

# **RESEARCH ARTICLE**

# ORGANISMS RESPONSIBLE FOR TOTAL KNEE PROSTHETIC JOINT INFECTION: A SAUDITERTIARY CENTER 10-YEAR-EXPERIENCE

# Mohammed Al Dakhil<sup>1</sup>, Amr A. Alsubaihi<sup>2</sup>, Abdulaziz A. Basaqr<sup>3</sup>, Abdulmajeed Mahfoudh<sup>4</sup> and Abdulaziz M. Al Dakhil<sup>5</sup>

- 1. Orthopedic Consultant, Department of Orthopedic Surgery, King Abdul-Aziz Medical City, Jeddah, Saudi Arabia.
- 2. Orthopedic Consultant, Department of Orthopedic Surgery, King AbdullahMedicalComplex-Jeddah, Saudi Arabia.
- 3. Orthopedic Consultant Department of Orthopedic Surgery, Dr. Samir Abbas Hospital, Jeddah, Saudi Arabia.
- 4. MD, Orthopedic Department, King Abdul-Aziz Medical City, Jeddah, Saudi Arabia.
- 5. MBBS, Saudi board of orthopedics (SBO), Prince Sultan Medical City, Riyadh, Saudi Arabia.

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### Manuscript Info

#### Abstract

..... ..... Manuscript History Background: Total Knee arthroplasty (TKA) is a standard procedure to Received: 25 September 2023 treat end-stage knee osteoarthritis. As with any surgery, complications Final Accepted: 29 October 2023 may arise, and one of the common complications reported from knee Published: November 2023 replacement procedures is infection. In this study, we aimed to retrospectively determine the prevalence of the infections pathogens following TKA and identify the most common microorganisms involved in infections in knee arthroplasty. Methods: Data were gathered from archived medical files using a retrospective descriptive study methodology. The current study included patients who underwent total knee arthroplasty and experienced infections between 2007 and 2017 at King Abdul-Aziz Medical City (KAMC), Jeddah, Saudi Arabia. **Results**: Out of 56 patients, almost half were hypertensive (57.1%) and diabetic (46.4%). 51.8% of patients had bilateral TKA. Among the patients, a third (41.8%)had pain; the primary organism identified was Staphylococcus (44.65%), and 20% of cases involved co-infection with another organism. 16% of patients had methicillin-resistant Staphylococcus aureus. Infections with pseudomonas, brucellosis, and tuberculosis were also present in 17.9%, 3.6%, and 1.8% of the patients, respectively. Conclusion: Staphylococci were identified as the primary organism responsible for prostheticknee infection in KAMC patients. We recommend a focus on staphylococci in both prophylactic and empirical antibiotic treatments. Additional multicenter studies examining larger sample sizes are required to identify other factors influencingProsthetic Joint Infection (PJI), including obtaining information on the patients' antimicrobial sensitivity profiles and geographic factors. Copy Right, IJAR, 2023,. All rights reserved. \_\_\_\_\_

**Corresponding Author:- Mohammed Al Dakhil** Address:- Orthopedic Consultant, Department of Orthopedic Surgery, King Abdul-Aziz Medical City, Jeddah, Saudi Arabia.

### **Introduction:-**

Total Knee Arthroplasty (TKA) is a cost-effective intervention in orthopedic surgery[1]. The common clinical indication for thisoperation is osteoarthritis (OA).Similar to other surgical operations, there is an inherent risk of complication. Prosthetic Joint Infection (PJI) is one of the worst complications of joint arthroplasty. Patients with PJI experience a dramatic clinical impact, studies indicated that the 5-year mortality rate after PJI is close to that of oncologic patients [2,3].

