table 3: Association Between Diabetes Mellitus and Type of Periprosthetic Joint Infection

Diabetes status	Acute PJI n (%)	Chronic PJI n (%)	p-value
Present	4 (30.8%)	10 (58.8%)	0.03
Absent	9 (69.2%)	7 (41.2%)	

Discussion

Periprosthetic joint infection remains a complex and challenging complication following joint arthroplasty. In the present study, the mean age of patients was comparable to that reported in earlier

studies, reflecting the higher prevalence of arthroplasty procedures in the elderly population [13]. The male predominance observed in our cohort is consistent with previous reports [14].

Knee joint involvement was more frequent than hip joint involvement, similar to findings reported in large registry-based studies [15]. Diabetes mellitus emerged as a significant risk factor for chronic PJI, highlighting the role of impaired immunity and poor wound healing in these patients [16,17].

Inflammatory markers such as ESR and CRP demonstrated high sensitivity in our study, reinforcing their utility as initial screening tools in suspected PJI [18]. However, these markers are non-specific and must be interpreted in conjunction with clinical and microbiological findings [19].

The microbiological profile revealed a predominance of gram-positive organisms, particularly *Staphylococcus aureus*, which aligns with global literature [20]. The presence of gram-negative organisms, although less frequent, underscores the need for broad-spectrum empirical coverage until culture results are available [21].

Early diagnosis and organism-specific antibiotic therapy, combined with appropriate surgical intervention, are critical for successful outcomes [22]. Our findings emphasize the importance of identifying modifiable risk factors and implementing strict perioperative protocols to reduce the burden of PJI [23–25].

Conclusion

Periprosthetic joint infection is a serious complication predominantly affecting elderly patients with comorbidities such as diabetes mellitus. Gram-positive organisms remain the most common causative agents. Early recognition, prompt microbiological diagnosis, and targeted management are essential to improve patient outcomes.

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