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Necrotizing Fasciitis in Children at the Dermatological Hospital of Bamako: Case-Control Study

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Abstract **Case Report**

Introduction*:** necrotizing fasciitis (FN) is a medico-surgical emergency that often involves the vital prognosis. Despite its rarity in children, necrotizing fasciitis is complicated by septic shock in 74 cases out of 100 and it is a serious infection, fatal in about 30% of cases. The aim of this work was to study the risk factors for necrotizing fasciitis in children. ***Methodology: This was a case-control study interesting children aged 0-15 years seen in dermatological consultation and included in accordance with the objectives of the study for a given period from January 1, 2020 to December 30, 2021. Diagnosis of necrotizing fasciitis was based on clinical and histological. ***Results:*** During the study period, 2501 children were seen in dermatological consultation, of which 20 had necrotizing fasciitis, ie a hospital frequency of 0.80%. These twenty cases of necrotizing fasciitis were matched with 20 controls by age, sex, hospital, date of admission. The age of children with necrotizing fasciitis ranged between 3 and 15 years, and the average age was 11.7 years. Preschool children (3-5 years old) accounted for 5%, school-age children (6-10 years old) accounted for 25% and adolescents accounted for 70%. The cases were divided into 11 boys (55%) and 9 girls (45%), the sex ratio was 1.22. The average duration of evolution of necrotizing fasciitis in children was 7.6 days with extremes ranging from 3 to 12 days. ***Conclusion:*** Many factors in our study were associated with the occurrence of necrotizing fasciitis in children, led by NSAIDs, traditional medications and traumatic wounds. In view of these results obtained in our study carried out under unfavorable conditions, it is necessary that cohort studies be carried out in order to confirm our results.

Keywords: Necrotizing fasciitis (FN), vital prognosis, Diagnosis, traditional medications.

INTRODUCTION

Necrotizing fasciitis is a medico-surgical emergency that is often life-threatening [1]. Group A beta-hemolytic streptococcus (*Streptococcus pyogenes*) is the most frequently involved germ, but a polymicrobial association is frequently noted [2].

Worldwide, its annual incidence is 0.08 per 100,000 children [3]. In industrialized countries, while its incidence seems low, it is much higher in developing countries.

In the neonatal period, although being a very rare entity, this condition is generally favored by bullous impetigo and postoperative complications [4].

In children, chickenpox seems to be a predisposing factor in the occurrence of this condition. Despite its rarity in children, necrotizing fasciitis is complicated by septic shock in 74% [5] and it is a serious infection, fatal in approximately 30% of cases [4]. Its prognosis depends on the precocity of the diagnosis, the speed with which antibiotic therapy is started and sometimes surgical treatment. It is important to recognize these infections early before the appearance of complications, in particular the extension of the necrotic patches and septic shock [6].

Numerous epidemiological studies around the world have been carried out on necrotizing fasciitis in general. However, very few have addressed the risk factors for necrotizing fasciitis in children. So what do

we know about the risk factors for necrotizing fasciitis for this age group?

The objective of this work is to study the risk factors of necrotizing fasciitis in children at the dermatological hospital of Bamako.

PATIENTS AND METHODS

From January 1, 2020 to December 30, 2021, we conducted a matched case-control study in children who consulted for necrotizing fasciitis at Bamako Dermatology Hospital. This hospital is the most important dermatological reference center in the country.

The diagnosis of necrotizing fasciitis was based on clinical and histological findings.

Population

Case

These were children (0-15 years) suffering from necrotizing fasciitis, admitted to the dermatology department.

Thus was considered as necrotizing fasciitis, whatever the location, a finding of a necrotic placard on a geographical map in a context of fever and whose histology was evocative (edema and necrosis of the superficial fascia, infiltration of tissues neutrophils).

Witnesses

Two controls were matched with each case, according to the following criteria: (i) hospital: the same; (ii) age: the same; (iii) sex: the same; (iv) date of admission: the earliest. Control diagnoses included all skin conditions except necrotizing fasciitis.

Collection tools

The questionnaire was structured to minimize interviewer and respondent bias.

The variables studied

The variables studied were socio-demographic data (age, sex, origin), clinical data (local factors, general factors).

Case Recruitment

The investigator examined the patients. When the diagnosis matched necrotizing fasciitis, he checked to see if the patient's characteristics were acceptable. If the patient met the acceptance criteria for the diagnosis and for his characteristics, the investigator proceeded to the interview and completed the questionnaire.

Recruitment of witnesses

The investigator examined the patients and selected for each case potential controls who met the matching criteria and who had appropriate diagnoses.

Confidentiality measures regarding anonymity have been guaranteed. An identification number was assigned to each patient; this number, carefully kept by the investigator, was carried on all the documents concerning the patient.

