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Research Article

Epidemiological, Clinical and Microbiological Profile of Bone and Joint Infections in a Sub-Saharan Centre

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Abstract

Introduction: Bone and Joint infections (BJI) are a real obsession for the orthopedic surgeon. Their clinical polymorphism and the relative unavailability of means of paraclinical exploration make their early diagnosis difficult in our context.

Objective: The objective of our work was to describe the epidemiological, clinical and microobiologic aspects of BJI in a Sub-Saharan Center in order to improve diagnosis.

Patients and Methods: We conducted a descriptive retrospective study over a period of 15 years at the National Center for the Rehabilitation of People with Disabilities in Yaoundé. All patients aged 0 to 17 years with BJI, whether primary or secondary, with or without the presence of orthopaedic implants and regardless of the site, were included.

Results: 171 patients were included in our study, with a prevalence of 0.35%. There were 121 men (70.8%) and 50 women (29.2%), a sex ratio of 2.4. The mean age was 25.1 ± 21.4 years. The average consultation time was 39.3 ± 38.8 days. 25.9% were sickle cell patients. Septic arthritis (26.7%) and osteitis (24.4%) predominated and chronic forms were the majority (57.9%) with fistula present in 32.2% of cases. The lower limb was involved in 137 cases (80.1%) with a predominance on the tibia (48.3%). Standard X-rays (85.3%) and bacteriological culture (76%) were the main diagnostic tests. Infection was monomicrobial in 89.2% of cases including 49.3% of Staphylococcus aureus, more sensitive to Lincocine (88.88%), Ceftazidime (75%) and Levofloxacin (73.73%).

Conclusion: Chronic BJI remain common in our environment and antibiotic resistance is growing. Raising public awareness of the need to consult the first clinical signs and training practitioners in early diagnosis are essential to improve the management of these serious conditions, which often cause disabling sequelae.

Keywords: Osteoarticular Infection; Sickle Cell Disease; Hip; Antibiotic

Introduction

Bone and joint infections (BJI) are a polymorphic group of conditions, characterized by microbial joint and/or bone involvement, with or without foreign material. They are distinguished by their site, their evolution, the germs involved, the terrain and the type of contamination [1]. These are medical-surgical emergencies diagnosiss and therapeutics, both by the vital risk engaged in acute forms and by the severity of the sequelae in chronic forms [2]. They are of indiscriminate interest to all age groups and the severity of the clinical picture may be related to the soil, the pathogen and the existence of an abscess or associated bacteremia [3,4].

In the Sub-Saharian environment, diagnosis remains late and the functional prognosis is often burdened with major disabilities because coverage is expensive, especially in the absence of universal health coverage. Also, prevention, early diagnosis of BJI and a better knowledge of the microbiological ecosystem could improve their management.

The main objective of our study was to describe the epidemiological, clinical and microbiological aspects of BJI at the NCRDP in order to improve knowledge and allow early diagnosis.

Patients and Methods

We conducted a retrospective and descriptive cross-sectional study at the National Centre for the Rehabilitation of People with Disabilities (NCRDP) in Yaoundé over a period of 15 years (2005-2020) whose main objective was to describe the epidemiological aspects, clinical and microbiological of BJI at the NCRDP.

We included all records of patients aged 0 to 17 years with BJI (septic arthritis, osteomyelitis, osteoarthritis, primary osteitis, spondylodiscitis, diabetic foot infection and infection on implantable medical device). Incomplete files were excluded. The sampling was consecutive and exhaustive.

The variables studied were prevalence, age, sex, past history, functional signs, mean time to consultation and hospitalization, type of infection, diagnostic tests, pathogen and antibiotic susceptibility.

Data was collected in CSPRO version 7.1 and Microsoft Excel 2010.

Results

Epidemiological Characteristics

Over the study period, were recorded 59. 001 cases including 210 cases of BJI for a hospital prevalence of 0.3 5% and an average frequency of 14 cases/year. 39 being incomplete, we retained 171 files with 121 men (70.8%) and 50 women (29.2%); a sex ratio of 2.4.

The most affected age group was [4-9] years (23.4%) for an average age of 25.1±21.4 years (Table 1).

Table 1: Distribution of patients by age.

