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Chronic Osteomyelitis in Children at Zinder National Hospital: Diagnosis and Therapeutic Aspects

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Abstract

Objective: Chronic osteomyelitis represents a frequent complication in young children, especially those with sickle cell disease. The aim of this study was to describe the epidemiological aspects and therapeutic implications of chronic long-bone osteomyelitis in sickle-cell subjects aged 0 to 5 years at Zinder National Hospital. **Methodology:** This is a descriptive study with retrospective data collection of sickle cell subjects hospitalized and treated for chronic osteomyelitis from November 2023 to October 2024 at Zinder National Hospital. **Results:** Of the 16 patients included, male sex predominated in 56.25% (9/16). The mean age of patients was 32.69 months, ranging from 12 to 54 months. Involvement was multifocal in 75% (12/16) and bilateral in 37.5% (6/16). Bone involvement was predominantly in the pelvic limbs (87.5%). Among the bones affected, the femur was the most frequent site of involvement. All patients presented clinical symptoms such as pain, fever and swelling. Hyperleukocytosis was present in all subjects. Abscesses were present in 93.75% of cases, and sequestration was observed in 37.5% of patients. All cases were managed medico-surgically. Complications were noted in 25% (4/16), and involved residual bone deformities. Cure was confirmed in 43.75% (7/16). **Conclusion**: Chronic osteomyelitis in sickle-cell patients is a serious complication of acute osteomyelitis. Early management of acute osteomyelitis helps to avoid.

Keywords

Osteomyelitis, Chronic, Sickle Cell Disease, Zinder

1. Introduction

Chronic osteomyelitis is bone damage lasting more than a month and may lead to fistula, sequestration, pandiaphysitis, pseudarthrosis or pathological fractures [1]-[3]. They sometimes result from complications of acute osteomyelitis in children, especially those with sickle cell disease [2] [4]. Sickle cell disease is an inherited disorder affecting the structure of haemoglobin, leading to a variety of complications, including painful attacks, chronic anaemia and increased susceptibility to infection [5] [6]. Among bone complications, chronic osteomyelitis manifests itself as inflammation of bone tissue, often linked to infection and ischemia. Chronic osteomyelitis in children is a frequent reason for consultation in paediatric orthopaedics [1] [7]. Treatment is primarily surgical to remove inert and necrotic elements by drainage or bone trephination. Drainage or bone trepanation [8]-[10]. Recurrences are frequent [11]-[13]. Chronic osteomyelitis can have serious after-effects. They are a handicap for the quality of life of young children and their families. Cases of osteomyelitis have been described in Burkina Faso and Mali [14]-[16]. Chronic osteomyelitis is particularly widespread in tropical regions where socioeconomic conditions limit access to early care. Recent studies show that advances in molecular diagnostics, such as the use of PCR to identify pathogens, can improve treatment accuracy [17]. A better understanding of risk factors, such as immunodeficiencies secondary to sickle cell disease, is essential for developing effective preventive strategies. Niger is a highly exposed country, geographically situated right in the heart of the sickle belt. In Niger, 66 cases of osteomyelitis in sickle cell patients were described by Souna *et al.* in 2006 [16].

The aim of this study is to explore the clinical aspects and treatment strategies of chronic osteomyelitis in sickle cell subjects aged 0 - 5 years in order to better understand the presentation of this condition and optimize management strategies.

2. Materials and Methods

This is a descriptive cross-sectional study with retrospective data collection over a 12-month period, from November 2023 to October 2024 on 16 patients who presented with symptoms of bone damage at HNZ. The methodology adopted in this study relies on rigorous inclusion criteria to ensure data reliability. However, the absence of microbiological analyses for all patients represents a limitation. Future studies could include systematic bacteriological analyses to correlate clinical and paraclinical data.

2.1. Inclusion Criteria

Included in this study:

- Children up to 60 months of age;
- Sickle cell disease confirmed by hemoglobin electrophoresis or at least a positive EMMEL test;
- Clinically and/or paraclinically diagnosed osteomyelitis.