Statistical analysis

The data collected from the survey form was processed by the stata 14 software. We calculated the unadjusted odds ratios (OR) and their confidence interval at the 95% level, using a univariate method (simple logistic regression) adapted to matched sets.

RESULTS

During the study period, 2501 children were seen in dermatological consultation, of which 20 had necrotizing fasciitis, ie a hospital frequency of 0.80%.

These twenty cases of necrotizing fasciitis were matched with 20 controls by age, sex, hospital, date of admission.

The age of children with necrotizing fasciitis ranged between 3 and 15 years, and the average age was 11.7 years.

Preschool children (3-5 years) accounted for 5%, school-aged children (6-10 years) accounted for 25%, and adolescents accounted for 70% (Figure 1).

The cases were divided into 11 boys (55%) and 9 girls (45%), the sex ratio was 1.22 (Figure 2).

The average duration of evolution of necrotizing fasciitis in children was 7.6 days with extremes ranging from 3 to 12 days.

In univariate analysis, the main factors studied were: inter-toe intertrigo (OR=1; 95% CI: 0.01-82.57 Table I), prurigo (OR=0.44; 95% CI: 0.036-3.66 Table II), eczema (OR=0.21; 95% CI: 0.005-2.50 Table III), varicella (OR=1.6; CI: 0.159-20.98 Table IV), traumatic wound (OR=10.23; 95% CI: 1.046-484.58 Table V), lymphedema (OR=4.75; 95% CI: 1.046-484.58 Table VI), obesity (OR=1 95% CI: 0.012-82.57 Table VII), HIV (OR=2.11; 95% CI: 0.09-130.99 Table VIII), anti-nonsteroidal inflammatory drugs (OR=19; 95% CI: 2.01-866.53 Table IX), the use of poultices (OR=4.88 95% CI: 1-26.52 Table X).