Due to infection, revision surgery following total knee arthroplasty is required to stop the pain, swelling, and drainage from the infection. According to the National Joint Registry report of 2013[4], about 22% of revision surgeries are conducted due to infection, while the report from 2014 [5]considered infection as the third most common cause for surgical revision, following aseptic loosening and pain. The most frequently isolated organism in PJI is Staphylococci (coagulase-negative staphylococci and staphylococcus aureus), where some cases have been associated with a single organism and others associated with multiple organisms [6,7].

Since antibiotics are less effective for isolated infected areas, surgery, on the other hand, is often the most effective treatment option for a total knee PJI[8,9]. In comparison to invasive surgery or revision, debridement, antibiotics, and implant retention (DAIR) is a potential candidate for treating prosthetic joint infection (PJI), particularly if the significant comorbidity prevents the surgery from being performed. [10, 11]. Previous studies reported poor outcomes among patients who experienced multiple procedures, including long-term antibiotic administration and extended hospitalization [12,13].

Unfortunately, in some cases, the patient may never overcome the infection, which requires lifelong medications and can lead to significant morbidity [14,15].

Both the infectious agent and the surgical process have the potential to significantly and directly influence the host response, resulting in soft tissue damage, host bone destruction, and poor patient outcomes. [16,17]. Early isolation of an organism increases the chance of implementing the appropriate surgical and antibiotic treatment strategies [18,19]. This entails a high degree of collaboration between Orthopedics and Infectious Disease teams [20,21]. This study aimed to evaluate the characteristics of patients and highlight the organisms responsible for Total Knee PJI.

# Methodology:-

This was a retrospective cohort chart review involving all patients whoperformed arthroplasty and developed prosthetic knee infections in KingAbdul-Aziz medical city (KAMC- WR)from 2007-2017. Data were retrieved frompatients' files, surgery notes, microbiology lab data, and registry books. Thepattern and influence of microbiology infectious on periprosthetic kneeinfection were detected by comparing the type of prosthesis, isolatedorganism, antibiotics, and outcomes. Data was entered and analyzed by BMISPSS version 21, and appropriate tests were used.

# **Result:-**

#### Characteristics of the study subjects:

Fifty-six patients were included in the present study; male to female ratio was 1:1. The mean age of participants was  $61 \pm 17$  years, ranging from 44 - 78 years. Almost a third of the caseshad a body mass index (BMI) of 30 to 35, indicating class-one obesity. From the medical history, it was found that about half of the patients had diabetes (46.4 %) and hypertension (57 %). (**Table 1**)

Characteristics	Frequency	Percent (%)
(Demographics and Medical History)	<b>(n)</b>	
Gender		
Male	25	45
Female	31	55
Body Mass Index categories		
Overweight: BMI is 25.0 to <30	22	41
Class 1: BMI of 30 to < 35	18	31
Class 2: BMI of 35 to < 40	8	14

**Table 1:-** Demographic and medicalhistory of patients (n=56).

8	14
32	57
24	46
5	9
3	5
3	5
1	2
	8 32 24 5 3 3 1

Some cases had more than one disease

#### Medical and surgical History

About two-thirds of patients underwent the primary typeof total knee replacement (total knee arthroplasty TKA), (14.2%) of them had tumor TKA, and (12.5%) of them had revision TKA.

Regarding the surgical site, almost half of the patients had a unilateral total knee replacement, and the other half, 29 (51.8%), had a bilateral total knee replacement that was performed for both knees at the same operation among 18 (62%) of them.

#### History of Prosthetic Joint Infection (PJI)

As regards the history of prosthetic joint infection, 28 (50.0%) of patients had an infection the right side, 26 (46.4%) on the left side, and only two (3.6%) were bilaterally infected. Besides the PJI, the hematoma was reported in two cases, and one patient had a tibia fracture intraoperatively.

Joint **niap** was the main presenting symptom in almost a third of cases 23 (41.1%), whereas 14 (25%) patients had swelling as a sign of presentation, and 19 (33.9%) patients presented with sinus discharge.