Age (years)	Number (n)	Percentage (%)
0-3	15	8.8
4-9	40	23.4
10-17	33	19.3
18-30	24	14.0
31-50	33	19.3
≥ 50 years	26	15.2
Total	171	100.0

These infections were favored by a particular terrain in 35 patients (20.5%) including 22 cases of sickle cell disease (25.9%), 8 of HIV infection (7.1%) and 5 of pre-existing pulmonary tuberculosis (4.7%). 22 patients had their BJI after an open fracture (12.9%) and 49 patients had previously experienced a similar episode of BJI at the same site (28.6%).

The median time to consult in our Centre was 39.3 days with extremes of 3 days and 1 year.

Clinical characteristics

The route of contamination was cutaneous in 38% of cases, hematogenous in 18.7%, ENT in 7.6% and unidentified in 38.6%.

According to the table 2, septic arthritis (26.7%), osteitis (24.4%) and osteomyelitis (18%) were the most common types. BJI were chronic in 57.3% of cases. Pain was the main symptom for consultation (74.8%) and fever was inconsistent (23.4%).

Predominant primary infections in children (septic arthritis, osteoarthritis and osteomyelitis) accounted for 97.4% of acute

Table 2: Types of BJI and distribution according to functional signs during the 1st consultation at the NCRDP.

BJI Types	Number (%)	Pain	Fever	Limp	Swelling
Septic arthritis	46 (26.7%)	41 (89.1%)	21 (45.7%)	21 (45.7%)	22 (47.8%)
Osteitis	42 (24.4%)	29 (69%)	4 (9.5%)	23 (54.8%)	14 (33.3%)
Osteomyelitis	31 (18%)	26 (81.2%)	9 (28.1%)	6 (18.8%)	13 (40.6%)
Osteoarthritis	15 (8.7%)	12 (80%)	2 (13.3%)	6 (40%)	9 (60%)
Septic non union	13 (7.6%)	5 (36.5%)	-	9 (69.2%)	7 (58.8%)
Infection on implantable device	9 (5.2%)	7 (77.8%)	1 (11.1%)	4 (44.4%)	4 (44.4%)
Pyogen spondylodiscite	5 (2.9%)	2 (40%)	3 (60%)	-	-
Tuberculous spondylodiscite	4 (2.3%)	3 (75%)	2 (40%)	-	-
Joint infection on prosthesis	3 (1.7%)	2 (66.7%)	1 (33.3%)	2 (66.7%)	-
Extraspinal bone tuberculosis	3 (1.7%)	1 (33.3%)	2 (66.7%)	-	-
Diabetic foot infection	1 (0.6%)	-	-	-	1 (100%)
Total	171	128 (74.8%)	40 (23.4%)	71 (41.5%)	70 (40.9%)

forms and 88.6% of subacute forms, while postoperative infections (osteosynthesis, arthroplasty) on implantable medical devices were rarer with 12 cases (7%) but all seen late (Table 3).

Clinically, fistula was found in 32.2% (55) of cases including 28 cases of osteitis (66.7%) and joint stiffness in 37.4% (64). According to the seat, the lower limb was involved in 137 cases (80.1%)

Table 3: Distribution of different types of BJI by clinical form.

Clinical forms	Acute	Subacute	Chronic	Total
Septic arthritis	25 (54.3%)	13 (28.3%)	8 (17.4%)	46
Osteoarthritis	7 (46.7%)	8 (53.3%)	-	15
Osteomyelitis	5 (16.1%)	10 (32.3%)	17 (54.8%)	31
Osteitis	-	3 (7.1%)	39 (92.9%)	42
Pyogen spondylodiscite	1 (20%)	1 (20%)	3 (60%)	5
Tuberculous spondylodiscite	-	-	4 (100%)	4
Diabetic foot infection	-	-	1 (100%)	1
Joint infection on prosthesis	-	-	3 (100%)	3
Infection on implantable device	-	-	9 (100%)	9
Septic non union	-	-	13 (100%)	13
Extraspinal bone tuberculosis	-	-	2 (100%)	3
Total	38 (22.2%)	35 (20.5%)	98 (57.3%)	171 (100%)

with a predominance on the tibia (48.3%), knee (22.9%), femur (18.6%) and ankle (10.2%). On the upper limb, affected in 25 cases (14.6%), the preferred locations were the forearm and elbow (respectively in 23.3% of cases), humerus (20%), shoulder (16.5%), hand (13.3%) and wrist (3.3%). The remaining 9 cases were localized on the spine (5.3%). The hip was the preferred site in sickle cell patients (31.8%).

