



Morbidity and mortality of paediatric burns patients at Maputo Central Hospital, Mozambique

Vanda Amado*¹, Massada da Rocha¹, Dalva Khosa¹, Stella Langa¹, Daniel A. DeUgarte², Prem Yohannan¹

¹Hospital Central de Maputo, School of Medicine, Eduardo Mondlane University, Maputo, Mozambique

²Division of Pediatric Surgery, David Geffen School of Medicine, UCLA, Los Angeles, California, USA

*Correspondence: amadovanda@gmail.com

<https://dx.doi.org/10.4314/ecajs.v22i3.4>

Abstract

Background: *The incidence of paediatric burn injuries is increasing in Africa. Paediatric burn injuries are among the leading causes of preventable morbidity and mortality in sub-Saharan Africa. Research on the morbidity and mortality in this setting is much needed.*

Methods: *We conducted a prospective questionnaire-based analysis of paediatric burn patients presenting to the Maputo Central Hospital during a five-month period. Interviews were conducted with the children's caretakers by 2 paediatric surgery residents and 1 paediatrician at the Eduardo Mondlane Medical School in Maputo, with the aid of nursing staff.*

Results: *Questionnaires were completed for 66 patients. Most burns occurred from scald injuries (n = 46), particularly from cooking (n = 27) and bathwater (n = 19), followed by fire injuries (n = 16). Burns occurred more frequently in the afternoon (n = 26) and morning (n = 23). Many patients reported no adult caretaker present at the time of the burn injury (n = 24). Most burns were grade II (n = 49). Nearly half of the patients received a blood transfusion (n = 30). One-third of the patients underwent operative surgical debridement (n = 21). Skin grafting was performed on a subset of these patients (n = 13). A large number of patients developed a wound infection (n = 39). All deaths occurred in patients who were admitted to the paediatric intensive care unit and had sepsis (n = 9). The mean total body surface area (TBSA) of burn deaths was 37% (range 20% to 50%), and many deaths were secondary to fire burns (6 of 9; 66.7%).*

Conclusions: *Most paediatric burn injuries occur in association with domestic activities, such as cooking and bathing. Adult caretakers are frequently not present at the time of the burn injury. Mortality rates are high, especially for large body surface area burns caused by fire. Educational programmes may help reduce the incidence of burns and the associated morbidity and mortality. The improvement and expansion of emergency and intensive burn care services may help to improve survival.*

Keywords: burns, morbidity, mortality, paediatrics, paediatric surgery, Mozambique

Introduction

Burns are common in sub-Saharan Africa and are considered to be a major healthcare problem. Burn injuries are among the most devastating and traumatic injuries and are a major contributor to morbidity and mortality in sub-Saharan Africa. The incidence of burns is increasing among paediatric patients and is highest in Africa (more than 96,000 children hospitalised per year). Children younger than 5 years old are at greatest risk.¹



Burn injuries are among the most common causes of childhood injury in previous studies in Maputo, the capital of Mozambique.² Burn injuries are a major cause of prolonged hospital stay, disfigurement, disability, and death in the African region. Long-term morbidity is often a significant problem for burn survivors. Burn injuries lead to multiple short- and long-term costs to families, communities, and the nation. Some of the consequences of burns are well known and include pain, infections, scarring, wound contractures, amputations, and death, as well as psychological trauma.^{3,4}

Children under 5 and the elderly have the highest burn mortality worldwide. The fire-related mortality rate in Africa for children under 5 is 32.9 per 100,000. Burns are the sixth leading cause of death among children 5 to 14 years of age worldwide. In Southeast Asia, more girls aged 5 to 14 years die from burns than tuberculosis, HIV/AIDS, and malaria combined.⁵

In Africa, paediatric burns occur mostly in and around the home. Most are accidental and, therefore, preventable. Burn incidents are prone to happen when parents—who may be out at work or looking for work—leave small children unsupervised or in the care of other children. Food preparation using open cast iron pots for cooking and boiling water constitute a major hazard for small children and toddlers who often play around cooking areas. Burn care in Africa is negatively affected by the limited availability of financial resources, equipment, and expertise. However, despite the lack of resources, excellent burn care can be provided.⁶