2.2. Non-Inclusion Criteria

Patients who did not meet all the above criteria were not included in this study.

Qualitative variables were examined in terms of frequency and quantitative variables on the basis of their means.

The variables studied concerned:

- Socio-demographic data;
- Clinical data;
- Biological data;
- Therapeutic data;
- Evolutionary data.

Data were collected using a data collection form. Data were entered into Excel and then exported for analysis in Epi Info.

2.3. Ethical Approval

This study was conducted in accordance with ethical principles, and received approval from Zinder National Hospital officials for the research request granted by the Faculty of Health Sciences. Confidentiality was respected throughout the study process.

3. Results

3.1. Epidemiological Aspects

Among the 16 patients, male predominated in 56.25% (9/16). Mean age was 32.69 months [12 - 54 months]. The most represented age group was [21 - 30 months] in 31.25%. The average number of hospitalizations was 2.19 [1]-[4]. The majority 75% (12/16) came from the rural area of Zinder (Magaria). The average length of hospital stay was 21 days [8 - 35 days].

3.2. Clinical Features

Involvement was multifocal in 75% (12/16). The thoracic limb was affected in 37.5% (6/16 times) and the pelvic limb in 87.5% (14/16 times). Involvement was bilateral in 37.50% (6/16). The femur was the most frequent site of bone involvement in 50% (8/16), followed by the tibia in 43.75% (7/16) (**Table 1**). Duration of clinical course varied, with a mean of 12.12 weeks [6]-[20]. Pain, fever and swelling were present in 100% of cases, followed by abscesses in 93.75%. Sequestration was found in 37.50% (6/16). Bone deformities and fractures were found in 25% (4/16). 6.25% (1/16) of abscesses were fistulized (**Table 2**).

3.3. Paraclinical Aspects

Biologically, blood counts revealed neutrophil hyperleukocytosis in all patients,

and severe anemia in 50% (8/16). Bacteriology was carried out in only one patient, whose sample was sterile.

Radiological findings included sequestration, fractures, deformities and geodes consistent with Brodie abscesses (Figures 1-3).

3.4. Topography

Table 1. Distribution according to bone involvement.

Focus	Workforce	Percentages
Femur	13	38.24%
Tibia	8	23.53%
Humerus	7	20.59%
Elbow	2	5.88%
Radius	2	5.88%
Calcaneus	1	2.94%
Fibula	1	2.94%
Total	**34**	**100.00%**

3.5. Therapeutic Aspects

All patients had received dual antibiotic therapy with ciprofloxacin and gentamycin. Ceftriaxone was used in combination in 93.75% of cases. Injectable paracetamol was administered to all patients. Optimal dosages and durations should also be re-evaluated to reduce side effects, particularly in young children. Immobilization was used in 25% of cases. Surgical treatment consisted of bone curettage, combined with excision of infected and necrotic tissue with sequestrectomy in 37.50% and drainage in 93.75% (Table 2).

Table 2. Patient distribution according to epidemiological, clinical and therapeutic data.

Epidemiology (n = 16)	%	Clinical	%	Therapeutics	%
Gender		Fever	100	Ceftriaxone	93.75
Male	56.25	Pains	100	Gentamicin	100
Female	43.75	Impotence	18.75	Ciprofloxacin	100
Age range (month)		Swelling	100	Paracetamol	100
[10 - 20]	18.75	Fistulas	6.25	Trabar	12.50
[21 - 30]	31.25	Abscesses	93.75	Drainage	93.75
[31 - 40]	18.75	Sequestrations	37.50	Immobilization	25
[41 - 50]	18.75	Fractures	25		
>50	12.50	Deformities	25		

