The effect of traditional healer intervention prior to allopathic care on pediatric burn mortality in Malawi

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ABSTRACT

Introduction: Burn injury is a significant contributor to mortality, especially in low and middle-income countries (LMICs). Patients in many communities throughout sub-Saharan Africa use traditional health practitioners for burn care prior to seeking evaluation at an allopathic burn center. The World Health Organization defines a traditional health practitioner as "a person who is recognized by the community where he or she lives as someone competent to provide health care by using plant, animal and mineral substances and other methods based on social, cultural and religious practices based on indigenous knowledge and belief system." The aim of this study is to determine the prevalence of prior traditional health practitioner treatment and assess its effect on burn injury mortality.

Methods: A retrospective analysis of the prospectively collected Kamuzu Central Hospital (KCH) Burn Surveillance Registry was performed from January 2009 through July 2017. Pediatric patients (<13 years) who were injured with flame or scald burns were included in the study and we compared groups based on patient or family reported use of traditional health practitioners prior to evaluation at Kamuzu Central Hospital. We used propensity score weighted multivariate logistic regression to identify the association with mortality after visiting a traditional healer prior to hospitalization.

Results: 1689 patients were included in the study with a mean age of 3.3 years (SD 2.7) and 55.9% were male. Mean percent total body surface area of burn was 16.4% (SD 12.5%) and most burns were related to scald injuries (72.4%). 184 patients (10.9%) used traditional medicine prior to presentation. Only a delay in presentation was associated with prior traditional health practitioner use. After propensity weighted score matching, the odds ratio of mortality after using a prior traditional health practitioner was 1.91 (95% CI 1.09, 3.33).

Conclusion: The use of traditional health practitioners prior to presentation at a tertiary burn center is associated with an increased odds of mortality after burn injury. These effects may be independent of the potential harms associated with a delay in definitive care. Further work is needed to delineate strategies for integrating with local customs and building improved networks for burn care, especially in rural areas.

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1. Introduction

Burn injury is often associated with poverty. An estimated 180,000 deaths associated with burn occur annually with the vast majority occurring in low and middle-income countries (LMICs) [1,2]. Countries in sub-Saharan Africa have the highest incidence of burns per capita [2]. While the majority of the population in this region reside in rural areas, burn units, where available, are mainly located within urban health centers [3].

Historically, many indigenous communities in sub-Saharan Africa have used medicinal plants and animal-derived remedies to treat disease in the setting of limited allopathic health care resources [4]. These therapies are often administered by a local, traditional health practitioner (THP) and often have a connection to religious practice or deep cultural significance [5]. The World Health Organization defines THPs as a "a person who is recognized by the community where he or she lives as someone competent to provide health care by using plant, animal and mineral substances and other methods based on social, cultural and religious practices based on indigenous knowledge and belief system." [6] Of the one billion people living in 54 African countries, over 80% use THPs for their primary health care needs, including burn care [7].

THPs or "traditional healers" hold an esteemed position in African societies. They are often regarded as both healers of the mind and body. There is nearly one traditional healer per five hundred people in comparison to only one physician per forty thousand people in sub-Saharan Africa [8]. Given the proximity and the ease of access to a traditional healer, THPs play a significant role in the treatment of burn wounds [9].

The utilization of THPs is an important issue challenging the effective, safe, and coordinated provision of conventional medical services, particularly in rural populations [10]. A prior report from Malawi revealed approximately 40% of all patients had seen a THP prior to hospital presentation [11]. Consequently, the aim of this study is to determine the prevalence of prior traditional healer treatment and assess its effect on burn injury mortality at our center in Malawi.

2. Materials and methods

A retrospective analysis of the prospectively collected Kamuzu Central Hospital (KCH) Burn Surveillance Registry was performed from January 2009 through July 2017. KCH is a 900-bed tertiary hospital located in Lilongwe, the capital of Malawi with a catchment area of six million people. The KCH burn unit is comprised of 31 beds and staffed by a consultant plastic or general surgeon, two specialized burn clinical officers, and six burn-trained nursing staff. All patients presenting to KCH with a burn injury are captured within the registry. Pediatric patients (<13 years) who were injured with flame or scald burns were included in the study. We compared groups based on patient or family reported use of traditional health practitioners prior to evaluation at Kamuzu Central Hospital.

