

Soft Tissue Infections Following Parenteral Injection in Children Aged 0 to 15 Years at the Mother and Child University Hospital Center, N'Djamena (Chad)

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How to cite this paper: Ngaringuem, O., Abakar Djibrine, M.N., Bembo, L., Djian-Noné, K. and Ibrahim, D.A. (2025) Soft Tissue Infections Following Parenteral Injection in Children Aged 0 to 15 Years at the Mother and Child University Hospital Center, N'Djamena (Chad). *Open Journal of Pediatrics*, 15, 1086-1094.

<https://doi.org/10.4236/ojped.2025.156102>

Received: October 1, 2025

Accepted: November 2, 2025

Published: November 5, 2025

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Abstract

Introduction: Soft tissue infections secondary to parenteral injection frequently arise due to inadequate adherence to aseptic protocols during medical care administration. This study aimed to characterize the clinical presentation, therapeutic management, and outcomes of such infections in a pediatric population. **Materials and Methods:** A cross-sectional study was conducted over a 12-month period at the Mother and Child University Hospital Center in N'Djamena. All patients aged 0 to 15 years presenting with post-injection soft tissue infections and managed in the pediatric surgery department were included. Data collected encompassed epidemiological, clinical, and outcome variables, recorded using a standardized data collection form. Data entry was performed using Microsoft Word and Excel 2016, and statistical analysis was conducted with SPSS version 20.0. **Results:** Thirty-seven patients were admitted for soft tissue infections following parenteral injection, accounting for 28% of all admissions to the department. The 1 to 5-year age group represented 48.6% of cases, with a mean patient age of 5.6 years. Injections were most commonly administered as part of malaria treatment (48.6%), with artemether implicated in 54.1% of cases. The buttock was the most frequent injection site (45.9%). Infections were attributed to home-based care in 37.8% of cases, and nurses were responsible for administering injections in 42.3% of cases. Pain was the predominant presenting symptom (72.9%). The interval between injection and hospital admission was 14 to 30 days in 35.1% of cases. Abscess formation was observed in 70.3% of cases, and *Staphylococcus aureus* was isolated in 70.3% of samples. Management was primarily based on surgical drainage and empirical antibiotic therapy. Anemia was detected in 67.5% of pa-

tients. Clinical outcomes were favorable in 95% of cases, with a mortality rate of 5%. **Conclusion:** Soft tissue infections secondary to parenteral injection remain a significant pediatric health concern. Strict adherence to aseptic procedures and improved training in injection techniques are essential to enhance patient outcomes.

Keywords

Infection, Soft Tissue, Parenteral Injection, Complications, Pediatrics, Chad

1. Introduction

Skin and soft tissue infections are frequently encountered in pediatric practice, presenting with diverse clinical manifestations, etiologies, and degrees of severity. These conditions are characterized by microbial invasion of the skin and underlying soft tissue layers [1] [2]. Such infections exemplify the persistent global challenge of patient safety, with their specific features differing according to a country's stage of development. In less developed countries, inadequate aseptic procedures are common, whereas in developed nations, advances in technology and the shift towards less regulated outpatient care settings are observed [3]. Both therapeutic and illicit injections represent major causes of superficial abscesses. In developing regions, abscesses are more often secondary to injections performed under poor aseptic conditions, frequently resulting in gluteal abscesses following intramuscular administration [4]. Multiple risk factors have been identified, including the direct contact of venous catheters, the use of hypertonic solutions, and the specific properties of certain medications [5].

The aim of this study was to characterize the epidemiological, clinical, therapeutic, and outcome features of soft tissue infections occurring as complications of parenteral injections in children.

2. Materials and Methods

A cross-sectional study was conducted over a 12-month period, from April 2023 to March 2024, in the Department of Pediatric Surgery at the Mother and Child University Hospital Center in N'Djamena, Chad. The study population comprised children aged 0 to 15 years who developed soft tissue infections subsequent to parenteral injection. The variables examined included epidemiological, etiological, clinical, paraclinical, and outcome-related factors. Data collection involved the use of a standardized survey form, interviews with patients or their parents, and clinical examination. Informed consent was obtained from the parents. Data were entered using Microsoft Word and Excel 2016, and subsequently processed and analyzed using SPSS version 20.0.

3. Results

During the study period, a total of 1787 patients were admitted to the pediatric

surgery department, of whom 132 were hospitalized for soft tissue infections, including 37 cases following parenteral injection. These cases accounted for 28.03% of all soft tissue infections. The overall hospital frequency was 2.07%.

Table 1. Distribution of patients by age group.

