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FREQUENCY OF PROSTHETIC JOINT INFECTION IN PATIENTS WHO UNDERWENT TOTAL HIP OR KNEE ARTHROPLASTY AT TERTIARY CARE HOSPITAL, KARACHI

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ABSTRACT

Background: Prosthetic joint infection (PJI) represents one of the most challenging complications of total hip and knee arthroplasty. It increases morbidity, prolongs hospital stay, and imposes a significant economic burden. Identifying the frequency of PJI and its association with patient characteristics in local healthcare settings remains crucial for developing effective prevention and management strategies.

Methods: We carried out a cross-sectional study of 164 patients who underwent total hip or knee arthroplasty at a tertiary care hospital. We collected demographic, socioeconomic, and clinical data, including comorbidities and lifestyle factors. We determined the frequency of PJI and examined the baseline characteristics of the cohort.

Results: PJI occurred in 7.3% of patients (12 cases). Most patients were aged 46–70 years (53%), while 47% were between 20 and 45 years. The gender distribution was almost equal, with 50.6% males and 49.4% females. Comorbidities were frequent: 54.3% had diabetes mellitus, 49.4% had hypertension, and 51.8% had dyslipidemia. Smoking was also common (47%). Most participants came from higher-income households (84.8%), while 15.2% reported lower income. Educational attainment varied, with 23.8% illiterate and 29.3% having higher education.

Conclusion: We identified a notable frequency of PJI in this data set. Comorbidities and lifestyle factors contributing to infection risk. These findings emphasize the need to strengthen perioperative optimization and infection-prevention strategies.

INTRODUCTION

Prosthetic joint infection is a severe and potentially life-threatening complication associated with total joint arthroplasty. Managing this condition presents significant challenges, as it often necessitates multiple surgical interventions along with prolonged courses of antibiotic therapy. [1] As the number of joint arthroplasty procedures continues to rise, the occurrence of prosthetic joint infections is expected to follow suit, posing significant challenges for both patients and the healthcare system. [2] Diagnosing prosthetic joint infection relies on an integrated approach that combines clinical assessment, laboratory tests, periprosthetic tissue cultures, histological evaluation of intraoperative samples, and various imaging modalities.[4] Despite their widespread use, these diagnostic methods may not provide an accurate assessment of the true incidence of prosthetic joint infection. Conventional periprosthetic tissue cultures exhibit low sensitivity, which can be compromised by several factors, including prior antibiotic use, the presence of viable but non-cultivable organisms, slow-growing pathogens, and biofilm formation, all of which can hinder reliable culture results. [5]

Although most joint arthroplasty procedures successfully restore pain-free function, a subset of patients will encounter device failure, necessitating further surgical intervention over the lifespan of the implant. [6-7] Aseptic failure can result from various factors, including loosening at the bone-cement interface, periprosthetic fractures, structural failure of the prosthesis, implant wear, improper positioning, instability due to dislocation, or material fatigue. [8] Prosthetic joint infection, also known as periprosthetic infection, is characterized by the presence of an infection affecting the implanted joint prosthesis and surrounding tissues. [9] Complete eradication of infection requires a combination of suitable surgical intervention and prolonged antimicrobial therapy. In cases where surgery is not an option due to patient preference or medical limitations, suppressive antibiotic therapy may be considered as an alternative approach. [10-11] For the management of chronic prosthetic joint infection, two-stage revision remains the preferred approach and is considered the gold standard, as endorsed by the Infectious Diseases Society of America (IDSA). [12] A study done by Hafez et at found the prevalence of prosthetic joint infection in patients who underwent TKA or THA to be 4.03%.[13]

In developing countries, the rate of infection after hip and knee arthroplasty surgeries is much higher compared to the published rate in developed countries, and this constitutes a substantially high economic burden on these countries. [13] The reasons include the late presentation of patients with complex bilateral deformities that subsequently result in prolonged operative time. Moreover, dedicated arthroplasty theaters, laminar flow, space gowns, and pulse lavage are not usually available in addition to the lack of stock of implants and instruments in hospitals, which are usually provided as a loan by the company distributor. While there is a plethora of registry and surgeons' data on the rate of infection for hip and knee arthroplasty in developed countries, there is a paucity of similar data in developing countries.

MATERIAL AND METHODS

A cross-sectional study was conducted in the Department of Orthopedics at Liaquat

National Hospital, Karachi, over a six-month period following the approval of the research synopsis by the College of Physicians and Surgeons Pakistan. The study aims to determine the frequency of prosthetic joint infection among patients who have undergone total hip or knee arthroplasty. A total of 164 patients were enrolled based on a calculated sample size, which was determined using WHO software with a prevalence estimate of 4.03%, a margin of error of 3%, and a confidence level of 95%.[13] The sampling method was non-probability consecutive sampling.