Methods

We conducted a prospective questionnaire-based analysis of paediatric burns, with a focus on morbidity and mortality. Institutional review board approval was obtained from the COSECSA Education, Scientific, and Research Committee (ESRC), as well as the Bioethics Committee of the Hospital Central de Maputo (HCM). Inclusion criteria included: (1) patient age \leq 14 years; (2) primary or secondary diagnosis of burn on any part of the body; (3) admission to the paediatric surgical ward, plastic surgery ward, or paediatric intensive care unit at HCM; and (4) informed consent of parents or caregivers. Exclusion criteria included: (1) patients or parents or caregivers who declined participation in the study; (2) patients who did not have caregivers present; (3) patients whose parents or caregivers who initially agreed to participate but refused to give information or proceed with the study. Due to the descriptive nature of the study, a specific sample size was not required, and convenience sampling was utilised, given resource constraints. Caregivers of patients meeting inclusion criteria and admitted to the paediatric surgery ward, plastic surgery ward, and paediatric intensive care unit at HCM were recruited to participate after providing verbal informed consent. We developed the questionnaire with input from clinical faculty and residents at the HCM. The questionnaire was presented to the department chiefs of paediatric surgery, plastic surgery, and paediatric intensive care to establish face validity before the pilot phase was initiated. We utilised only 3 interviewers (1 for each location) throughout the study to minimise interviewer bias. Two senior paediatric residents and 1 paediatric junior doctor at the Eduardo Mondlane Medical School in Maputo (which is affiliated with HCM) conducted all interviews after training and piloted the study with a subset of patients to verify question relevance and establish a systematic method of conducting the interview. Interviews were conducted over a 4-month period (May to August 2016). Interviews were mostly conducted in Portuguese and translated into English. Some interviews were conducted in Shangana, a local Mozambican language with the aid of nurse translators. All approached families agreed to participate in the study.



Results

A total of 66 patients were included in our study. Results are described in Tables 1 to 7.

Males accounted for 39 (59.1%) of the cases. The male-to-female ratio was 1.4: 1. Most patients were between the ages of 3 and 5 years (n = 25). Twenty-five (37.9%) of the patients were from the outskirts of Maputo City, 18 (27.3%) lived in Maputo Province, 6 were from Inhambane Province, 6 were from Gaza Province, and 5 were from Maputo City.

Table 1: Mechanisms of burn injuries		
Mechanism of burn injury	Frequency	Percentage
Scald	46	70%
Fire	16	24%
Electrical	2	3%
Chemical	2	3%
Total	66	100%

Table 1 shows the causes of the injuries among study patients. The majority (70%) of children sustained scalds. The next most frequent cause of burns was fire (n = 16; 24%), followed by electrical wire (n = 2) and chemical agents (n = 2). Of the scald burns, most occurred during cooking (n = 26) and bathing (n = 19); a smaller number had burns related to use of an electrical kettle used to boil water for making tea, cooking, and preparing a warm bath (n = 4). Burns related to fire occurred by falling into the fire (n = 11) or during house fires (n = 5).

The burns occurred in the morning in 24 patients (36.4%) and in the afternoon in 26 (39.4%) of the 66 patients. Burns occurred at night in 15 (22.7%) of the cases. In 23 patients (34.9%), the mother was reportedly present at the time of the injury. In 18 patients (27.3%), a minor younger than 15 years of age was present at the time of the burn injury. Six patients (9.0%) were reportedly alone during the incident.

Table 2: Activities associated with burn injuries		
Activity	Frequency	Percentage
Cooking	27	41%
Bathing	19	29%
Electrical Kettle	4	6%
Fall into the Fire	10	15%
Traditional Healing	1	2%
Home Fire	5	8%
Total	66	100%

Table 2 shows the activities that were being carried out when the patients sustained their injuries. In 27 (41%) of the cases, cooking was taking place. Ten (15%) of the children fell in an open fire, while 5 (8%) fell in fire in the home.

Table 3: Supervisor present at time of burn

Supervisor	Frequency	Percentage
Mother	23	35%
Other adult	14	21%
Minor (Age < 15 years)	18	27%
None	6	9%
Unknown	5	8%
Total	66	100%

The majority of patients (76%) arrived at the hospital within 6 hours of injury (Table 4). Forty-eight (73%) of the patients sustained second-degree burns, while 18 (27%) of the patients had third-degree burns.

Table 4: Time between burn injury and presentation to hospital

Time from Injury to Hospital	Frequency	Percentage
0-6h	50	76%
6-12h	7	11%
12-18h	1	2%
18-24h	0	0%
+24h	3	4%
Unknown	5	7%
Total	66	100%

Burns were mostly second degree (n = 48; 72.7%), with the rest being third degree (n = 18; 27.3%). The majority of patients had total body surface area (TBSA) burns between 10% and 30% (n = 36; 54.5%) (Table 6). Upper (n = 51; 77.3%) and lower (n = 38; 57.6%) limbs were the most affected regions, followed by anterior (n = 37; 56.1%) and posterior (n = 31; 47.0%) trunk and then anterior head (n = 21; 31.8%) and neck (n = 12; 18.2%).

Most of the patients were treated non-operatively with burn dressings only (n = 52; 78.8%). Surgical debridement was performed in 21 patients (31.8%), and skin grafting was performed in 14 (21.2%). Nearly half of the patients received a blood transfusion (n = 29; 43.9%). Most received antibiotics (n = 63; 95.5%).

Table 5: Burn injury complications

Complications	Frequency	Percentage
Anaemia	39	59%
Wound infection	38	58%
Sepsis	18	27%
Contracture	4	6%
Acute gastroenteritis	4	6%
Keloid / hypertrophic scar	3	5%
Amputation	1	1.5%
Gangrene	1	1.5%
Malnutrition	1	1.5%
Hypovolemic shock	1	1.5%
Upper airway oedema	1	1.5%
Otitis media	1	1.5%
Pneumonia with effusion	1	1.5%



The majority of burn injuries had at least 1 complication (Table 5). The majority had wound infections (n = 38; 57.6%). Sepsis was diagnosed in 18 patients (27.3%). Wound contracture developed in 4 patients (6.1%) and keloid/hypertrophic scar in 3 patients (4.5%). One patient required an amputation.

