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ORIGINAL ARTICLE

Retrospective Study

Native and prosthetic septic arthritis in a university hospital in Saudi Arabia: A retrospective study

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Abstract

BACKGROUND

Septic arthritis, whether native or prosthetic, poses a significant challenge in clinical practice due to its potentially devastating consequences. Despite its clinical importance, there remains a dearth of comprehensive studies and standardized diagnostic criteria, particularly in the Kingdom of Saudi Arabia.

AIM

To investigate the epidemiology, microbiological profiles, and clinical characteristics of native and prosthetic septic joints in the Saudi Arabian population.

METHODS

Medical records of patients diagnosed with septic arthritis between January 1, 2015, and December 31, 2022, were retrospectively reviewed. Data regarding patient demographics, clinical presentation, microbiological cultures, treatment modalities, and outcomes were analyzed.

RESULTS

In a retrospective review of 52 cases of septic arthritis, a balanced gender distribution was observed (1:1 ratio), with the knee being the most commonly affected joint (80.8%). Methicillin-resistant *Staphylococcus aureus* predominated in native joints (24.2%), while *Brucella spp.* was more prevalent in prosthetic joints (21.1%). Joint preservation was achieved in most cases (84.6%), with no significant difference in clinical features between native and prosthetic joints. However, certain comorbidities were more common in native joint cases, including renal impairment (P = 0.002), hemodialysis (P = 0.004), heart disease (P = 0.013), and chronic liver disease (P = 0.048). At the same time, osteoarthritis was more prevalent in prosthetic joint cases (P = 0.013). Vancomycin was the most frequently used antibiotic (26.9%), and most patients received antibiotics before joint aspiration (57.7%). Surgical intervention, predominantly arthrotomy, was required in most cases (32.7%). Notably, a significant association was found between joint type and

mortality (odds ratio = 0.587, P = 0.048), as well as the Charlson comorbidity index and mortality (P = 0.001).

CONCLUSION
This study highlighted distinctive microbiological profiles and etiological factors in septic arthritis cases in the Saudi Arabian population.

Key Words: Septic arthritis; Native joint; Prosthetic joint; Epidemiology; Diagnostic criteria; Saudi Arabia

Core Tip: Our retrospective study in Saudi Arabia reveals distinctive microbiological profiles and clinical characteristics of septic arthritis. Notably, methicillin-resistant *Staphylococcus aureus* prevails in native joints, while *Brucella spp.* is more common in prosthetic joints. We found a balanced gender distribution, with the knee being the most frequently affected joint. Joint preservation was achieved in the majority of cases, despite the need for surgical intervention. Comorbidities differed between native and prosthetic joints, impacting mortality rates. This study sheds light on important epidemiological aspects of septic arthritis in Saudi Arabia, guiding tailored diagnostic and management approaches.

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INTRODUCTION

Septic arthritis is an uncommon but severe orthopedic emergency primarily impacting one joint (with only 5%-10% occurrence in multiple joints)[1]. It can escalate to systemic sepsis, with a mortality rate of approximately 16.3%, if not treated promptly[2-6]. The frequency of occurrence varies across different age groups[7,8], ethnicities[9], and socio-economic backgrounds[10]. Typically, males exhibit a higher susceptibility compared to females in most cases[11]. The knee is frequently affected, accounting for nearly half of all cases, with the hip, shoulder, elbow, and ankle following in frequency[12]. Risk factors for septic arthritis include rheumatoid arthritis, diabetes, old age, neonatal age, and excessive alcohol consumption[13,14].

