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Evaluating the Socioeconomic and Cultural Factors Associated with Pediatric Burn Injuries in Maputo, Mozambique

Abraar Karan¹, Vanda Amado², Pio Vitorino², David Kulber³, Atanasio Taela², and Daniel DeUgarte¹

¹UCLA David Geffen School of Medicine; Department of Pediatric Surgery

²Hospital Central de Maputo, Eduardo Mondlane School of Medicine

³Cedar-Sinai Medical Center and USC Keck School of Medicine; Division of Plastic Surgery

Abstract

Background—Pediatric burn injuries are one of the leading causes of preventable morbidity and mortality in Sub-Saharan Africa. Research on the complex system of social, economic and cultural factors contributing to burn injuries in this setting is much needed.

Methods—We conducted a prospective questionnaire-based analysis of pediatric burn patients presenting to the Hospital Central de Maputo. A total of 39 patients were included in the study. Interviews were conducted with the children's caretakers by two trained medical students at the Eduardo Mondlane Medical School in Maputo with the aid of local nursing staff.

Results—Most burns occurred from scald wounds (26/39) particularly from bathwater, followed by fire burns (11/39). Burns occurred more frequently in the afternoon (16/39) and evening (16/39). Over one quarter of burns (9/33) occurred in the absence of a caretaker. One third (12/36) of participants attempted to treat the burn at home prior to bringing the child in to the hospital, and roughly two-thirds (24/37) reported using traditional remedies for burn care. The average household had just 2 rooms for an average of 5 family members. Most burns were grade II (25/37).

Conclusions—Prevention efforts in this setting are much needed and can be implemented taking complex cultural and social factors into account. Education regarding regulation of water temperature for baths is important, given the prevalence of scald burns. Moreover, the introduction of low-cost, safer cooking technology can help mitigate inhalation injury and reduce fire burns. Additionally, burn care systems must be integrated with local traditional medical interventions to respect local cultural medicinal practices.

Keywords

burns; Sub-Saharan Africa; health systems strengthening

Corresponding Author: Daniel A. DeUgarte, MD, MS, Co-Director, Global Health Education Programs, UCLA Center for World Health, Department of Surgery, UCLA, and Harbor-UCLA David Geffen School of Medicine UCLA, Box 709818, 10833 Le Conte Avenue, Los Angeles, CA 90095-7098, Phone: 310-206-2429, Fax: 310-206-1120, ddeugarte@mednet.ucla.edu.

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Introduction

Pediatric burn injuries are one of the leading causes of preventable morbidity and mortality in Sub-Saharan Africa (SSA). [1] [2] Among all causes of child deaths under age 5 due to injuries worldwide, burns are the leading cause and 95% of burns occur in low-income countries. [2] Burn injuries in children often occur in the community setting and are treated on an outpatient basis, for which there is scarce data; most studies to date have focused on hospital admissions. [1] The prevention of pediatric burn injuries is particularly important in Sub-Saharan Africa due to the lack of specialized burn care units in most of the region. Some of the major difficulties hindering high-quality burn management include a lack of antibiotics, shortage of skin banks for grafting, limited blood bank volume, and a dearth of basic wound care supplies. [1] Clinical management protocols have been particularly lacking, and many patients suffer from hypovolemia and septicemia due to delayed access to care. Still, the majority of pediatric burns are never even seen in the hospital, and home-treatment has been highly variable, with outcomes directly related to family affluence and access. [1] Studies have indicated that flame, hot liquid, and chemical burns occur with highest frequency, but the mechanisms and factors related to these burns have not been well elucidated. [1] Among the many potential social factors, there are clear examples attributing certain cultural practices to increased burns in both children and adults, including warding away evil spirits and treating upper respiratory tract infections. [3] One commonly cited example is the burning of children's feet as a traditional epilepsy treatment in Nigeria [3] [4]. However, more research is needed to thoroughly understand the process behind pediatric burn injuries in the region, with an emphasis on the complex system of social, economic and cultural factors that influence health outcomes. Burn injuries are among the most common causes of childhood injury in previous studies in Maputo, the capital of Mozambique. [5]