Table 6: Total body surface area categorisation of burns experienced by study patients

Total body surface area (TBSA)	Frequency	Percentage
0-10%	20	9%
10-20%	21	35%
20-30%	15	21%
30-40%	4	9%
40-50%	6	8%
+50%	0	18%
Total	66	100%

There were 9 deaths, yielding a mortality rate of 13.6%. The average age of the patients who died was 4 years. Two patients were from the city of Maputo, 2 from Inhambane, 1 from Gaza, 2 from Maputo Province, and 1 from the outskirts of Maputo. Six of the burn deaths were due to fire burns and 3 were from scald burns. The average TBSA for those who died was 37% (range 20% to 50%). All deaths occurred in the 28 patients admitted to the paediatric intensive care unit (ICU), after a mean hospital stay of 8 days. Septic shock was the cause of all 9 deaths. Two patients had associated respiratory failure, and 1 had hypovolaemic shock.

Table 7: Diagnoses associated with death

Diagnosis (associated with death)	Frequency	Percentage
Septic shock	9/9	100%
Respiratory failure	2/9	22%
Hypovolemic shock	1/9	11%
HIV (+)	4/9	44%
Epilepsy	1/9	11%
Other	5/9	56%

Discussion

Our findings are consistent with other reports that demonstrate that paediatric burn injuries in Africa have a high mortality rate. Patients with TBSA > 45% rarely survive, and young children with burns as small as 20% TBSA often die.⁷ Fatalities often occur in malnourished burned children who are, in many instances, only weaned between the ages of 18 months and 3 years.⁸ These results, although very distressing, are often unavoidable because the necessary facilities, equipment, and trained personnel are not available in many settings in sub-Saharan Africa.

We observed that most of the burns occurred in the home, during the preparation of food or bathwater, or as a result of fires ignited to illuminate households or eliminated household waste. These situations could be avoided with poverty reduction and improvements in education and municipal services. Child supervision and the potential role of negligence is also an important



part of the conversation, as many of the burn patients were left at home alone or only accompanied by another child under 15 years of age.

In Mozambique, ICUs only exist in referral (central) hospitals located in the main provincial cities and there are few paediatric intensivists. Thus, severe burn injuries that frequently occur in remote regions should be transferred to the referral hospital. However, transportation is limited, and most patients do not have access to intensive care or trained burn surgeons. In this study, we observed that patients were only transferred in from nearby provinces, not from more remote provinces. Interestingly, most of the patients were transferred within 24 hours. This may explain why hypovolaemia, which is often due to delay in treatment,¹⁰ was not the primary culprit for patient deaths in our study.

Sepsis was the main cause of mortality in our study. Extensive injuries and the absence of barrier nursing are believed to be the major contributors to wound infections and likely bacteraemia. We found that the deaths occurred in children with more than 20% of burned body surface. These results occur because we do not yet have a formal burn unit with equipment, infrastructure, and personnel trained to manage patients with more extensive burns. We also observed 2 patients who developed respiratory distress syndrome, a usually fatal complication in burned children.¹⁰ Pre-existing medical conditions such as anaemia, malnutrition, malaria and inadequate burn management may further contribute to the high mortality rate.¹¹

Morbidity in paediatric burn patients is exacerbated by prolonged hospital admissions and healing time, where complications such as infections, contractures, depigmentation, and keloid formation are noted.⁹ Delayed grafting of burns, lack of splinting, and inadequate physical therapy services further contribute to these common problems.

In this study, only 20% of patients had a graft, which contributes to complications, such the contractures and keloids that are frequently observed. Squamous cell carcinoma is not uncommonly seen in adult cases of chronic burn wounds at our hospital. Increasing operative capacity to increase the frequency of burn debridements and early grafting could improve outcomes when combined with improved postoperative care and infection control practices.

Conclusions

A better understanding of the causes of morbidity and mortality of paediatric burn patients can help to inform future prevention and treatment strategies. Our study showed that most burns occurred at home and could, therefore, be preventable. More should be invested in burn prevention and to empower hospitals to adequately equip and staff burn units.

Acknowledgments

This research was supported in part by the COSECSA RCSI Grants Scheme 2015 and the Division of Pediatric Surgery of Maputo Central Hospital. We acknowledge contributions from Dr Amácio Oliveira, Dr Valeria Chicamba, Dr Celma Issufo, Dr Paula Santos, Dr Atílio Moraes, Dr Mohsin Sidat, Dr Emilia Noormahomed, Dr Stephen Bickler, and Dr Bruce Potenza. The research also received support from partnerships with the University of California, Los Angeles through the UCLA Center for World Health, as well as the University of California, San Diego.



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