Septic arthritis presents a significant risk to life, with documented mortality rates ranging from 11% to 19%[15]. It constitutes a surgical emergency necessitating immediate evaluation, diagnosis, and intervention. The most extensive investigation to date on septic arthritis in native joints among adults revealed an incidence rate of 21 cases per 100000 individuals, with notable variations observed among different ethnic groups[16]. *Staphylococcus aureus* (*S. aureus*) is a Gram-positive bacterium known for its ability to evade antimicrobial agents. This bacterium is implicated in invasive infections, sepsis, and fatal outcomes[17]. In 2019, *S. aureus* as the sole bacterial pathogen, contributed to over 1.1 million deaths globally, with approximately 10000 fatalities attributed to bone and joint infections[18]. *S. aureus* is identified as the predominant causative agent of septic arthritis[17]. This condition, characterized by infection within the synovial fluid and joint tissues, leads to considerable morbidity and mortality if not diagnosed and managed promptly. Early identification is important in mitigating bone destruction, and necrosis, and preventing long-term disability[19,20]. Despite antibiotic administration, in-hospital mortality rates for septic arthritis range from 7% to 15%, with one-third of patients experiencing morbidity[17]. A retrospective, multicenter study conducted in France by Richebé *et al*[21] highlighted that 48.3% of patients necessitated surgical intervention. Additionally, during follow-up, 28.3% encountered severe complications, and 9.2% succumbed, with *S. aureus* infection correlating with increased mortality[21].

The diagnosis of septic arthritis typically involves a comprehensive assessment guided by clinical suspicion, which considers symptom presentation, examination of serum markers, imaging modalities, and the collection of synovial fluid for analysis. Acute manifestations commonly include fever, redness, tenderness upon palpation, swelling, and limited joint function. Chronic cases are manifested by the presence of a draining sinus communicating with the affected joint. Over half of septic arthritis patients have a medical history marked by joint pain, swelling, and fever[22]. Notably, a retrospective analysis of 248 cases of native joint infections revealed that septic arthritis frequently manifests as monoarticular involvement with predominance in 92.3% of cases in medium to large joints[8].

Clinical suspicion in the diagnosis of septic arthritis necessitates awareness of predisposing risk factors. Common risk factors associated with septic arthritis include human immunodeficiency virus infection, intravenous drug usage, advanced age (> 80 years old), rheumatoid arthritis, skin infections, iatrogenic causes, diabetes mellitus, immunosuppression, prosthetic joints, smoking, osteoarthritis, and recent surgical procedures[22]. According to Cipriano *et al*[23], diabetes mellitus emerges as the most frequently reported comorbidity, affecting approximately 20.6% of patients. A five-year retrospective study conducted in New Zealand by McBride *et al*[14] revealed that 35% of patients were tobacco users, while 24% had diabetes mellitus. These identified risk factors may also contribute to the severity of the disease. For instance, Hunter *et al*[24] observed that a history of diabetes increased the risk of developing recalcitrant septic arthritis.

There is a significant gap in our understanding of the epidemiology of both native and prosthetic septic joints, both globally and in Saudi Arabia. This gap is primarily due to the absence of comprehensive studies and standardized diagnostic criteria. The objective of this study is to address this gap by examining the prevalence of both types of septic joints over the past seven years. The study aims to investigate the microbiological causes, clinical implications, outcomes, mortality rates, and complications of septic joints observed in both inpatient and outpatient settings. Additionally, it also seeks to determine if there are any disparities between our findings and those reported internationally. This study marks the first of its kind in Saudi Arabia, as it simultaneously investigates both native and prosthetic joint infections. This approach is crucial, considering the distinct risk factors and outcomes associated with each type of infection.

MATERIALS AND METHODS

Study design and setting

A retrospective study was conducted at King Abdulaziz University Hospital in Jeddah, Saudi Arabia. We reviewed old charts of the patients having positive synovial cultures for both native and prosthetic joints between the periods of January 1, 2016, and December 31, 2023.

Study sampling

For including patients with native septic joints, we enrolled individuals aged 18 years and above who exhibited clinical symptoms suggestive of native septic joint, such as inflammation characterized by pain, warmth, redness, and swelling, along with joint effusion or the presence of a sinus tract. Additionally, patients were required to have a positive synovial fluid culture and meet at least one of the following criteria: Presence of purulent aspirate from the joint, synovial white cell count exceeding 50000 cells/μL, or a polymorphonuclear percentage greater than 90%. For prosthetic joint infection, we adhered to the modified criteria outlined by the Infectious Diseases Society of America, considering its increased sensitivity in detecting such infections[25,26] (Supplementary Table 1). Exclusion criteria for both native and prosthetic septic joints included individuals below the age of 18, absence of clinical signs indicating inflammation, negative synovial cultures, and clear fluid obtained from joint aspiration. After applying the eligibility criteria, a total of 52 individuals were included in the study.