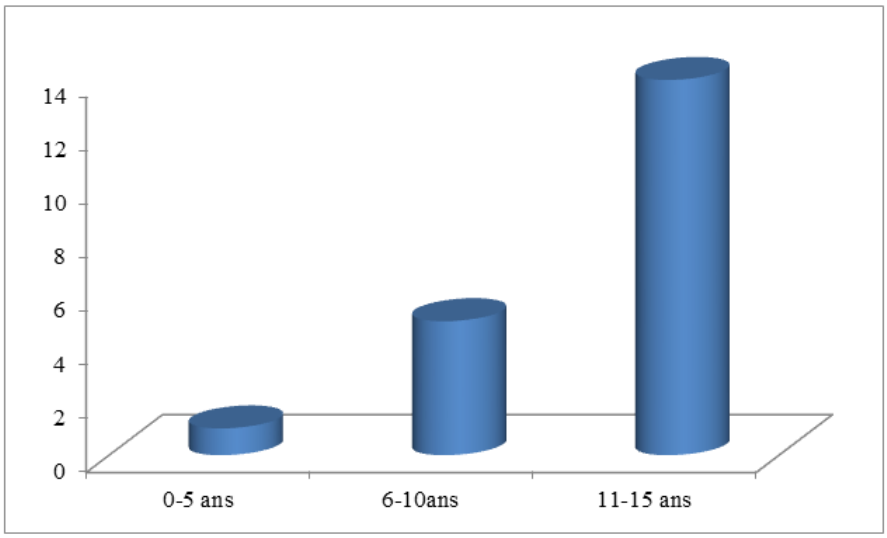

Figure 1: Distribution of patients according to age group

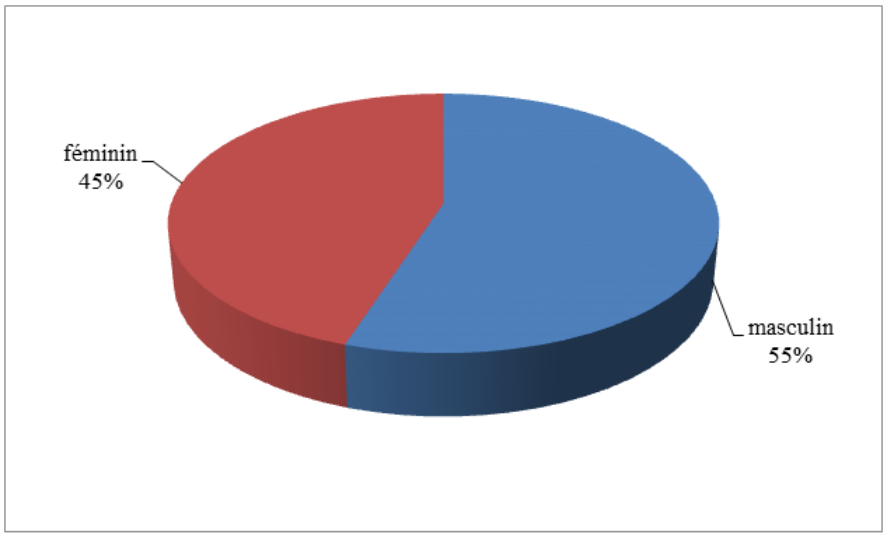

Figure 2: Distribution of cases by sex

Table I: Distribution of patients according to intertrigo inter-toes

Exposure	Case (n =20)	Control (n=20)	odds ratio	95% CI
Intertrigo	1	1	1	0.0121098-82.57755
Lack of intertrigo	19	19		
exposure frequency	0.0500	0.0500		

The exposure frequency is 0.0500 in cases and 0.0500 in controls. The odds ratio is 1 and the 95% confidence interval is 0.0121098 (lower bound) and 82.57479 (upper bound).

Table II: Distribution of patients according to prurigo

Exposure	Cases (n=20)	Control (n=20)	odds ratio	95% CI
prurigo	2	4	0.444	0.0363884-3.662124
Absence of prurigo	18	16		
frequency exhibition	0.1000	0.2000		

The exposure frequency is 0.1000 in cases and 0.2000 in controls. The odds ratio is 0.444 and the 95% confidence interval is 0.0363884 (lower bound) and 3.662124 (upper bound).

Table III: Distribution of patients according to eczema

Exposure	Case (n=20)	Control (n=20)	odds ratio	95% CI
Eczema	1	4	0.210	0.004555-2.501363
Absence of eczema	19	16		
Frequency exhibition	0.0500	0.2000		

The Exposure Frequency is 0.0500 in cases and 0.2000 in controls. The odds ratio is 0.210 and the confidence interval is 0.004555 (lower bound) and 2.501363 (upper bound).

Table IV: Distribution of patients according to varicella

Exposure	Case (n=20)	Witness (n=20)	odds ratio	95% CI
Varicella	3	2	1.59	0.1599194-20.98099
Freedom from varicella	17	18		
Frequency exhibition	0.1500	0.1000		

The exposure frequency is 0.1500 in cases and 0.1000 in controls. The odds ratio is 1.599 and the confidence interval is 0.1599194 (lower bound) and 20.980099 (upper bound).

Table V: Distribution of patients according to the traumatic wound

Exposure	Case (n=20)	Witness (n=20)	odds ratio	95% CI
Wound traumatic	7	1	10.23	1.04612-484.585
No wound traumatic	13	19		
Frequency exhibition	0.3500	0500		

The exposure frequency is 0.3500 in cases and 0.0500 in controls. The odds ration is 10.23 and the confidence interval is 1.04612 (lower bound) and 484.585 (upper bound).

Table VI: Distribution of patients according to lymphedema

Exposure	Case (n=20	Witness (n=20)	odds ratio	95% CI
Lymphedema	4	1	4.75	0.3997701-245.9511
No lymphedema	16	19		
Frequency exhibition	0.2000	0.0500		

The Exposure Frequency is 0.2000 in cases and 0.0500 in controls. The odds ratio is 4.75 and the confidence interval is 1.04612 (lower bound) and 484.585 (upper bound)

Table VII: Distribution of patients according to obesity

	Case (n=20)	Witness (n=20)	odds ratio	95% CI
Obesity	1	1	1	0.0121098-82.57479
No obesity	19	19		
Frequency exhibition	0.0500	0.0500		

The exposure frequency is 0.0500 in cases and 0.0500 in controls. The odds ratio is 1 and the confidence interval is 0.0121098 (lower bound) and 82.57479 (upper bound).

Table VIII: Repair of patients according to HIV

Exposure	Case (n=20)	Witness (n=20)	odds ratio	95% CI
HIV positive	2	1	2.111111	0.0997658-130.9946
HIV negative	18	19		
Frequency exhibition	0.1000	0.0500		

The Exposure Frequency is 0.1000 in cases and 0.0500 in controls. The odds ratio is 2.11 and the confidence interval is 0.0997658 (lower bound) and 130.9946 (upper bound).

Table IX: Distribution of patients according to non-steroidal anti-inflammatory drugs

Exposure	Case (n=20)	Witness (n=20)	odds ratio	95% CI
NSAIDs	10	1	19	2.019504-866.5342
No NSAIDs	10	19		
Frequency exhibition	0.5000	0.0500		

The Exposure Frequency is 0.5000 in cases and 0.0500 in controls. The odds ratio is 19 and the confidence interval is 2.019504 (lower bound) and 866.5342 (upper bound).

