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Severe Burn Injury: Epidemiologic Profile, Clinical Presentation and Prognostic Factors in A Non-Specialised Setting

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Abstract

Background: Severe burns is a life-threatening condition. The aim of this study was to determine the epidemiologic profile, clinical presentation and the prognostic factors of these affections managed in a non-specialised setting.

Methodology: It was a longitudinal study from January 1st, 2011 to December 31st, 2021, which included severe burns patients admitted in the ICU of the YCH. Epidemiologic data, clinical presentation and prognostic factors were studied. Statistical analysis was performed using Epi info 3.5.4 software.

Results: 224 patients were included. The mean age was 22.5 ± 19 years with children between 0 to 5 years (27.7%) and patients above 60 years (6.3%). The sex ratio was 1.1. Domestic accidents were the main circumstance of occurrence (74.1%). Thermal burns were the most frequent (96.4%) with 57.4% being flame burns. The delay of admission was 48 ± 46 hours. The mean BSB was 39 ± 16.0%. As for depth, 77.7% of patients presented with deep second-degree burns with an average BSB of 40.9 ± 17.2% and 25% of patients had third-degree burns with an average BSB of 54.7 ± 20.2%. On admission, 57.1% of patients presented with hypovolemic shock associated to acute kidney injury and 95 patients (42.4%) showed signs of smoke inhalation. Mortality rate was 51.8%. Factors of poor prognostic were age ≤ to 5 years (OR(95% CI): 4.129 (2.469-32.317); p= 0.0015) and > 60 years (OR(95% CI): 6.081 (1.166- 2.670); p=0.0001), the delay in intrahospital management > 24 hours (OR (95% CI): 3.222 (1.360-7.635); p = 0.004), insufficient fluid resuscitation (OR (95% CI): 4.381 (1.741-11.020); p = 0.001), ABSI score (Tobiasen) ≥ 8 (OR (95% CI): 12.236 (3.166-47.299); p = 0.0002).

Conclusion: The management of severe burns patients in a poor and non-specialized environment is very difficult. Burn units should be set up for the management for these patients.

Keywords: Severe burn injury, epidemiology, clinical profile, prognostic factors, non-specialised settings

Abbreviations: ICU: intensive care unit, YCH: Yaoundé central hospital, BSB: body surface burned

Introduction

Burn injury is defined as being a partial or total destruction of the skin, or underlying structures, by a thermal, chemical, electrical agent or by ionizing radiation [1-3]. It is severe when it becomes life threatening and engages the functional and/or aesthetic prognosis by its extent, its depth and its location. The presence of intoxication, associated trauma, or comorbidities are factors of severity [1-3]. According to the World Health Organization, burn injuries cause 180,000 deaths a year worldwide, and the majority of these occur in low and middle-income countries. Almost two-thirds in regions of Africa and of Southeast Asia [4]. In Sub-Saharan Africa, severe burn injury is a real problem and a drastic experience in terms of incidence, morbidity and mortality [5,6]. Our aim was to determine the epidemiologic profile, clinical presentation and the prognostic factors of this condition in a non-specialised setting.

Patients and Methods

Study design, setting and population

It was a descriptive longitudinal study from January 1st, 2011 to December 31st, 2021 carried out in the intensive care unit of the Yaoundé Central Hospital. After the approval of the National Ethics Committee and the obtention of consent from the patients or the legal tutors, severe burn injury patients were included in the study. These were children with a burn surface area ≥ 10%, and adults with a burn surface area ≥ 25%. Patients presenting with toxic epidermal necrolysis were excluded. Patients included in the study were followed from admission to discharge.

Study variables and data analysis

Data collected was: socio-demographic characteristics, circumstances of occurrence, type of burn, time for initial intrahospital management, clinical presentation, evolution and prognostic factors. Data analysis was performed using Epi info 3.5.4 software. The results were expressed as median together with their dispersion indices for quantitative variables and as percentage for the qualitative variables. Statistical analysis was done using Mantel-Haensel chi-square and Fisher's test with a $p < 0.05$ considered significant.