Data collection

We reviewed the patient's charts to obtain the following information: Age, gender, body mass index, clinical presentation, affected joint, type of joint, clinical picture including signs and symptoms, microbiological agents identified from both blood and synovial cultures, blood works including C-reactive protein, synovial analysis, joint histopathology (if available), patient comorbidities, antimicrobial agents used, duration of therapy, surgical procedures performed, and outcomes/mortality within 30 days. The primary goal of the study was to assess the incidence of both native and prosthetic joint infection, the associated risk factors, and microbiological agents, and if they are different in terms of both types of joint infection. Furthermore, details regarding the appropriateness of treatment, whether cultures were taken before aspiration and in compliance with most guidelines, and finally treatment outcomes including complicated infections in association with osteomyelitis, severe soft tissue infection such as necrotizing fasciitis, and mortality from septic joint and whether it is different in both types of joint infection was also extracted.

Statistical analysis

The analysis was done at a 95% confidence interval using SPSS version 24.0. Data were checked for data entry errors which were corrected. Missing values were also adjusted. Categorical variables were presented as frequencies and percentages. Numerical variables were presented as mean and standard deviations. All data were presented in tables and charts. Numerical data were checked for normality using Shapiro-Wilk and Kolmogorov-Smirnov tests. The tests showed the data were mostly non-normally distributed. The association between categorical variables was assessed using the χ^2 test. The Spearman correlation test was done to check the correlation between all numerical variables. Univariate analysis was done to check the relationship between clinical features, comorbidities, and mortality but none of the analyses revealed a significant *P* value hence the results were not presented.

RESULTS

This retrospective chart review study included 52 septic arthritis cases. The ratio of males to females was equal, with a 1:1 distribution. Almost two-thirds (63.5%) had native joints and others had prosthetic joints. The knee joint was the most frequently affected joint, accounting for 42 (80.8%) cases, while the predominant imaging findings were joint effusion and swelling, observed in 18 (34.6%) cases (Table 1).

Different organisms were identified after joint aspiration as shown in Tables 2 and 3. The most common organism in native joints was methicillin-resistant *S. aureus* observed in 8 (24.2%) cases, and in prosthetic joints was *Brucella spp.* observed in 4 (21.1%) cases (Table 2). Almost all cases had joint swelling, 50 (95.2%), but blood culture was positive in 17 (32.7%) cases (Figure 1A and B). The outcome was 'joint preservation' for the majority of the patients, 44 (84.6%). However, five (9.6%) cases suffered irreversible joint destruction (Figure 1C). Table 3 shows there was no statistically significant difference in clinical features in native *vs* prosthetic joints, with all *P* values > 0.050. Table 4 shows the distri-

Table 1 Distribution of gender, joint type, affected joint, imaging, and Echo results

Variables	Attributes	N	%
Gender	Male	26	50.0
	Female	26	50.0
Joint type	Native	33	63.5
	Prosthetic	19	36.5
Affected joints	Knee	42	80.8
	Hip	4	7.7
	Shoulder	2	3.8
	Ankle	2	3.8
	Elbow	1	1.9
	Sterno-clavicular	1	1.9
Imaging	Joint effusion	18	34.6
	Joint effusion and osteomyelitis	3	5.8
	Joint swelling	1	1.9
	Loosening of prosthesis	1	1.9
	Not done	8	15.4
	Prosthetic joint fluency	1	1.9
	Soft tissue swelling	18	34.6
	Soft tissue swelling and osteomyelitis	2	3.8
Echo	Joint effusion	2	3.8
	Loosening of prosthesis	1	1.9
	No vegetations	20	38.5
	Not done	22	42.3
	Soft tissue swelling	4	7.7
	Vegetations	3	5.8