Continued

Source	
Magaria	75
Mirriah	18.75
Matameye	6.25

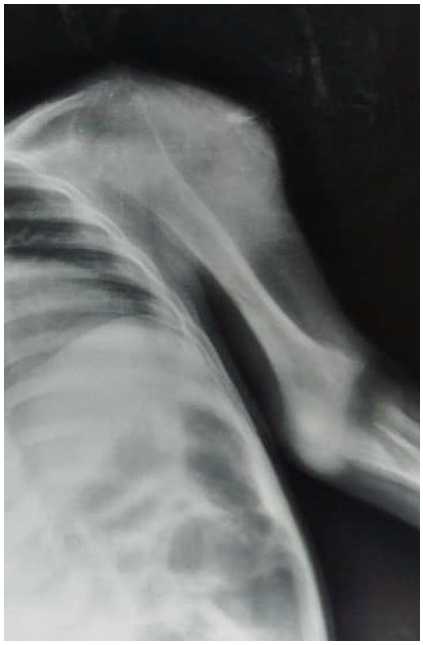

Figure 1. Sof tissue swelling in a 12-month-old infant, HNZ, 2024.

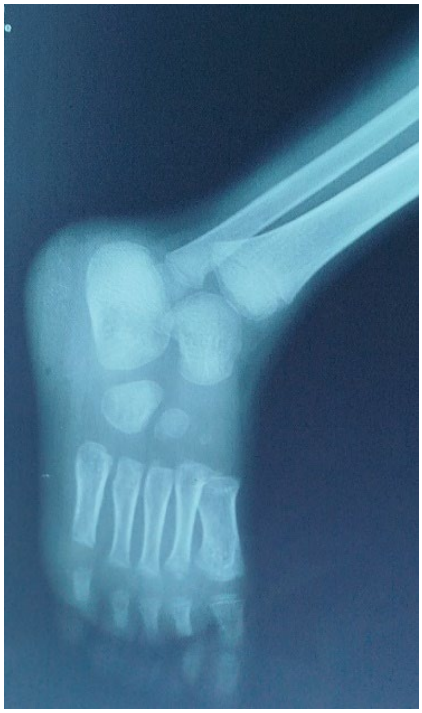

Figure 2. Range of calcaneal osteolysis in a 48-month-old infant, HNZ, 2024.

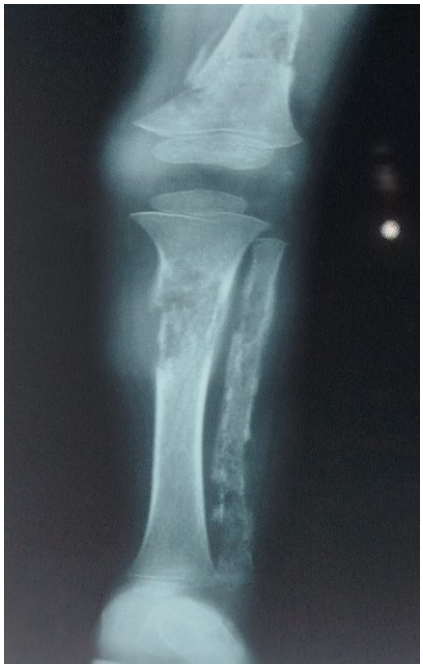

Figure 3. Chronic multifocal osteomyelitis in a 24-month-old infant, HNZ, 2024.

3.6. Evolutionary Aspects

Complications were noted in 25% (4/16) and involved residual bone deformities. The cure was confirmed in 43.75% (7/16) (**Figure 4**).

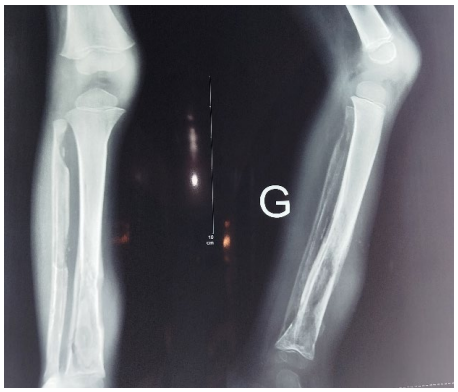

Figure 4. Osteomyelitis of the leg of a 30-month-old infant showing numerous radiolucent areas corresponding to abscesses in the bone, 2024.