Paraclinical characteristics

Standard radiography (146; 85.4%) and ultrasound (33; 19.3%) were the primary imaging examinations. Abnormal in 82.2% (120) of cases, X-rays was mainly performed in 83.7% septic arthritis and 9-2.9% osteitis and was abnormal in 56.1% and 97.4% of cases, respectively. It mainly revealed bone demineralization (33%), bone sequestration (20.8%), joint narrowing (17%), osteolysis (16%) and periosteal reaction (13.2%). CT (3 patients) and MRI (1 patient) were exceptionally performed while scintigraphy was not available.

The main laboratory tests were complete blood count (CBC) in 107 patients (62.6%), Reactiv Protein (CRP) C in 92 (53.8%) and sedimentation test (ESR) in 54 (31.6%). The NFS found hyperleukocytosis greater than 12,000 GB/mm 3 in 51.4% of cases, between 10,000 and 12,000 GB/mm^3 in 15% but was otherwise normal. CRP was positive in 87.1% of cases including 59.9% greater than 100 mg/l. ESR was high in 8 8.9% of cases including 33.3% greater than 100 mm the 1^{st} hour.

The cytobacteriological study was performed in 130 patients (76%) following joint puncture in 52.9% of cases, bone biopsy and blood culture in 23.1% respectively. Culture was positive in 74 patients (56.92%). It was monobacterial in 67 patients (89.18%) with Staphylococcus aureus predominance in 49.3% of cases (Figure 1).

Figure 1: Distribution of isolated germs in monomicrobial BJI.

In polymicrobial BJI, Klebsiella pneumoniae was the most common germ (Figure 2).

Susceptibility testing has led to resistance to major anti-Staphylocal drugs in our context (Table 4). Staphylococcus aureus was more sensitive to Lincocin (88.88%), Ceftazidime (75%) and Levofloxacin (73.73%).

Discussion

We conducted a descriptive retrospective study at the NCRPD whose purpose was to describe the epidemiological, clinical and microbiological aspects of BJI in a specialized sequellar surgery center in order to improve their care in our context.

Figure 2: Polymicrobial associations isolated in IOAs.

Table 4: Sensitivity profile of antibiotics used on Staphylococcus aureus.

Antibiotics	Sensitive		Intermediary		Resistant		Total
	n	%	n	%	n	%	
Oxacilline	10	45.5	8	36.4	4	18.2	22
Flucloxacilline	7	70	2	20	1	10	10
Amoxicillin-Acide clavulanic	0	0	6	60	4	40	10
Vancomycin	1	25	2	50	1	25	4
Lévofloxacine	11	73.7	3	20	1	6.7	15
Ciprofloxacin	8	66.7	2	16.7	2	16.7	12
Cotrimoxazole	0	0	0	0	2	100	2
Lincocine	8	88.9	1	11,1	0	0	9
Cefuroxime	06	66.7	3	33.3	0	0	9
Ceftazidime	06	75	2	25	0	0	8
Métronidazoland	0	0	1	25	3	75	4
Gentamycine	7	26.9	15	57.7	4	15.38	26

Epidemiological characteristics

We collected 171 cases of BJI with a hospital prevalence of 0.3 5%. This one is weaker than that of Houzou., *et al*. in Togo reporting 4.74% [5] but can be explained by the expertise of the NCRDP, more specialized in the surgery of complications and sequelae than in the management of emergencies. We determined a mean frequency of 14 cases/year, similar to that of other authors [6,7].

OA mainly affected the male sex (70.8%). This predominance is classic in literature [8-11].

All age groups were concerned with a peak at [4-9] years (23.4%) for an average age of 25.1 years. This distribution is linked to the exhaustive sampling of our population.

The median time to consultation in our study was 39.3 days with extremes of 3 days and 1 year. This delay in patient consultation is corroborated by several African authors [2,4,6,12,13]. In addition, it is common in our context for patients to initially have recourse to the tradipratician before consulting successively the Community Health Centre, then the Community Hospital before being admitted, in large cases, to the Reference Hospital. This therapeutic homelessness, the sometimes-difficult access to health facilities and the lack of community awareness of the seriousness of BJI are factors that can explain these latencies in the African literature.