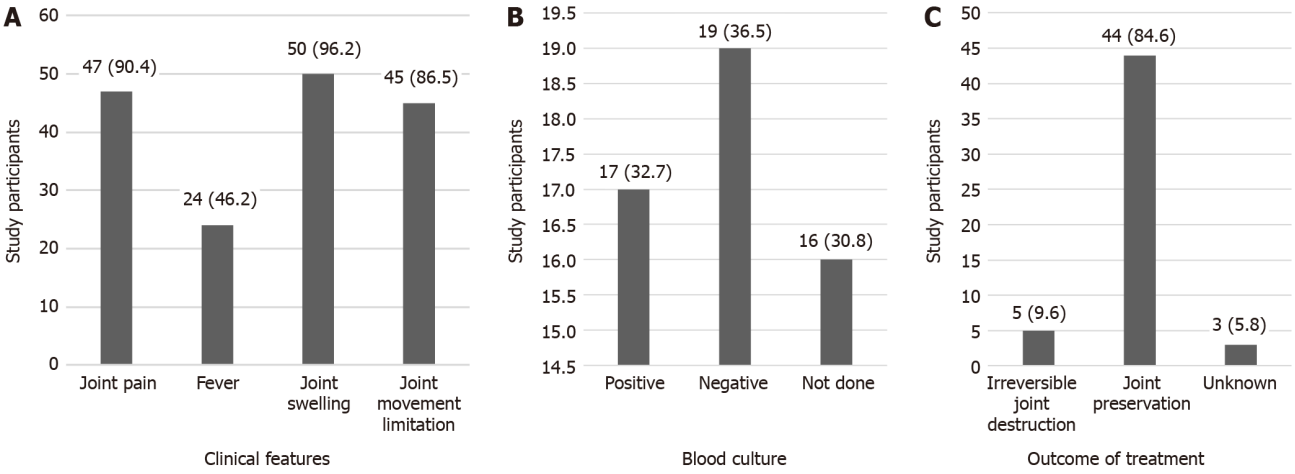

Figure 1 Frequency and percentage of clinical features, blood culture, and treatment outcomes among study participants. A: Clinical features; B: Blood culture results; C: Treatment outcomes.

Table 2 Organisms in native and prosthetic joints

Organism	*N*	%
Native joints		
Bacteroides stercoris	1	3.0
Coagulase-negative staphylococcus	1	3.0
Enterobacter cloacae	1	3.0
Enterococcus faecalis	1	3.0
ESBL *E. coli*	3	9.1
Lactobacillus	1	3.0
Leuconostoc	1	3.0
MRSA	8	24.2
Polymicrobial	1	3.0
Pseudomonas aeruginosa	6	18.2
Salmonella	1	3.0
Staphylococcus aureus MSSA	5	15.2
Staphylococcus haemolyticus	1	3.0
Streptococcus uberis	1	3.0
Tuberculosis	1	3.0
Prosthetic joints		
Brucella spp	4	21.1
Coagulase-negative staphylococcus	2	10.5
E. coli	2	10.5
Enterococcus faecalis	1	5.3
ESBL klebsiella pneumoniae	1	5.3
MRSA	1	5.3
Pseudomonas aeruginosa	2	10.5
Ralstonia	1	5.3
Staphylococcus aureus MSSA	2	10.5
Staphylococcus epidermidis	1	5.3
Staphylococcus lugdunensis	1	5.3
Tuberculosis	1	5.3

ESBL: Extended-spectrum beta-lactamase; *E. coli*: *Escherichia coli*; MRSA: Methicillin-resistant *Staphylococcus aureus*; MSSA: Methicillin-susceptible *Staphylococcus aureus*.

bution of risk factors in all cases and two joint types. It also compares the risk factors in native *vs* prosthetic joints. Some comorbidities were more prevalent in native joint cases *e.g.*, renal impairment (P value = 0.002), hemodialysis (P value = 0.004), heart disease (P value = 0.013), and chronic liver disease (P value = 0.048). Osteoarthritis was more prevalent among prosthetic joint cases (P value = 0.013) (Tables 3 and 4).