4. Discussion

Chronic osteomyelitis is frequently observed in young subjects with sickle cell disease [18]. The results show that chronic osteomyelitis occurs with increased frequency in children with sickle cell disease, particularly due to auto-infarction and iron overload. Few large series have been reported in the literature apart from those involving children [17]-[19]. In this study, over a one-year period, 16 cases of chronic osteomyelitis were reported. Other authors have reported cases in adults [2] [4] [12] [15] [18] [21]. These results show that chronic osteomyelitis

occurs with increased frequency in children with sickle cell disease, particularly due to auto-infarction and iron overload. Immunodepression is, therefore, a favorable factor, as has been reported by other authors [2] [7] [16] [18] [21]. The average age of these patients is comparable to that reported by authors [3]; others report older ages [15] [21]. This can be explained by the fact that the study was carried out in a paediatric population. Male sex predominated in this study, as demonstrated by studies carried out [14]-[16]. Depending on topography, the most frequently affected sites include long bones (femur, humerus) and ankles, as in the authors' series [12] [14]. Infection of the bone marrow occurs preferentially at the metaphyseal level, as this is a highly vascularized region with slow blood flow, thus favoring bacterial grafting. It is performed "away from the elbow, close to the knee", as this is the location of the most active growth plate. The results of this study underline the predominance of bone involvement in the pelvic limbs, particularly the femur, and highlight common symptoms such as pain, fever and swelling. This symptomatology has been reported by several authors [2] [14] [21].

Radiographically, rapid identification of abscesses and sequestrates is crucial for effective management [1] [2] [16] [22] [23].

As far as biology is concerned, the leukocyte count was increased in all patients. These results are comparable to those reported in the literature [2] [4]. Bacteriology, an essential test, was carried out in only one child, whose result was sterile. Work by Souna *et al.* in Niger and Traoré *et al.* in Mali had demonstrated the presence of germs [2] [15] [16]. Chronic osteomyelitis can lead to sequestration of the long bones. Treatment consists of a sequestrectomy, once the new bone is well formed and occupies the entire length of the sequestrated bone. After this procedure, we perform a curage lavage and place a Redon drain. Don't forget to take a pus sample from the operative perspective.

For abscesses, we perform a flattening procedure which involves collapsing the pus pockets and inserting a glove finger drain or Delbet blade. Always take a sample for cytobacteriological examination. Osteitis and osteoarthritis can also occur, which we manage by taking samples after flattening. Further studies could explore the underlying etiologies of these conditions and assess the impact of different therapeutic interventions. The treatment of chronic osteomyelitis is medico-surgical, based on probabilistic biantibiotherapy, then adapted to the antibiogram, and a surgical procedure. The use of ciprofloxacin and gentamicin is justified by their efficacy against frequently involved gram-positive and gram-negative pathogens. However, the potential emergence of antimicrobial resistance highlights the need for systematic monitoring. Literature data suggest that more personalized regimens, integrating new-generation antibiotics, could improve therapeutic outcomes [1] [23]. Because of their immunological and vascular particularities, children with sickle cell disease are at high risk of chronic osteomyelitis. Pain and inflammation require a multidisciplinary approach integrating paediatric, rheumatological and orthopaedic care. Treatment is generally based on appropriate antibiotic therapy, pain management and surgical intervention in advanced cases.

Treatment results show a significant improvement in symptoms in patients benefiting from early management. However, relapses remain frequent, underlining the importance of regular follow-up [2] [4] [21].

The results of this study provide new insights into the impact of integrated case management approaches in low-resource settings. They also highlight the importance of early intervention to limit sequelae. Generalizing these results to other populations requires multicenter studies with larger samples. Moreover, technological advances, such as 3D imaging to localize lesions, could transform the clinical management paradigm [24]. In addition to the small sample size, the absence of reliable bacteriological data reduces the robustness of the conclusions. A prospective approach with advanced diagnostic tools is recommended.

5. Conclusion

Chronic osteomyelitis in children with sickle cell disease aged 0 - 5 years represents a major clinical challenge. Early identification and appropriate management of this complication are essential to improve patients' quality of life. Further research is recommended to better understand the pathogenesis of osteomyelitis and optimize prevention and treatment strategies.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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