Univariate analysis was performed to assess to determine data distribution and missing data. Less than 10% of missing data was seen after application of the inclusion and exclusion criteria. Bivariate analysis was performed on the study population stratifying by exposure to a THP prior to admission. For normally and non-normally distributed variables, means with standard deviations and medians with interquartile ranges were used to report measures of central tendency during univariate and bivariate analysis, respectively. In bivariate analysis, χ^2 for categorical variables, Student's *T*-Test for normally distributed continuous variables, and Kruskal–Wallis for not normally distributed continuous variables were used to compare exposure distribution.

In order to minimize bias of patient characteristics and injury patterns, we used propensity score matching to better determine the role of pre-hospital treatment by a THP on mortality. The propensity score was calculated based on age, sex, percent TBSA, mechanism of burn injury, time to presentation, and whether the patient underwent surgery. We included the use of surgery due to previously published data from our center that demonstrated a strong association between the use of surgery and a decrease in burn-associated mortality [12]. The propensity score was inversed to calculate the inverse probability of treatment weight (IPTW) to balance the groups based on treatment by a THP. A logistic regression was performed using treatment by a THP as the dependent variable to confirm balance between the weighted cohorts by comparing covariates in a multivariate logistic regression model, Table 2.

To determine the impact of seeking pre-treatment from a traditional healer on mortality we performed a propensity score-weighted logistic regression. Variables included *a priori* in the model were sex, age, percent total body surface area (TBSA%) of burn, time from injury to presentation at KCH, surgery, and mechanism of burns based on bivariate analysis. All variables were included in the final model.

This analysis was performed using StataCorp v14.2, College Station, Texas. Confidence intervals are reported at 95% and alpha was set at 0.05 for this study. This study was approved by Malawi's National Health Science Research Committee and the University of North Carolina Institutional Review Boards.

3. Results

From May 2011 to July 2019, 2364 patients were recorded in the KCH Burn Surveillance Registry and 1689 met inclusion criteria. Among all patients, mean age was 3.3 years (SD 2.7) and 55.9% (n=985) were male. Mean TBSA% was 16.4% (SD 12.5%) and most burns were related to scald injuries (72.4%, n=1223) in contrast to flame burns (27.6%, n=466). Over half of patients presented within twenty-four hours of injury, but 25.7% (n=429) arrived at the burn center greater than forty-eight hours after burn. The mean length of stay in the burn unit was 20.3 days (SD 25.3) and 19.5% (n=329) of patients had surgery. Crude mortality was 15.4% (n=254).

Overall, 184 patients (10.9%) utilized THP prior to presentation. When comparing patients who utilized THP prior to arrival at our burn center to those who did not, basic demographic and burn injury details were relatively similar. This includes age, sex, TBSA%, the use of surgical intervention, the proportion of patients with a scald or flame burn, and

length of stay (Table 1). However, patients who utilized THP presented later. Almost half, 42.9% (n=78), of patients who utilized THP presented greater than 48h after burn injury compared to 23.6% (n=351) in the non-THP cohort ($p<0.001$). Only 16.5% (n=30) of patients in the THP cohort presented between 12 and 24h after burn compared to 39.5% (n=588) among those who did not utilize THP ($p<0.001$). Crude mortality was statistically similar at 18.6% (n=33) for those who used traditional medicine and 15.0% (n=221) for those who did not (p=0.2).

Using multivariate logistic regression modeling, we examined several factors that were potentially associated with the use of traditional medicine prior to presentation. Age, sex, TBSA%, type of burn (flame *vs.* scald), and the use of surgery for burn excision was not associated with the use of traditional medicine (Table 2). When using the time of 0–6h as the referent for time to presentation after injury, both presentation at 7–12h and 12–24h were inversely associated with THP utilization, suggesting patients who sought care from THPs presented later. Presentation >48h after burn injury had a positive but non-significant association with THP utilization with a OR of 1.26 (95% CI 0.75–2.10) of using THP.