The mean body mass index, age, and Charson comorbidity index in all cases was 28.63 ± 6.61 kg/m^2, 59.31 ± 17.53 years, and 2.79 ± 2.28 respectively. Table 5 shows the distribution of tuberculosis test results and histopathological findings for all cases. The most commonly used antibiotic was vancomycin, as observed in 14 (26.9%) cases (Tables 5, 6 and 7). Most of the patients received antibiotics before aspiration, 30 (57.7%), and had appropriate antibiotic treatment, 45 (86.5%). The majority needed surgical treatment, and the most common surgery performed was arthrotomy, 17 (32.7%) (Table 8).

Correlation between numerical variables showed a moderate negative correlation between monocyte and neutrophil counts, r = -0.816, P = < 0.001. A moderate strength positive correlation was also found between the Charlson comorbidity index and creatinine, r = 0.762, P = < 0.001. Weak negative correlations were observed between monocyte and C-reactive protein (r = -0.543, P = 0.013), duration of antibiotic treatment and cell count (r = -0.470, P = 0.001), duration of antibiotic

Table 3 Comparison of clinical features in native *vs* prosthetic joints

Clinical feature	Presence	Native		Prosthetic		Odds ratio	*P* value
		N	%	*N*	%		
Joint pain	Yes	31	93.9	16	45.5	0.344	0.252
	No	2	6.1	3	15.8		
Fever	Yes	15	45.5	9	47.4	1.080	0.894
	No	18	54.5	10	52.6		
Joint swelling	Yes	33	100	17	98.5	2.941	0.057
	No	0	0	2	10.5		
Joint limitation	Yes	30	90.9	17	89.5	0.856	0.866
	No	3	9.1	2	10.5		

Table 4 Risk factors/comorbidities

Risk factors/comorbidities present	All cases		Native		Prosthetic		Odds ratio	*P* value
	N	%	*N*	%	*N*	%		
Complicated by osteomyelitis	11	21.2	9	27.3	2	10.5	0.314	0.154
Associated with necrotizing fasciitis	7	13.5	2	6.1	5	26.3	0.536	0.039
DM	36	69.2	22	66.7	14	73.7	1.400	0.598
HTN	29	55.8	19	57.6	10	52.6	0.819	0.730
Renal impairment	23	44.2	20	60.6	3	15.8	0.122	0.002
Hemodialysis	15	28.8	14	42.4	1	5.3	0.075	0.004
Heart disease	13	25.0	12	36.4	1	5.3	0.097	0.013
CVD	5	9.6	3	9.1	2	10.5	1.176	0.866
CLD	6	11.5	6	18.2	0	0	0.587	0.048
Malignancy	4	7.7	2	6.1	2	10.5	1.824	0.561
Hematological malignancy	1	1.9	1	3.0	0	0	0.627	0.444
Solid organ malignancy	4	7.7	2	6.1	2	10.5	0.339	0.561
Surgery within 90 days before Dx	5	9.6	2	6.1	2	10.5	2.906	0.252
Osteoarthritis	12	23.1	4	12.1	3	15.8	5.273	0.013
Rheumatoid arthritis	2	3.8	0	0.0	2	10.5	0.340	0.057
Psoriasis	1	1.9	1	3.0	0	0	0.627	0.444
Sickler	1	1.9	1	3.0	0	0	0.627	0.444
Other rheumatological disease	1	1.9	1	3.0	0	0	0.627	0.444
Past septic arthritis	1	1.9	0	0	1	3.0	0.353	0.183
Hx of trauma	9	17.3	4	12.1	5	26.3	2.589	0.181

None of the cases had lung disease or immunosuppressive therapy. DM: Diabetes mellitus; HTN: Hypertension; CVD: Cardiovascular disease; CLD: Chronic liver disease; Dx: Discharge; Hx: History.

treatment and Charlson comorbidity index (r = -0.458, P = 0.002) (Table 9). The association between joint type and mortality was statistically significant. All six deceased patients had native joints (odds ratio = 0.587, P = 0.048). The deceased patient also had a significantly higher Charlson comorbidity index compared to their counterparts (5.82 ± 5.50 *vs* 2.39 ± 2.02, P value = 0.001) (Tables 10 and 11).