Results

During the ten years in which the study was conducted, 3,734 patients were admitted in the ICU of the YCH. Of which 224 cases were severe burn injury patients, representing a hospital prevalence of 6%. The male gender accounted for 52.7% of cases, while the female gender accounted for 47.3%. The mean age was 22.5 ± 19 years with 27.7% being children aged between 0 to 5 years (62 cases) and 6.3% of patients (14 cases) aged above 60 years. Domestic accidents were the main circumstance of occurrence with thermal burns being the most frequent with flames (124; 57.4%) and hot liquids (92; 42.6%) as burning agents (Table 1). No medical attention was provided at the site of the accident. The average time admission in the intensive care unit was 48 ± 46 hours. In 60.7% of cases initial management in the ICU began more than 24 hours after the burn injury (136 patients). The average burn surface area was 39.6 ± 16% according to the Lund and Browder chart. The anterior trunk (88.4%), upper limbs (81.3%), head and neck (57.1%) were topographically the most affected. Regarding the depth of the burns, 77.7% of patients had deep second-degree burns with an average burn surface area of 40.9 ± 17.2% and 25% of patients (56 cases) had third-degree burns with an average burn surface area of 54.7 ± 20.2%. On admission, 128 patients (57.1%) presented with hypovolemic shock associated with acute kidney injury and 95 patients (42.4%) presented signs smoke inhalation. We recorded 116 deaths, i.e., a mortality rate of 51.8% of which 45% where children aged from 0 to 5 years (28 cases/62 patients) and 85.7% where patients aged above 60 years (12 cases/14 patients). Factors of poor prognosis are shown in Table 2.

Table 1: Main patient characteristics at admission.

Characteristics	n = 224
Sociodemographic characteristics	
Mean age (years)	22,5 ± 19
Sex: Male / Female n (%)	118 (52.7%) / 106 (47.3%)
Circumstances of occurrence	
domestic accidents n (%)	166 (74.1%)
accidents at work n (%)	24 (10.7%)
Fire n (%)	12 (5.3%)
suicide attempt n (%)	12 (5.3%)
Forest fire n (%)	10 (4.6%)
Delays of management	
Average time for hospital management (hours)	48 ± 46
Delays of management in ICU > 24 H n (%)	136 (60.7%)
Types of burn	
Thermal burns n (%)	216 (96.4%)
Electrical burns n (%)	8 (3.6%)
Burned surface area	
Mean body surface area burned (%)	39.6 ± 16.0%
depth of burn	
2nd deep degree n (%)	174 (77.7%)
3rd degree	56 (25%)

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Table 2: mortality risk factors (N=224).

factors	n (%)	Deaths (n)		p	OR(IC95%)
		Yes	No		
Age 0 – 5 years	62 (27.7%)	28	34	0.0015	4.129 (2.469-32.317)
Age > 60 years	14 (6.3%)	12	2	0.0001	6.081 (1.166 – 2.670)
Delays in initial management > 24h	136 (60.7%)	96	20	0.004	3.222(1.360-7.635)
Insufficient fluid and electrolyte resuscitation	128 (57.1%)	88	40	0.001	4.381(1.741-11.020)
ABSI on admission ≥ 8	151 (67.4%)	116	35	0.0002	12.236(3.166-47.299)

ABSI: Abbreviated burn severity index (Tobiasen)