Methods

Our study was a prospective questionnaire-based analysis of pediatric burns with a focus on the socioeconomic and cultural context of injury. Institutional review board approval was obtained from the UCLA Institutional Review Board as well as the Bioethics Committee of the Hospital Central de Maputo (HCM). Inclusion criteria were as follows: pediatric patients (less than age 14) who presented to the HCM pediatric surgery ward with a chief complaint of a burn injury. No exclusion criteria were specified. Due to the descriptive nature of the study, a specific sample size was not required and convenience sampling was utilized given resource constraints. Caregivers of patients were approached in the burn unit within the pediatric ward and were requested to participate after oral informed consent. The questionnaire was developed by the authors along with input from clinical faculty and residents at the HCM (see Appendix 1). Cultural relevance and sensitivity were of particular importance to the study design and protocol; the questionnaire was presented to the department chair of Pediatric Surgery to establish face validity before the pilot phase was initiated. We utilized only two interviewers throughout the study to minimize interviewer bias. Two second year medical students 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 two 1-month periods – one during the hot, rainy season at the end of 2013 and the other during the cold, dry season mid 2014. Interviews were mostly conducted in Portuguese and translated to English. Some interviews were conducted in Shangana, a local Mozambican language with the aid of local nurse translators. All families approached agreed to participate in the study. If the bedside caregiver was unable to answer a question, the data was considered missing.

Results

A total of 39 patients were included in our study. Results are described in Tables 1–5.

Patient Characteristics (Table 1)

The large majority of patients were male (28/38) and the average age of patients was 3 years old (n=39). An overwhelming majority of patients were from the city of Maputo (34/37) and presented the same day of their burn. Almost a quarter of patients (9/38) reported a history of seizures and a small number had a developmental delay (2/36). Fifteen patients were interviewed during the hot, rainy season and twenty-four were interviewed during a similar time frame in the cold, dry season.

Mechanisms of Injury (Table 2)

The majority of pediatric burns occurred from scald wounds (26/39); the next most frequent were from fire burns (11/39); and just 1 from electrical wire (1/39). Of the scalds, most were from bath water (17/26); a smaller number from cooking (8/26); and 1 from a eucalyptus mixture (1/26). Of the injuries from fire, they were relatively evenly distributed across candle burns (4/11), apartment fires (3/11), and cooking (2/11), while the remaining 2 were not specified.

Characteristics of Injury (Table 3)

A smaller number of burns occurred in the morning (7/39), while an equal number took place in the evening and at night (16/39 for both). In one quarter of households, participants reported having had a previous burn injury (9/36). In over one quarter, the caretaker reported that no parent was present during the incident (9/33). One third of families attempted to treat this specific burn at home (12/36), while roughly two thirds reported using home remedies to treat burns in the past (24/37). In no cases was alcohol reported to be a factor in the burn incident (0/35).

Household Characteristics (Table 4)

When separated by area of residence, over half of families were located within the city of Maputo (15/28), a number were from rural areas near the city (11/28), and 2 reported residence in a suburb of the city (2/28). The average household had 5 members, with 2 being children (n=37). The average household size, measured by number of rooms, was 2 (n=34). The average educational status of the child's caregiver was 7 years, indicating completion of grade school only (n=35). Slightly less than half of families reported using traditional medicinal therapy on a regular basis (14/36). Most households had a regular caretaker at

home to supervise children (33/36). In only two thirds of households was the father reported as living at home (24/36). We also assessed cooking methods in the household, which can be found in Table 4; coal, gas, and wood were the most common used mediums. Households primarily used electricity for lighting purposes (23/31), although some used petroleum (5/31). The average monthly income of a household was USD 122.77.

Clinical Characteristics (Table 5)

Burns were mostly 2nd degree (25/37), with the rest being 3rd degree (5/37), 2nd and 3rd (6/37), and 1st and 2nd degree (1/37). The average total body surface area affected was 11% (n=31). Management of injury was for the most part non-surgical (25/34). The average length of stay was 8 days (n=30), and a total of 2 deaths were recorded (2/31).

Discussion

A number of important interventions for burn injury prevention have been previously discussed in multiple studies [6]. Our study identified the social, economic and cultural factors common to households in which burn injuries have occurred primarily in the capital city of Maputo and surrounding districts. Understanding this larger context behind burn injuries is critical in developing stronger public health systems in Sub-Saharan African countries.