Table 5 Distribution of numerical variables

Variables	Mean	Median	SD
BMI	28.63	27.00	6.61
Age	59.31	64.00	17.53
CRP	7535.66	148.50	35267.86
Cell count from aspiration	102998.04	49375.00	139227.01
RBC	90367.48	10583.00	366693.04
Neutrophil	76.21	84.00	27.52
Lymphocyte	4.96	4.00	3.59
Monocyte	10.14	10.00	8.63
Charlson index	2.79	2.00	2.28
Duration of antimicrobials in days	69.86	42.00	100.61

BMI: Body mass index; CRP: C-reactive protein; RBC: Red blood cell.

Table 6 Tuberculosis acid-fast bacilli, tuberculosis polymerase chain reaction, tuberculosis culture, histopathology

Test	Status	*N*	%
TB AFB	Negative	18	34.6
	Not sent	33	63.5
	Positive	1	1.9
TB PCR	Positive	2	3.8
	Negative	12	23.1
	Not sent	38	73.1
TB culture	Negative	15	28.8
	Not sent	35	67.3
	Positive	2	3.8
Histopathology	Exudate and granulation tissue	1	1.9
	Features of septic joint	2	3.8
	Features of synovitis	1	1.9
	Inflamed granulation tissue	2	3.8
	Inflammatory changes	2	3.8
	Noncaseating granuloma	1	1.9
	Not sent	43	82.7

TB AFB: Tuberculosis acid-fast bacilli; TB PCR: Tuberculosis polymerase chain reaction.

DISCUSSION

Native Septic joint is clinically diagnosed by swollen, tender, and hot joints with a decreased range of movement. It has been shown to account for 27% of cases in Taiwan[27], 29% in Saudi Arabia[28], 33% in the United Kingdom[29], and 35% in Australia[9]. The present study adhered to internationally recognized definitions for both native and prosthetic joint infections and implemented exclusion criteria to eliminate patients with negative synovial fluid cultures, aiming to focus on capturing cases of septic joints accurately. The results showed that two-thirds of our patient had a native joint infection and one-third had a prosthetic joint infection which emerged as the most commonly affected site for both types of infections, highlighting a contiguous pattern in their distribution. Similar findings have been reported in other studies, consistently highlighting the knee as the most frequently affected site for joint infections, followed by the hip and ankle joints[5,9,30-32].

Table 7 Antibiotics used to treat

	Specifics	N	%
Antibiotics	Vancomycin	14	26.9
	Ceftriaxone	6	11.5
	Meropenem	5	9.6
	Cloxacillin	4	7.7
	Ceftazidime	3	5.8
	Antituberculous drugs	2	3.8
	Cefazolin	2	3.8
	Ceftriaxone + rifampin	2	3.8
	Ciprofloxacin	2	3.8
	Imipenem	2	3.8
	Piperacillin tazobactam	2	3.8
	Streptomycin + rifampin + doxycycline	2	3.8
	Ampicillin	1	1.9
	Cefepime	1	1.9
	Gentamicin + rifampin + doxycycline	1	1.9
	Piperacillin tazobactam, vancomycin, clindamycin	1	1.9
	Streptomycin + rifampin	1	1.9
	Teicoplanin	1	1.9

Table 8 Antibiotic prior aspiration, treatment, surgery

Variables	Attributes	N	%
Antibiotics prior aspiration	Yes	30	57.7
	No	22	42.3
Appropriateness of treatment	Appropriate	45	86.5
	Inappropriate	7	13.5
Surgical treatment	Arthrotomy	17	32.7
	Joint preservation	7	13.5
	Arthroscopic irrigation	6	11.5
	Two-stage exchange	6	11.5
	Debridement, antibiotics, and implant retention	4	7.7
	Above knee amputation	1	1.9
	None	11	21.2