Group of age	n	%
0 to 28 days	2	5.4
1 month to 11 months	8	21.6
1 to 5 years	18	48.7
6 to 11 years	7	18.9
12 to 15 years	2	5.4
Total	37	100

The 1 to 5 year age group represented 48.7% of all cases (**Table 1**).

Patients presented for consultation between the 14th and 30th days following disease onset, accounting for 35.1% of cases.

Table 2. Distribution by type of injected product.

Product	n	%
Artemether	20	54.1
Unknown product	10	27
Infusion solution	4	10.8
Vaccine	2	5.4
Ampicillin	1	2.7
Total	37	100

Soft tissue infections subsequent to intramuscular administration of Artemether constituted 54.1% of the reported cases (**Table 2**).

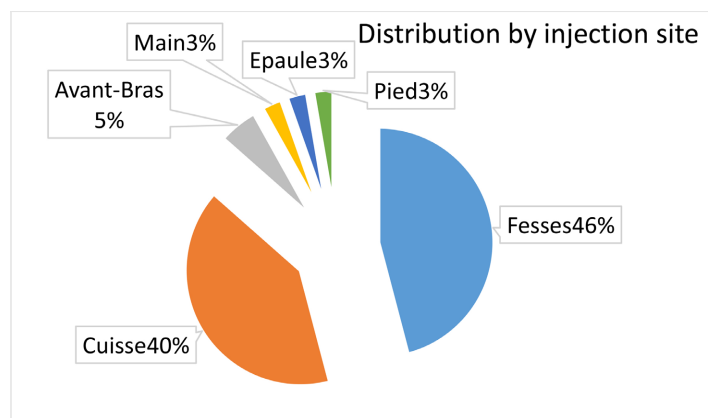


Figure 1. Distribution by anatomical site of injection.

Parenteral injection-related infections were localized to the buttock in 45.9% of cases and to the thigh in 40.6% of cases (**Figure 1**).

Injections administered in the buttock and thigh accounted for infections in children aged 1 to 5 years in 48.6% of cases, a relationship that was statistically significant ($P = 0.01$).

Distribution by Personnel Qualification

Soft tissue infections were observed in 43.2% of cases when injections were administered by nurses, in 35.1% of cases when performed by street drug vendors, and in 21.7% of cases when carried out in a pharmacy.

Care delivered by street drug vendors accounted for the occurrence of abscesses in 29.7% of cases. There was no statistically significant association between the qualification of the personnel and the type of infection ($P = 0.4$; $\chi^2 = 5.7$).

Table 3. Patient distribution by infection type (**Figures 2-5**).

Infection type	n	%
Abscess	26	70.3
Phlegmon	5	13.5
Non-necrotizing bacterial dermo-hypodermatitis	3	8.1
Necrotizing fasciitis	3	8.1
Total	37	100

Abscesses accounted for 70.3% of infections associated with parenteral injections. All age groups were affected, with incidence peaking in the 1 - 5 and 6 - 11 years age ranges (**Table 3**). However, no statistically significant association was observed between age and type of infection ($P = 0.3$).

Table 4. Patient distribution according to bacteriological examination results.

Bacteriological findings	n	%
<i>Staphylococcus aureus</i>	26	70.3
Examination not performed	6	16.2
No growth (sterile)	5	13.5
Total	37	100

Infections associated with parenteral injections were caused by *Staphylococcus aureus* in 70.3% of cases (**Table 4**).

Anemia, defined as a hemoglobin level below 10 g/l, was observed in 68% of cases.

Among patients with infections associated with parenteral injections, 37.8% had sought traditional treatments prior to hospital admission.

Surgical exploration in the operating room was performed in 73% of cases, while debridement was carried out in 27% of cases.



Figure 2. Myositis affecting the left thigh.



Figure 3. Necrotizing fasciitis involving the left thigh.



Figure 4. Cutaneous necrosis of the left arm and shoulder.



Figure 5. Necrotizing fasciitis of both thighs.

The mortality rate was 5%, with anemia and septic shock identified as the causes of death.