Clinical characteristics

Pain was the main reason for consultation (74.8%) and fever was inconsistent (23.4%). The predominance of pain is described by other authors in more than 70% of BJI [14,15]. The inconstancy of fever would be related to the lower proportion of acute forms in our series because we found chronic forms of BJI in 57.9% of cases. For Madougou., *et al*. [13] in Benin, this rate was 71.4% while for Roger., *et al*. [16] in France, it was only 46%. This disparity could support the socio-geographic influence in the epidemiology of OA, with low-income countries more conductive to progression to chronic forms. Added to this are favorable areas such as sickle cell disease, HIV or tuberculosis found in 20.5% of the patients in our study. Sickle cell disease is a major factor in the occurrence of BJI conventionally implicated in the literature [2,4,6,12,13,17-19].

On physical examination, a fistula was found in 32.2% of cases in our series, a rate comparable to those of Bauer., *et al.* [20] and Nacinovich., *et al.* [21] which yielded 38.6% and 38% respectively. For Pensotti., *et al.* [14], it was lower (21.7%). However, it is important to note that these authors are mainly post-operative BJI of adults while our series is heterogeneous. And from this point of view, fistulas in the osteitis of our serie seem much more frequent (66.7%), probably related to the chronicity of BJI and the recurrence of these (28.6%).

Paraclinical characteristics

Standard radiography was the 1st line imaging examination (85.4%). Its accessibility and ease of interpretation justify the choice in our practice. It was abnormal in 82.2% of cases in our series and in 97.4% of osteitis. These rates are comparable to those of the literature ranging from 71.5% to 91% [22-24]. This high sensitivity is probably related to the predominance of chronic forms in our study because for Bonhoeffer., *et al.* [25], radiography found abnormalities in only 58% of acute osteomyelitis. CT, MRI, bone scintigraphy and scan with marked leukocytes are currently the tests for the early morphological diagnosis of BJI. However, the expensive cost of some (CT, MRI) and the unavailability of others (scintigraphy, leuko-scan) remain limiting factors in our context.

Biologically, an inflammatory syndrome with elevated CRP and ESR in more than 85% of cases and hyperleukocytosis greater than 12,000/mm^3 in 51.4% of cases were found. However, normal white blood cell counts were reported in 33.6% of BJI. This observation calls for caution in current practice and justifies taking into account anamnestic, radiological and biological elements in the diagnosis of BJI, especially in the absence of a Procalcitonin test, more specific to the infection but unavailable in our context for the duration of the study.

From a bacteriological point of view, the culture was positive in only 56.9% of BJI, isolating a single germ in the majority of cases (89.18%); Staphylococcus aureus accounting for half (49.3%). This predominance of S. aureus is corroborated in the literature [8,23,25]. However, we noted an emergence of resistance of the latter to major anti-staphyloccic drugs in our context, S. aureus being more sensitive to Lincocin (88.88%), Ceftazidime (75%) and Levofloxacin (73.73%). There is nevertheless a bias, sensitivity to Vancomycin having been little tested in our study, due to its relative unavailability in bacteriology laboratories in the 2000s. New prospective studies with more complete bacteriological kits including Vancomycin would provide an accurate estimate of microbial resistance in BJI.

Despite the limitations of our study, in particular its retrospective and descriptive nature as well as its exhautive recruitment, it allowed a preliminary global collection of data still little exploited both epidemiologically, diagnostically and bacterialogically, thus improving our knowledge on the subject. This groundwork will be

used for later, more targeted studies.

Conclusion

OA are severe and polymorphic pathologies, affecting all ages and requiring early diagnosis. The aim of our study was to provide a better understanding of the epidemiology, clinical expression and the main germs responsible for BJI in our context in order to allow their diagnosis as early as possible. Multicentric and multinational studies would be needed to deepen our knowledge of the subject,

Bibliography

1. Ghislain Aubin G and Corvec S. "Epidemiology and general pathophysiology of osteoarticular infections". *Revue Francophone des Laboratoires* 480 (2016): 25-31.v

2. N'Soundhat NEL., *et al*. "Osteoarticular Infections in Children: Monocentric Retrospective Study of 112 Cases Followed at the University Hospital of Brazzaville (Congo)". *Health Sciences and Disease* 20.6 (2019).