The typical mechanism of infection involves hematogenous spread to the joint. However, in the present study, only 32% of patients had positive blood cultures, and 30% did not undergo blood culture withdrawal. In cases where the same organism was isolated from both synovial fluid and blood cultures, confirming hematogenous spread, this pattern was observed in the identified patients. In terms of microbiological isolation in the native joint, *S. aureus*, including both methicillin-susceptible and methicillin-resistant strains, was the most commonly isolated organism, accounting for 39% of the cases followed by *Pseudomonas aeruginosa* (18%) and extended-spectrum beta-lactamase *Escherichia coli* (9%). This finding was different than the reported microbiological agents in native joints elsewhere, where the most commonly isolated organisms were *S. aureus*, followed by *Streptococcus spp.*, and other gram-negative organisms, including *Pseudomonas aeruginosa*, which accounted for approximately 1% of cases[33-36]. In terms of prosthetic joint infection, we found that *Brucella* was the most common isolate (21%) followed by coagulase-negative *Staphylococcus* (10%), methicillin-susceptible *S. aureus* (10%), and *Pseudomonas aeruginosa* (10%). Contrary to findings in other studies, our results differed, with the most common causative agents being *S. aureus* at 43%, followed closely by coagulase-negative *Staphylococcus*

Table 9 Correlation between numerical variables

		BMI	AGE	CRP	Cell count	RBC	Neutrophil	Lymphocyte	Monocyte	Creatinine	Charlson
AGE	*r* value	0.372[b]									
	P value	0.007									
CRP	*r* value	0.025	0.048								
	P value	0.861	0.739								
Cell count	*r* value	-0.049	-0.180	0.213							
	P value	0.731	0.201	0.137							
RBC	*r* value	-0.042	0.017	-0.331[a]	0.279[a]						
	P value	0.769	0.906	0.019	0.045						
Neutrophil	*r* value	-0.310	-0.192	0.097	0.082	0.177					
	P value	0.140	0.368	0.659	0.702	0.407					
Lymphocyte	*r* value	0.124	0.265	-0.148	-0.349	-0.050	-0.406				
	P value	0.565	0.211	0.500	0.094	0.818	0.055				
Monocyte	*r* value	0.379	0.430	-0.543[a]	-0.311	0.134	-0.816[b]	0.191			
	P value	0.091	0.052	0.013	0.170	0.564	0.000	0.421			
Creatinine	*r* value	-0.100	0.171	0.258	0.240	0.074	0.186	-0.357	-0.170		
	P value	0.514	0.260	0.095	0.113	0.631	0.419	0.122	0.461		
Charlson	*r* value	-0.184	-0.041	-0.070	0.331[a]	0.272	0.268	-0.391	-0.112	0.762[b]	
	P value	0.192	0.771	0.630	0.016	0.051	0.205	0.059	0.629	0.000	
Duration of antimicrobials in days	*r* value	0.109	0.253	0.058	-0.470[b]	-0.308[a]	0.121	-0.003	0.298	-0.325[a]	-0.458[b]
	P value	0.480	0.098	0.715	0.001	0.042	0.612	0.990	0.202	0.031	0.002

[a]$P < 0.05$, correlation is significant at the 0.05 level (2-tailed).
[b]$P < 0.05$, correlation is significant at the 0.01 level (2-tailed).
BMI: Body mass index; CRP: C-reactive protein; RBC: Red blood cell.

(39%). Streptococci and gram-negative bacilli each accounted for 12% of cases. It is noteworthy that *Brucella* is endemic in Saudi Arabia due to the consumption of unpasteurized dairy products by certain individuals.