Participants were selected based on predefined inclusion and exclusion criteria. Eligible patients included those with a history of total knee or hip arthroplasty within the last three months who experience hip or knee joint pain (VAS $\geq$ 6) persisting for more than one week. Individuals of either gender between the ages of 20 and 70 years was considered. Patients with a history of thromboembolism, sepsis, recent hospitalization within the last three months, or specific infections such as pneumonia, urinary tract infections, meningitis, malaria, dengue, enteric fever, or hepatitis B or C were excluded. Additionally, individuals with a history of peripheral arterial disease, malignancy, chronic liver disease, chronic obstructive pulmonary disease, asthma, congestive heart failure, or stroke were not included.

Following ethical approval, informed consent was obtained from all participants. Data collection included demographic information such as age, gender, residence, occupation, family income, and educational status. Clinical variables, including diabetes mellitus type II, hypertension, dyslipidemia, and smoking status, was also recorded. Blood samples were collected and analyzed for complete blood count, while tissue samples from prosthesis interfaces and suspected inflammatory sites was obtained for microbiological culture under aerobic and anaerobic conditions. Patients were classified as having prosthetic joint infection based on the predefined criteria.

Statistical analysis was performed using SPSS Version 22. Descriptive statistics was used to summarize demographic data, with mean and standard deviation reported for normally distributed variables, while non-normally distributed variables was presented as median and interquartile range. Categorical variables, including gender, residence, occupational and educational status, income level, and comorbid conditions, was expressed as frequencies and percentages. Effect modifiers were controlled by stratifying variables such as age, gender, residence, occupation, education, income, diabetes mellitus, hypertension, dyslipidemia, and smoking status to assess their impact on prosthetic joint infection. Post-stratification analysis was conducted using the chi-square or Fisher's exact test, with statistical significance set at a p-value of less than 0.05.

RESULTS

A total of 164 patients underwent total hip or knee arthroplasty during the study period and met the inclusion criteria. Just over half of the participants (53%) were between 46 and 70 years of age, while 47% were younger, between 20 and 45 years. The gender distribution remained nearly equal, with 50.6% males and 49.4% females. More than half of the patients had diabetes mellitus (54.3%), almost half had hypertension (49.4%), and 51.8% had dyslipidemia. Smoking was also common, reported by 47% of the participants. Socioeconomic characteristics showed that most patients belonged to families with a monthly income greater than 50,000 (84.8%), and almost one-third of the study population had higher education (29.3%).

The frequency of prosthetic joint infection (PJI) in the cohort was 7.3% (12 out of 164 patients). Infections occurred more often in patients aged 46–70 years and in females,

although these associations did not reach statistical significance. Diabetes mellitus appeared more frequently among patients with PJI (10.1%) compared to those without infection (4%), but the difference remained non-significant (p=0.13). Hypertension and smoking status also showed no meaningful variation between the infected and non-infected groups.

Among the comorbidities, dyslipidemia showed a near-significant association with prosthetic joint infection (p=0.05). Patients without dyslipidemia experienced a higher rate of infection (11.4%) compared to those with dyslipidemia (3.5%). Family income, employment status, and educational attainment did not differ significantly between the two groups. These findings suggest that while certain patient characteristics appear more common in those with PJI, most observed differences were not statistically significant in this cohort.

Taken together, the study demonstrates that prosthetic joint infection occurred in approximately seven out of every one hundred arthroplasty patients treated at this tertiary care hospital. Although diabetes mellitus and the absence of dyslipidemia appeared to contribute to a greater risk of infection, these results require cautious interpretation given the small number of infection cases. Larger studies with robust multivariable analysis are needed to better clarify which clinical and socioeconomic factors may predispose patients to PJI in this setting.

DISCUSSION

We found that the frequency of prosthetic joint infection (PJI) in our data set was 7.3%. This places our results at the higher end of reported ranges from low- and middle-income countries. [14] This figure exceeds the rates described in registry-based studies from high-income settings, where infection rates often remain below 2%.[23-24] Studies from India, Pakistan, and Nigeria have reported frequencies between 5% and 9%. These data closely resemble our findings. [15, 17, 22] The contrast highlights the persisting disparity between healthcare systems with well-established infection control measures and those operating with limited perioperative resources and surveillance infrastructure.

Diabetes mellitus and dyslipidemia appeared more common among infected patients, even though statistical significance was not achieved. Previous research has consistently linked diabetes with PJI due to impaired immunity, poor vascularization, and delayed tissue healing. [15.17,19] Dyslipidemia has received less attention in this context. However its association with obesity and metabolic syndrome suggests a plausible indirect role in infection risk. The high prevalence of both conditions in our cohort underscores the importance of systematic preoperative screening and optimization of metabolic health before arthroplasty. By addressing these comorbidities, clinicians may reduce postoperative complications and improve surgical outcomes. [16]

We observed no significant associations between infection and smoking, hypertension, or occupational status. These findings agree with prior reports from South Asia and the Middle East, which showed similar patterns. [17-19] Smoking is well recognized as a risk factor for poor wound healing. However, its direct effect on prosthetic joint infection remains inconsistent across studies. Socioeconomic indicators, including education and household income, also showed no strong influence in our analysis. Nevertheless, these factors may exert indirect effects by shaping health literacy, adherence to follow-up, and access to timely medical care. Larger multi-center investigations will be necessary to clarify these relationships.