**Figure 1** illustrates the median changes before and after the surgery; the median scores of lab markers on presentation were 58.5 mm/hr for erythrocyte sedimentation rate (ESR), 229.5mg/L for C-reactive protein (CRP),and 7.5 thousand/mm<sup>3</sup> for white blood cell (WBC). While the median scores of labsmarkers after surgery were 38 for ESRmm/hr, 152.6 mg/L for CRP, 6.8 thousand/mm3 for WBC, and 37 for albumin. No data were found for usingInterleukin-6 (IL-6) as a diagnostic tool forPJI.



Figure 1:- The median changes of lab markers before and after the surgery (n=56).

Empirical antibiotics were prescribedfor all patients before culture results were known. **Figure 2** shows the common microbiological cause of PJI in the current study, Staphylococcus was present in 25 cases; of them, there were five cases combined with another organism. Moreover, four cases had Methicillin-resistant Staphylococcus aureus (MRSA), sixwere positive for streptococcus, andpseudomonas was present in 10 cases. Furthermore, Brucella was positive only in two cases, whileMycobacterium tuberculosis was only in one case. Interestingly, no organisms were identified in eight(14.8%) cases, but they were treated asinfected TKR.



Figure 2:- The common Microorganisms causing Prosthetic Joint Infection (n=56).

Concerning the treatment approach, surgical revision and medical therapy were provided in all cases. The type and frequency of surgical interventions were different. The surgery of one-stage revision was performed in 27 (48.2%) of cases, a two-stage revision was in 23 (41.1%) of cases, and other surgical interventions were performed for six (10.7%) of cases. However, the overall recurrence rate of prosthetic joint infection (PJI)was 10 cases (17.9%); almost two-thirds of cases presented with the same organism, and three cases (30%) presented with a different organism.

# **Discussion:-**

The current study's main outcome was identifying the most common organism inPJI. Staphylococcus was the most commonly found genus isolated after revising the first implant for infection, which was present in 25 (44.65%) cases overall. Specifically, it was found in80% of patients with a single-genus infection and 20% of patients with a mixed-genus infection. This result was lower than the findings reported in a study from two studies from England [2,5] and one study from the Swedish Knee Arthroplasty Register (SKAR) where the percentage of Staphylococcusin these studies was 72%, 61%, and 58% retrospectively [7].

In the present study, a single-genus infection was responsible for periprosthetic joint infection in 83.9% of cases, andmixed genera were responsible for 16.1% of cases. These findings are the same as those reported in the England study, where 83.1% of the cases were single-genus infections, and 16.9% were mixed genera [2].

Previous studies indicated that Streptococcal infection is oftensignificantly associated with extremes of age [2]. In the current study, therewas no significant difference in the mean age of patients regarding organismkind, even when there was an isolated pure streptococcal infection (62.0 years) compared to gram-negative infections (60 years). Furtherstudies on serotyping and examination of each case alone is needed and recommended in order to support and strengthen the evidence for prospective monitoring and a separate national database. [2,21]

The whole sample consisted of patients from one center, and this an advantage for the study, given that cases from different surgical centers are a possible confounder that was eliminated by involving patients from one center. However, differences in themicroorganism of periprosthetic joint infection between surgical centers were addressed in a previous study [3]. These differences provided evidence of the significant geographical variability inorganism prevalence and highlighted the necessity for population-level registry data analysis [2,3].

#### Limitations

The small sample size and the fact that this study was conducted in a single center were its two main limitations, which limited the generalizability of the results. However, this work may serve as the core part of further study.

### **Conclusions:-**

Staphylococci were the main isolated organism species responsible forperiprosthetic knee infection in KAMC patients. We recommended focusingon targeting Staphylococci in both prophylactic and therapeutic antibiotictreatments. Further studies on multicenter with larger sample sizes are required to detect other factors including associated antimicrobial sensitivity profiles, and geographical factors. Also, longitudinal studies are needed to utilize patient-reported outcome measures (PROMs) for outcomes.

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