The incidence rate of infection in Saudi Arabia is reported at 70 per 100000 individuals[37]. This finding suggests that a significant portion of the infections observed did not occur during the time of surgery but likely developed postoperatively. This could be attributed to patients consuming unpasteurized dairy products, leading to bacteremia that subsequently seeded the joint. This is an important finding that necessitates communication with the community to prevent similar occurrences in the future. Additionally, osteomyelitis was observed in 11 cases, comprising 21% of the total population. Interestingly, the majority of these cases occurred concurrently with native septic joint infections, with only two cases occurring in patients with prosthetic joint infections. The co-occurrence of septic arthritis and osteomyelitis is relatively rare in adults, and more commonly observed in pediatric populations. Upon review of existing literature and reports, this phenomenon is predominantly associated with femoral osteomyelitis complicated by knee septic joint. Chronic osteomyelitis has been identified as a potential precursor to septic joint development[38,39]. Conversely, in cases of prosthetic joint infection, osteomyelitis likely arises as a complication of hardware infection. Regarding skin and soft tissue infections, necrotizing fasciitis was observed in two cases. Both instances occurred when native arthritis progressed and were accompanied by risk factors such as diabetes and renal impairment.

The mortality rate was observed to be 11% among six patients and did not exhibit significant differences between native and prosthetic joint infections[40]. Notably, mortality rates were higher among patients with higher Charlson comorbidity index scores, as expected. This trend is consistent with findings from other studies, which have reported mortality rates ranging from 7% to 15%[41,42]. However, some studies have documented even higher mortality rates, ranging from 30% to 50%, particularly among patients with multiple native septic joints and multiple comorbidities[31,40,41]. Additionally, elevated mortality rates, reaching up to 50%, have been associated with factors such as joint deformity, pre-existing joint diseases, limited joint mobility, and the type of infectious pathogen[42]. Despite advancements in treatment modalities, hospital care, and antimicrobial agents, the overall mortality rate for native septic joints has remained relatively unchanged over the past two to three decades[31].

The study revealed that the majority of patients initially received appropriate antibiotic therapy, and most underwent surgical treatment, with only 11 patients not undergoing surgery. Consequently, a higher proportion of cases (84%)

Table 10 Association between variables of interest

Association between	Odds ratio	*P* value
Joint type and mortality	0.587	0.048
Mortality and appropriateness of treatment	0.848	0.304
Platelet count and mortality	-	0.273
WBC count and mortality	-	0.382

WBC: White blood cell.

Table 11 Relationship between Charlson comorbidity index and mortality

	Charlson comorbidity index
Alive, mean ± SD	2.39 ± 2.02
Dead, mean ± SD	5.83 ± 5.50
P value	0.001

achieved joint preservation, while 9% exhibited reversible joint destruction. The decision to forego surgical intervention in some cases was likely influenced by various factors, including surgical risk considerations. This underscores the importance of early antimicrobial therapy in conjunction with surgical debridement, irrespective of the specific procedure employed, as it is associated with improved outcomes and joint preservation, a trend also observed in other studies[43].

In cases of prosthetic joint infection, the majority underwent a two-stage exchange, which contributed to the favorable outcomes observed in the study. Notably, among the 12 patients who did not undergo surgical intervention but instead underwent joint aspiration on multiple occasions, 10 patients had native septic joint infections. Remarkably, only one of these patients passed away, while the rest experienced joint preservation despite antimicrobial therapy alone in certain situations, suggesting that favorable outcomes can be achieved without surgical intervention in specific cases[44].

This study is subjected to certain limitations, notably the exclusion of patients presenting with signs of septic joint but with negative cultures. This limitation is due to the possibility that negative cultures do not definitively rule out septic joints, especially if the patient has received antibiotics before joint aspiration. In such cases, organisms may fail to grow on cultures and may require specific media for detection. However, due to the retrospective nature of the study and the necessity for prospective chart review, these cases had to be excluded. This limitation may have resulted in underestimating the true number of septic joints in both prosthetic and native joints. Additionally, the retrospective design of the study poses challenges in interpreting the results, as it relies on existing medical records and may be subject to biases or incomplete data collection.

CONCLUSION

In conclusion, the study revealed notable differences in microbiological organisms, particularly in prosthetic joint infections where *Brucella* emerged as the most prevalent organism, diverging from international trends. Furthermore, the findings highlighted the significance of chronic osteomyelitis as a potential etiology for native septic joints. Additionally, it also emphasizes the imperative for additional multicenter prospective studies in this field to gain deeper insights into the true burden of this disease and its ramifications.

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FOOTNOTES

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