We found that seizure disorders were common among a number of injured children. Seizure disorders in Sub-Saharan Africa have a particularly high association with burns, both because they can cause children to seize into boiling liquids and open fires, but also because epilepsy has been treated in some African cultures by purposefully inducing burns [4] [7]. We also noted some participants to have developmental delays, which puts them at higher risk for exposure to household dangers. One important national intervention that should be further developed is to educate families with regards to the clinical signs of seizures and important safety precautions in the home, particularly for children. These must include the need for extra-vigilant parental supervision during cooking and open fires.

Consistent with other previous studies in the country and region, scald burns were the most common cause of burns in children. [5] [8] However, contrary to other studies, which report boiling water used in cooking, we found that bathwater exposure was the most common cause of burns. It is important to understand how baths are prepared in this setting. Running water is not always available; nor is a water heater that can regulate maximal water temperature. Water is therefore boiled in preparation for baths. A simple prevention effort could involve instructing caretakers to add hot water to cool water rather than adding cool water to boiling water at an incorrect dilution. Some have postulated the potential for parental abuse in cases where children present with scalds specifically on the buttocks from bathing. This has also been mentioned as a home remedy when children have diarrheal illness. Alcohol use has also been suggested as a potential factor in pediatric burns, although participants in our study did not report any alcohol use. Child abuse patterns with regards to burn injury have not been well studied in the Sub-Saharan African context and further research into this area is needed. [9]

Fires were the second most common burn mechanism in our study, which is consistent with previous findings [Wesson]. Cooking fires in Africa are dangerous due to the presence of open flames and candles in small, closed quarters [1]. Open fires are often present during the evening and night hours, which were the highest reported time of burn occurrence in our study. Moreover, we found that families often had far more members than the number of rooms in the house, indicating very crowded living conditions, and over 1 in 4 burns occurred when no caretaker was present. Additionally, in 25% of households, there had been a burn injury in the past, indicating that many families likely do not make appropriate changes after the first incident—among other factors, we predict this is due to resource limitations. Education of families with regards to safer cooking practices (both ventilation and method of cooking) can help reduce burns as well as inhalational injury. The introduction of low-cost, safe cooking technologies in Sub-Saharan Africa is absolutely necessary, and has been in development through the World Bank's Africa Energy Group "Africa Clean Cooking Energy Solutions Initiative" (ACCES). [10]

The use of traditional remedies to treat burns has been well documented. [3] In our study, 1 in 3 caretakers attempted to first treat the burn at home, and slightly less than half reported using traditional medicines in the household in general. While the use of traditional medicines can deter injured patients from seeking medical care, these medicines are nonetheless important because of the value and trust that people place in them. Because most of the rural areas are out of reach of modern healthcare infrastructure in Mozambique and other countries in Sub-Saharan Africa, it will be important to create public health interventions that work within the cultural framework of traditional healing. Educational programs that teach home-care of burns, and signs to self-assess if patients should be taken to the hospital are needed in rural areas, but these messages will be best delivered through local village leaders and healers. Culturally sensitive burn prevention, education and self-management should be prioritized by national governments and civil society.

Our study uniquely highlights the complex, multifaceted nature of burn injuries. An effective burn injury prevention program must take these into account through a combination of educational initiatives, poverty assistance programs, resource provision that can promote safer cooking and heating practices, and cultural ambassadorship that integrates local traditional healthcare providers into acute burn management and transition of care. While our study elucidates some of the associated factors pertinent to pediatric burn patients in Mozambique, our recommendations can be generally applied to the Sub-Saharan African region as the causes of burns in our study were consistent with findings in larger studies across the entire region [1].

In our study, total mortality was reported at 6.5%. A previous study by Agbenorku et al. in Ghana found that predictors of mortality for burn injuries included age less than 6 years old, total body surface area greater than 36%, and mechanism of injury being scald burns. [10] While our study population met two of these criteria, we found that on average, the TBSA was 11%, which was likely protective in our patients. Moreover, most patients in our sample presented to the hospital the same day as their injury, allowing for prompt care. The majority of our participants were from Maputo or nearby areas. However, some patients did not speak a language that the interviewer or any available nurses spoke fluently and thus were not

included. Many of these patients are from more rural parts of the country. Thus, our study does not elucidate the poorly understood context of burns in the rural community setting. Patients from rural areas likely suffer more mortality given their lack of access to care, which makes it difficult to characterize and quantify the full extent of burns in this context.