4. Discussion

During the study period, 132 patients were recorded with soft tissue infections, of whom 37 cases followed parenteral injection, accounting for 28.03% of all soft tissue infections. Ndoma *et al.* (2022) and Gabouga *et al.* (2023) in the Central African Republic reported frequencies of 31.3% over a 10-year period and 32.9% over 18 months, respectively [6] [7]. The incidence of these infections is rising and likely underestimated, as cases lacking parental consent were not included in the count. All age groups were affected, with a predominance observed in children aged 1 to 5 years (48.6%). However, there was no statistically significant association between age and the risk of post-injection soft tissue infections. This finding is consistent with those of Ndoma and Gabouga *et al.* [6] [7], who reported rates of 60% and 62.9%, respectively, in the 0 to 5 years age group. The mean age in our cohort was 5.6 years, closely aligning with existing literature, which reports mean ages between 5.5 and 7.8 years [6] [8]. Males were slightly more represented, with a sex ratio of 1.04, corroborating previous studies [6] [7] [9] [10]. The delay in seeking medical consultation ranged from 14 to 30 days in 35.1% of cases. The consultation time is reported at variable rates depending on the studies. It is 11.95 days on average in the Dohourou series and 4 to 5 days in that of Ndoma [6] [11] who observed a delay of 8 to 14 days in 85.7% of cases. This prolonged delay may be attributed to parental negligence, limited financial resources restricting access to higher-level healthcare, and a prevailing preference in the community for treatment from informal drug vendors.

Post-injection soft tissue infections are frequently observed in patients with underlying malnutrition (16.2%) and sickle cell disease (10.8%). However, Ndoma [2] has reported sickle cell disease in a much lower proportion, at 3.1%. Both

home-based care and care provided in health centers contribute to the incidence of soft tissue infections. This is most likely due to breaches in aseptic technique during care delivery, which underscores deficiencies within the healthcare system. Additionally, such interventions are often performed by street drug vendors, who remain accessible to the general population, many of whom are unaware of the significant risks associated with post-injection infections. In most instances, malaria constitutes the primary indication (48.6%) for which injectable treatments are administered. Similar findings were reported by Mouko *et al.* [12]. This can be attributed not only to the high prevalence of malaria in our setting, but also to the prevailing tendency among the population to treat uncomplicated malaria with injectable medications—often in the context of self-medication. In this series, injectable artemether was the principal pharmaceutical agent implicated (44.1% of cases), whereas quinine was more frequently implicated in other studies. Increased awareness regarding the dangers of quinine—both its toxicity and adverse effects—as well as current antimalarial treatment protocols, has contributed to the reduced use of quinine in our context.

The most common injection sites are the buttocks and thighs. The same observation is made Pannaraj [8], who reported 40.0% of pediatric abscesses located in the thigh and 28.9% in the pelvis. Indeed, the thigh and buttocks are the most commonly used intramuscular injection sites [11]. Pain is the leading reason for medical consultation, followed by swelling and fever. Our results corroborate those of the literature where pain represents 99.2% of the reasons for consultation [6] [11]. In our series, abscesses were the predominant lesion (70.3%), followed by phlegmons (13.5%). Ndoma made the same observation [6]. This discrepancy may be explained by the fact that our study included only infections following parenteral injection.

The bacteriological profile of these infections is highly diverse, with considerable regional variation. *Staphylococcus aureus* was the most frequently isolated germ, accounting for 70.3% of cases. According to the literature, the frequency of *Staphylococcus* varies from 35.2 to 100% [6] [13]. Indeed, *Staphylococcus* is a saprophytic germ of the skin. This high prevalence is explained by a lack of aseptic rules during care.

An initial traditional treatment prior to admission to a healthcare facility was administered in 37.8% of cases. In Africa, families tend to adhere more strongly to traditional practices, largely due to lack of awareness and widespread poverty. These factors hinder timely access to quality healthcare, which is generally perceived as more costly by the population.

Surgical exposure in the operating room was performed in 73% of cases, followed by debridement in 10.8%. Simple incision and incision with drainage constitute the mainstays of soft tissue infection management in both pediatric and adult patients. However, in cases of uncomplicated cellulitis, antibiotic therapy alone, combined with appropriate management of the portal of entry, is generally sufficient. In certain scenarios, the cornerstone of treatment for necrotizing

fasciitis is prompt and radical surgical debridement, involving the complete excision of necrotic tissue and fascia.

The clinical outcome was favorable in 95% of cases, and the mortality rate was 5%. Pannaraj reports a favorable outcome in 100% of cases [8]. Mortality in our study was due to septic shock associated with anemia. This unfavorable clinical picture is explained by the delay in consultation in our series.

5. Conclusion

Soft tissue infections are prevalent among pediatric populations. Medical interventions for malaria-related conditions, particularly the administration of artemether, whether performed in healthcare facilities or at home, represent the most frequent and significant sources of soft tissue infections. The primary risk factor identified is inadequate aseptic technique during these procedures. *Staphylococcus aureus* is the pathogen most commonly isolated in such cases. While the overall prognosis is generally favorable, complications such as inflammatory anemia are not uncommon. Ongoing training of healthcare personnel in aseptic protocols constitutes a key strategy for reducing the incidence of post-intramuscular injection infections.

Conflicts of Interest

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

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