3. Nguyen S., *et al*. "Management of severe osteoarticular infections in intensive care". *Resuscitation* 24.3 (2015): 256-264.

4. Mouafo TFF., *et al*. "Sickle cell osteomyelitis in children in Cameroon: epidemiological, diagnostic and therapeutic particularities". *Revue Africaine de Chirurgie et Spécialités* 3.5 (2019): 10-15.

5. Kouamé BD., *et al*. "Treatment of complicated osteomyelitis in children at Yopougon University Hospital, Abidjan". *Cah D'études Rech Francoph Santé* 15.2 (2005): 99-104.

6. Ibrahima FC., *et al*. "Assessment of osteorticularis infections in Yaoundé. Experience of the National Centre for the Rehabilitation of the Disabled with regard to 20 operated cases". *Black African Medicine* 52.12 (2005).

7. Massin P., *et al*. "Diagnosis and treatment of chronic osteomyelitis in adults with pyogenic". *Rev Rum* 73 (2006): 380-386.

8. Grammatico-Guillon L., *et al*. "Paediatric bone and joint infections are more common in boys and toddlers: a national epidemiology study". *Acta Paediatrica Oslo, Norway* 102.3 (2013): 120-125.

9. Moser T., *et al*. "Traps in osteoarticular imaging: how to distinguish a bone infection from a tumor?" *Elsevier Masson* 93.5 (2012): 377-385.

10. Abuamara S., *et al*. "Osteoarticular infections of children". *Rev Chir Orthopaedic Restorative Appar Word* 90.8 (2004): 703-713.

11. Grimprel E and Cohen R. "Epidemiology and pathophysiology of osteoarticular infections in children (excluding newborns)". *Archives de Pédiatrie* 14 (2007): 81-85.

12. Kouamé BD., *et al*. "Treatment of complicated osteomyelitis in children at Yopougon University Hospital, Abidjan". *Cah d'études Rech Francoph Santé* 15.2 (2005): 99-104.

13. Madougou S., *et al*. "Surgical aspects of osteoarticular infections in adults with sickle cell disease in Cotonou". *Rev Morocco chir ortho traum* 68 (2017): 16-20.

14. Pensotti CA., *et al*. "Prosthetic joint infections: A multidisciplinary approach (1992-2008)". *International Journal of Infectious Diseases* 1.14 (2010): 55-56.

15. Gaujoux-Viala C., *et al*. "Osteomyelitis in adults: a little-known clinical entity in immunocompetent people. About six cases". *Rev Rum* 77.3 (2010): 286-290.

16. Roger P-M., *et al*. "Paraclinical examinations and duration of antibiotic therapy for osteoarticular infections". *Medicine Mal Infect* 41.5 (2011): 242-247.

17. Millet A., *et al*. "Sickle cell disease and osteoarticular invasive salmonellosis". *Archives de Pédiatrie* 19.3 (2012): 267-270.

18. Akakpo-Numado G., *et al*. "Osteoarticular complications of sickle cell disease in children". *Hard Tissue avr* 94.1 (2008): 58-63.

19. Kouamé BD., *et al*. "Treatment of complicated osteomyelitis in children at Yopougon University Hospital, Abidjan". *Cah D'études Rech Francoph Santé* 15.2 (2005): 99-104.

20. Bauer T., *et al*. "Continuous bone infection in the lower limb: About 127 cases". *Elsevier Masson* 93.8 (2008): 807-817.

21. Nacinovich F., *et al*. "Bone and joint infections in elderly and young adults patients: Comparison of clinical features and outcomes (1991-2007)". *International Journal of Infectious Diseases* 14 (2010): 55.

22. Chambers JB., *et al*. "Retrospective review of osteoarticular infections in a pediatric sickle cell age group". *Journal of Pediatric Orthopaedics* 20.5 (2000): 682-685.

23. Timsit S., *et al*. "Osteoarticular bacterial infections in infants and children: experience over one year". *Arch Pediatrics* 12.1 (2005): 16-22.

24. Teklali Y., *et al*. "Septic arthritis in infants and children about 554 cases". *Journal of Pediatrics and Child Care* 15.3 (2002): 137-141.

25. Bonhoeffer J., *et al*. "Diagnosis of acute haematogenous osteomyelitis and septic arthritis: 20 years' experience at the University Children's Hospital Basel". *Swiss Medical Weekly* 131.39-40 (2001): 575-581.