Discussion

Severe burn injuries accounted for 6% of admissions in the intensive care unit. This sample does not reflect the prevalence of severe burn injury in Cameroon, as some patients die at the site of the accident; others are treated in various hospitals in the country. However, it is a considerable prevalence due to the fact that the YCH was and remains the only non-specialised centre for the management of burn injury patients in the capital of Cameroon. It covers the Central, South and East regions. The country has only one nationally-recognised burn unit which is the Douala General Hospital, located 230 km from Yaoundé, in the Littoral region. The prevalence of severe burn injury observed in our series was higher than that reported by Kouabenan et al in Bouaké in Ivory coast (0.75%) [7], Pikabalo *et al.* in Lomé in Togo (1.4%) [8], and Tchaou *et al.* in Parakou, Benin (1.6%) [9], all three in non-specialized burn centres. Our population was essentially young with a considerable proportion being children aged from 0 to 5 years. The non-compliance with safety measures by young people, the agitation and imagination of children, and sometimes the laxity of parents would be the cause. Similar, studies carried out in non-specialised settings had also revealed a high prevalence of young subjects and children [7-9]. Domestic accidents were the main circumstance of occurrence and the thermal burns by flames was the first culprit. Moreover, the period our study coincides with that of load shedding. The use of palliative solutions such as the use of candles as source of lighting was the cause of the majority of accidents observed. The inattentiveness of parents concerning the safety and control of these palliative solutions had certainly favoured the occurrence of accidents causing severe burn injuries. Domestic accidents and thermal burns by flames have been reported as the first circumstance of occurrence and the main type of burn respectively in most of the series described in literature reviews [6-10]. The time for initial hospital care was long (> 24 hours in 60.7% of cases). The absence of pre-hospital care in our environment on one hand and the retention of patients in primary care centres on the other hand would explain this delay of admission in the intensive care unit. Moreover, traditional treatment done at home would also be a cause of delay in initial management. Owono Etoundi et al had noted this in the same hospital in 2014 [11]. Admission times in our context were very long compared to those reported by Tchaou et al (2 hours in 71.4% of cases) in Benin and Kouamé *et al* in Ivory Coast (24 hours in 69.8% of cases) [9,10]. Clinical presentation on admission was mostly made of hypovolemic shock associated with acute kidney injury (57.1%), smoke inhalation found in 42.4% of cases, average BSB of 39.6 ± 16.0% with a significant percentage of third-degree burns. These were severe burn injury patients with a profound altered general state caused by delay in treatment. We observed a mortality rate of 51.8%. This high mortality rate in our series is explained on one hand by the absence of prehospital care and the delay in admission to the intensive care unit. On the other hand, management in the intensive care unit was very approximate, especially during the first 24 hours, due to insufficient fluid resuscitation. Inappropriate fluid replacement was secondary to the insufficiency in fluids purchased by the families. Universal Health Coverage does not yet exist in Cameroon; thus, families are obliged to provide caregivers with drugs and the first necessities for the care of their loved ones. Furthermore, the management of severe burn injury requires great financial resources. The poverty and indigence of families was a limiting factor of care. The mortality rate observed in our sample was higher compared to that of those who treated severe burns injury in non-specialized centers in Sub-Saharan Africa: 10.6% for Pikabalo et al, 40.8% for Tchaou et al, 41.2 % for Amengle et al [8,9,12]. Our mortality rate remains very high compared to that reported in specialised burn units in Sub-Saharan Africa: 25.9% in Douala in Cameroon according to Beyiha et al [13], 35.4% according to Kouamé et al in Abidjan in Ivory Coast [10]. In North Africa and in France, the mortality rate of burn injury patients treated in specialized burn units is much lower than ours: 1.4% reported by Haïdara et al in Casablanca in Morocco [14], 5.5% described by Elkafssaoui et al in Rabat in Morocco [15], and 2.5% observed by Dupont et al in France [16]. Factors of poor prognosis in our context were age (0 to 5 years, > 60 years), delay in initial management, insufficient fluid and electrolyte resuscitation and the clinical condition of patients assessed by the prognostic score of ABSI Tobiasen ≥ 8. Extreme ages are classically recognized for being very vulnerable to severe burn injury due to physiological immaturity (children aged 0 to 5) on one hand, and physiological immunosuppression (elderly

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people) on the other [1,2]. The delay in initial management and the insufficient fluid replacement are the result of a health system characterized by: the absence of the prehospital care necessary for adequate conditioning and good orientation of patients and the lack of Universal Health Coverage. The consequences of these are the inability to catch up the delay in fluid replacement in patients who still had a probability of survival of about 50% [17].

Conclusion

The management of severe burn injury in a poor non-specialized environment is very difficult and encumbered with very a high mortality. Burn units should be set up for the management of these patients.

Thanks

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Conflict of Interest

The authors declare that they have no conflict of interest concerning to this work.

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