Another limitation of the study was the relatively small sample size and the fact that it was restricted to the pediatric surgery ward. Patients managed as an outpatient or admitted to other wards (e.g. pediatrics ward, intensive care unit, or plastic surgery ward) were not included. Nonetheless, the results do provide some perspective on the demographic profile observed in hospitalized patients.

A number of strategies to help reduce the burden of burn injuries in Sub-Saharan Africa have been suggested in the literature. Spiwak et al. assessed the effectiveness of a burn management course for training in East Africa, which was rated highly by participants. [12] However, the most significant limitation in improving burn prevalence and outcomes is a severe lack of resources, including the absence of designated burn centers, the need for basic medical supplies, and insufficient medical staffing in Sub-Saharan Africa. This is specifically important to burn care as frequent dressing changes are required to prevent infection, and this is often compounded by a subsequent lack of antibiotic availability. Many hospitals are also limited by a shortage of blood products readily available, and constrained operating room space for acute care cases. Training programs, as well as development aid must focus on creating healthcare systems that can better accommodate burn patients by focusing on building treatment capacity and integrating burn care into the overall surgical healthcare system in Mozambique and other countries in East Africa.

Important areas of future study related to both acute and chronic burns include more precise documentation of the time from burn to presentation at the hospital; the number of surgical procedures needed per burn patient; the type of procedures (skin grafts, flaps, contracture release etc.); the use of blood transfusion in the operating room; infection rates in hospital-treated burns; and patient morbidity outcomes, including contractures and deformities.

Conclusion

An understanding of the social, economic, and cultural characteristics of pediatric burn patients can help to inform future prevention and treatment strategies. Our study elucidated factors including comorbidities such as epilepsy, overcrowded households and lack of parental supervision, the need for improved cooking technologies, poverty, and the importance of culturally sensitive program development. We recommend further research on burn injuries in the rural community setting, as well as further investigation into the patterns of child abuse as they relate to pediatric burn injuries.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Patient Characteristics

	N	%
Male	28/38	74
Female	10/38	26
Age (years)	39	3±3 (years)
Residence in Maputo	34/37	92
History of Seizures	9/38	24
Abnormal Development	2/36	5.5
Regularly use traditional medicines	14/36	39
Caretaker regularly at home	33/36	92

Table 2

Mechanism of Injury

	N	%
Scald	26/39	66
Bathwater	17/26	65
Cooking	8/26	31
Eucalyptus Steam	1/26	4
Fire	11/39	28
Candle Burns	4/11	36
Apartment Fires	3/11	27
Cooking	2/11	18
Unspecified Fire	2/11	18
Electrical Burn	1/39	3
Unspecified	1/39	3

Table 3

Characteristics of Injury

	N	%
Time of Incident		
Morning	7/39	18
Evening	16/39	41
Night	16/39	41
Repeat Burn Injury	9/36	25
Parent Absent at Time of Injury	9/33	27
Treated Burn at Home	12/36	33
Used home remedy (Vaseline, water)	24/37	65
Alcohol involved	0/35	0

Table 4

Household Characteristics

	N	%
Area of residence		
Rural	11/28	39
Suburb	2/28	7
City	15/28	54
Average household size	N=37	5 members; 2 children (Age 3)
Average # rooms	N=34	2
Average education of caregiver	N=35	7 years
Father lives in home	24/36	66
Cooking method		
Coal only	3/37	8
Gas only	14/37	38
Wood only	10/37	27
Gas & Electric	2/37	5
Gas & Coal	3/37	8
Gas & Wood	2/37	5
Coal & Wood	3/37	8
Lighting Method		
Electricity	23/31	74
Petroleum	5/31	16
Candle	3/31	10
Avg. Household Income	N=37	123 USD (conversion at time was 31.8 metical=1 USD)

Table 5

Clinical Characteristics

	N	%
Degree of Burn		
1 st and 2 nd	1/37	3
2 nd	25/37	68
2 nd and 3 rd	6/37	16
3 rd	5/37	14
Mean total body surface area	N=31	11%
Treatment		
Surgical	5/34	15
Non-surgical	25/34	74
Surgical & Non-surgical	4/34	12
Mean length of stay (days)	N=30	8 days
Deaths	2/31	7