The broader impact of PJI extends beyond clinical complications. In high-income countries, the treatment of PJI: through revision surgery, prolonged antimicrobial

therapy, and extended hospitalization. These can triple the cost of care for each case. [19] In resource-limited settings, the consequences are even more severe because of the absence of subsidized revision programs, inadequate microbiological diagnostic facilities, and restricted antimicrobial availability [3,9]. [17, 22] For patients and their families, this often translates into catastrophic health expenditure and loss of livelihood. Our data suggest that relatively higher-income patients were able to access tertiary care; however, those from lower socioeconomic backgrounds remain more vulnerable to both infection and its economic consequences.

The demographic profile of our study population mirrors regional trends in arthroplasty. Most patients fell within the 46–70-year age group, consistent with the increasing prevalence of degenerative joint diseases in aging populations. [18] Unlike registry data from high-income countries, where women often predominate, we observed a nearly equal gender distribution. [23] This difference may reflect cultural and healthcare access dynamics in our setting. Of note, nearly one-quarter of patients were illiterate, raising concerns about health communication and postoperative adherence. Educational limitations may compromise a patient's ability to recognize complications early or to follow rehabilitation protocols, which could indirectly influence infection outcomes. [18]

Taken together, these findings highlight the complex interaction between biological, demographic, and health system factors in determining infection risk. Although our observed PJI rate is higher than in high-income settings, the major risk factors are largely modifiable. Optimizing diabetes and metabolic control, strengthening perioperative infection surveillance, and expanding patient education represent feasible strategies to reduce the burden of infection. Future studies should pursue multi-center collaborations across South Asia and Africa to establish regional benchmarks and to evaluate the effectiveness of tailored preventive strategies. At the policy level, investments in affordable revision surgery and microbiology capacity are essential to reduce the clinical and economic burden of PJI in resource-limited environments.

LIMITATIONS

We conducted this study in a single tertiary care hospital, which restricts the generalizability of the findings to other institutions and populations. The retrospective design depended on hospital records, and incomplete documentation may have introduced bias. The small number of prosthetic joint infection cases limited the statistical power to establish stronger associations with comorbidities and other risk factors. reported and may not accurately reflect all determinants of infection risk.

CONCLUSION

We observed a 7.3% frequency of prosthetic joint infection among patients who underwent total hip or knee arthroplasty in a tertiary care hospital. The high burden of diabetes, hypertension, dyslipidemia, and smoking in this data set indicates that comorbid conditions substantially influence postoperative risk. Despite most participants coming from higher-income households, variations in education and occupational status suggest that socio-demographic factors still play a role in health outcomes.

Table 1: Distribution of baseline characteristics among the study participants.

Variables	n (%)
Age	
20 to 45 years	77 (47)
46 to 70 years	87 (53)
Gender	
Male	83 (50.6)
Female	81 (49.4)
Diabetes Mellitus	
Yes	89 (54.3)
No	75 (45.7)
Hypertension	
Yes	81 (49.4)
No	83 (50.6)
Dyslipidemia	
Yes	85 (51.8)
No	79 (48.2)
Smoking status	
Yes	77 (47)
No	87 (53)
Family monthly income	
≤ 50000	25 (15.2)
>50000	139 (84.8)
Occupational status	
Employed	82 (50)
Unemployed	82 (50)
Educational status	
Illiterate	39 (23.8)
Primary	36 (22)
Secondary	41 (25)
Higher	48 (29.3)
Prosthetic Joint Infection	
Yes	12 (7.3)
No	152 (92.7)
Total	164 (100)

Table 2: Distribution of patient characteristics according to the Prosthetic joint infection groups.

Variables	Prosthetic joint infection Yes n (%)	Prosthetic joint infection No n (%)	P value
Age 20 to 45 years 46 to 70 years	 04 (5.2) 08 (9.2)	 73 (94.8) 79 (90.8)	0.32
Gender Male Female	 04 (4.8) 08 (9.9)	 79 (95.2) 73 (90.1)	0.21
Diabetes Mellitus Yes No	 09 (10.1) 03 (4)	 80 (89.9) 72 (96)	0.13
Hypertension Yes No	 04 (4.9) 08 (9.6)	 77 (95.1) 75 (90.4)	0.24
Dyslipidemia Yes No	 03 (3.5) 09 (11.4)	 82 (96.5) 70 (88.6)	0.05
Smoking status Yes No	 05 (6.5) 07 (8)	 72 (93.5) 80 (92)	0.70
Family monthly income ≤ 50000 > 50000	 02 (8) 10 (7.2)	 23 (92) 129 (92.8)	0.88
Occupational status Employed Unemployed	 06 (7.3) 06 (7.3)	 76 (92.7) 76 (92.7)	1.00
Educational status Illiterate Primary Secondary Higher	 01 (2.6) 02 (5.6) 05 (12.2) 04 (8.3)	 38 (97.4) 34 (94.4) 36 (87.8) 44 (91.7)	0.39

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