We used propensity score weighted multivariate logistic regression to examine whether the utilization of THP was associated with an increased odds ratio of mortality. A comparison of included model variables after weighting revealed an adequate distribution between cohorts (Table 2). Prior to propensity weighted matching, the adjusted OR of mortality when utilizing a pre-hospital THP was 1.76 (95% CI 1.08–2.87, p=0.02). When comparing the weighted cohorts, the OR of mortality was 1.91 (95% CI 1.09–3.33, p=0.02) (Table 3).

4. Discussion

At our tertiary, urban burn center in sub-Saharan Africa, we demonstrated that the utilization of a traditional health provider prior to presentation is associated with an increased odds of burn injury-related mortality. This effect was even greater after propensity weighted analysis. We did not identify any demographic or injury-related factors associated with using a traditional healer, but did show that using a traditional healer after burn injury led to a delay in presentation.

Our findings raise important questions about the utility of traditional medicine in burn care and its effect on patient outcomes throughout the region. These data suggest the significantly increased odds of burn mortality seen in with pre-admission utilization of a THP may be attributable to delay in presentation. Previous studies have discussed this phenomenon which is especially important in rural areas where access to care is already very limited [13]. Delays in burn care are especially consequential due to increased risks of burn infection with the potential for progression to sepsis and death. An older study from Ghana showed a substantial number of burn patients seeking care weeks after injury with many developing serious burn infections [14]. Outside of Africa, data from south India showed an increased risk of mortality after only a four-hour delay to presentation [15].

There is a dearth of data on the utilization of THPs following burn injury in sub-Saharan Africa and basically no reports on the potential effects on clinical outcomes. In 2018, Outwater et al. published a mini-meta-analysis on prehospital treatment of burns in Tanzania but did not examine the use of traditional medicine [16]. Similarly, a 2017 systematic review of burn injuries in sub-Saharan Africa did not comment on traditional medicine use in burn patients [17]. There are a few small studies from the region describing the prevalence of THP use. A 2002 study from Ethiopia showed 7% of patients visited a THP prior to presentation at a burn center, similar to our patient population at 11%. In addition, 36% of patients used a potentially harmful traditional medicine before seeking treatment [18]. In 2015 in Mozambique, researchers reported two-thirds of caretakers brought pediatric burn patients to THPs before presenting to the hospital. However, they did not report the number of visits to a traditional healer nor any associations with clinical outcomes [19]. Lastly, a report from

Table 1 – Bivariate analysis comparing patients who used pre-hospital traditional medicine with those who did not.

	Traditional medicine (n=184, 10.9%)	No traditional medicine (n=1505, 89.1%)	p value
Male sex: n (%)	93 (51.1)	845 (56.2)	0.1
Age: μ (SD)	3.2 (2.7)	3.3 (2.7)	0.6
TBSA: μ (SD)	17.5 (13.0)	16.3 (12.4)	0.1
Length of stay: μ (SD)	17.6 (17.6)	20.6 (26.0)	0.1
Surgery: n (%)	43 (23.4)	286 (19.0)	0.2
Time to presentation: n (%)			
0–6h	32 (17.5)	152 (10.2)	0.003
7–12h	38 (20.9)	336 (22.6)	0.6
12–24h	30 (16.5)	588 (39.5)	<0.001
24–48h	4 (2.2)	62 (4.2)	0.2
>48h	78 (42.9)	351 (23.6)	<0.001
Mechanism of burn: n (%)			
Scald burn	138 (75.0)	1085 (72.1)	0.4
Flame burn	46 (25.0)	420 (27.9)	
Died: n (%)	33 (18.6)	221 (15.0)	0.2

Table 2 – Unweighted and propensity score weighted logistic regression predicting use of a traditional health practitioner (THP).