Table X: Distribution of patients according to poultices

Exposure	Cases (n=20)	Witness (n=20)	odds ratio	95% CI
poultices	11	4	4.888889	1.009076-26.52901
No poultices	9	16		
Frequency exhibition	0.5500	0.2000		

The Exposure Frequency is 0.5500 in cases and 0.2000 in controls. The odds ratio is 4.88 and the confidence interval is 1.009076 (lower bound) and 26.52901 (upper bound).

DISCUSSION

To our knowledge, this is the first case-control study carried out in Mali which has documented the association of certain risk factors and necrotizing fasciitis in children.

This study would contribute to deepening the knowledge on the risk factors associated with necrotizing fasciitis in children and thereby considerably reduce the mortality rate linked to this deadly condition.

In our study, the hospital frequency of this condition was higher than that reported in the literature [7].

In our countries where living conditions are precarious, traditional treatment and self-medication are the families' first recourse for children's illnesses, thus delaying medical treatment. This could explain the very high admission rate of fasciitis necrotizing in children in our department [8].

Regarding intertrigo, a rare pathology in children, there was no association between it and necrotizing fasciitis because the tests are not statistically significant with an OR=1 and an IC at 95%= [0.0121098-82.57755]. Intertrigo has been found as a potential risk factor for the onset of this condition in many studies in adults OR=51.4 and 95% CI=IC=11.7-225.6 [9].

Prurigo is an immuno -allergic dermatosis occurring most frequently in favor of a mosquito bite. It is known as a gateway to bacterial infections but its role in the occurrence of the pathology studied could not be demonstrated because our tests are not statistically significant OR=0.444 and 95% CI= [0, 0363884-3,662124].

According to the results of our study, there would be a statistically insignificant protective link between eczema and the appearance of necrotizing fasciitis, even if in the literature certain authors have shown that 13% of chronic dermatoses were providers of necrotizing fasciitis while combined age [5].

Our study showed a statistically non-significant association between chickenpox and the occurrence of necrotizing fasciitis in children; OR=0.210 and 95% CI=[0.004555-2.501363]. As certain authors have proven, the most important risk factor for the occurrence of this condition in children was a history of chickenpox in the preceding month [8, 10, 11].

This would be due on the one hand to the deterioration of the barrier function of the skin and on the other hand to the reduction of the immunological function due to the activation of the LThelper1 immune cells induced by the varicella zoster virus [8].

Our study highlighted a statistically significant association between the presence of a traumatic wound in children and the occurrence of necrotizing fasciitis with an OR=10.3; 95% CI = [1.04612-484.585]. This result is similar to that of Kaul R. et al where skin rash was the most common local risk factor, ie 49% of cases [5].

Most authors have described obesity as a risk factor for the onset of necrotizing fasciitis in adults [12].

But in view of the statistical tests that we carried out, it was not a risk factor in the child OR=1; CI= [0.0121098-82.57479].

The presence of lymphedema was not associated with the occurrence of necrotizing fasciitis, as the test was not statistically significant with an OR= 4.75 and 95% CI= [0.3997701- 245.9511]. In the study conducted by C. Runel -Belliard *et al*., In 54 children with FN , only one had lymphedema [13].

Our study showed the existence of a statistically insignificant association between HIV infection and the onset of necrotizing fasciitis in children. OR=2.11; 95% CI=[0.0997658-130.9946]. However, the French dermatology society at its consensus conference in the year 2000 on necrotizing fasciitis demonstrated in a cohort study that infections with the human immunodeficiency virus (HIV) constituted a risk factor for the occurrence necrotizing fasciitis [14].

Taking nonsteroidal anti-inflammatory drugs was associated with the occurrence of necrotizing

fasciitis in our study, and we found this association to be statistically significant with an OR= 19 and 95% CI = [2.019504-866.5342]. However, several cohort studies on invasive SBHA infections have shown neither an increase in the frequency nor aggravation of these infections under NSAIDs [10, 15, 16]. This would be explained by their indirect effect, NSAIDs could be the cause of a diagnostic delay and therefore of an evolution towards necrotizing fasciitis by decreasing the local reaction by reducing chemotaxis and phagocytosis.

The occurrence of necrotizing fasciitis was associated with the use of poultices, this association was statistically significant with OR=4.88 and 95% CI= [1.009076-26.52901]. The poultices could lead to superinfection and maceration of the excoriations.

CONCLUSION

Many factors in our study were associated with the occurrence of necrotizing fasciitis in children, led by NSAIDs, poultices and traumatic wounds. Some factors, although possible, pose small risks. In view of these results obtained in our study carried out under unfavorable conditions, it is necessary that cohort studies be carried out in order to confirm our results.

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