	Unweighted logistic regression			Weighted logistic regression		
	OR of using THP	95% CI	*p*-Value	OR of using THP	95% CI	*p*-Value
Age	0.97	0.90–1.04	0.4	1.01	0.93–1.10	0.7
Sex	1.20	0.85–1.70	0.3	1.17	0.79–1.73	0.4
Percent TBSA	1.01	1.00–1.02	0.1	1.00	0.98–1.01	1.0
Flame burn	0.69	0.44–1.08	0.1	0.94	0.54–1.62	0.8
Time to presentation						
0–6 h	Ref	***	***	Ref	***	***
7–12 h	0.50	0.28–0.90	0.02	1.02	0.56–1.86	0.9
12–24 h	0.29	0.16–0.51	<0.001	1.03	0.57–1.84	0.9
24–48 h	0.45	0.15–1.35	0.2	0.81	0.27–2.42	0.7
>48 h	1.26	0.75–2.10	0.4	1.03	0.60–1.75	0.9
Surgery	1.05	0.66–1.67	0.8	1.16	0.67–1.00	0.6

Table 3 – Unweighted and propensity score weighted logistic regression predicting mortality.

	Unweighted logistic regression			Weighted logistic regression		
	OR of mortality	95% CI	*p*-Value	OR of mortality	95% CI	*p*-Value
Traditional medicine	1.76	1.08–2.87	0.02	1.91	1.09–3.33	0.02
Age	0.89	0.82–0.95	0.001	0.82	0.75–0.91	<0.001
Sex	1.09	0.79–1.50	0.6	1.03	0.56–1.88	0.9
Percent TBSA	1.10	1.08–1.11	<0.001	1.08	1.03–1.12	0.001
Flame burn	2.46	1.66–3.64	<0.001	4.04	1.87–8.69	<0.001
Time to presentation						
0–6 h	Ref	***	***	Ref	***	***
7–12 h	0.98	0.54–1.75	0.9	1.09	0.45–2.61	0.8
12–24 h	1.28	0.75–2.17	0.4	1.94	0.75–5.01	0.2
24–48 h	1.36	0.54–3.45	0.5	3.55	1.02–12.36	0.05
>48 h	0.94	0.53–1.65	0.8	1.34	0.59–3.06	0.5
Surgery	0.35	0.21–0.57	<0.001	0.30	0.10–0.91	0.03

South Africa did not describe how many patients were using traditional healers but did note there was evidence that several commonly used cooling methods in the community such as kerosene, salt, and dung actually worsened burn injury or symptoms [20].

Outside of the potential delay, current literature offers a mixed picture on whether traditional therapies help or harm patients. Our study showed an increase in the odds of mortality associated with THP use, even when accounting for the resulting delay in treatment it causes. One possible contributor to the increased mortality seen in our burn population may be the traditional therapies utilized. It is clear some traditional practices can cause substantial pain or increase the risk of sepsis, while others may have benefits [20]. Honey for example, which is commonly used throughout sub-Saharan Africa, is beneficial to wound healing with demonstrated antimicrobial properties [21–23]. Two traditional medicines, *Callicarpa nudiflora* water extract and sweetgum oil, used in burn care in China and Turkey show promise in animal model research in their respective regions [24,25].

Our data and other published reports indicate substantial heterogeneity in the potential benefits and harms from many of these therapeutic approaches. Over the last few decades, the public health sector has struggled to balance the interplay between "traditional medicine" in African communities and the "modernization" of health care in the region. This relationship is very complex and fraught with challenging ethical dilemmas regarding balancing the needs of a community and improving traditional therapies, while not ignoring the potential benefits of a patient's proximity to a THP, nor minimizing the deep cultural connections between the community and the THP [26,27]. Regardless, the reality is that many patients living in sub-Saharan Africa seek health care from the most accessible, available, and affordable option [28]. In Malawi and many other countries in the region, this is often a local, traditional health practitioner. Public health efforts aimed at improving burn care must explore creative and innovative solutions at incorporating safe local practices, while also ensuring that patients receive safe, efficacious, and prompt treatment.

Our study is limited by its retrospective methodology and the lack of detail on the type of treatment THP used. Consequently, we are unable to comment on patients with burn injuries who were not able to reach the hospital due to critical illness or patients that received care from a THP but did not seek any more treatment at our burn center. However, we are still able to establish an important clinical relationship

between the utilization of THP and burn mortality in a pediatric cohort in Malawi using propensity matching. Our methodology should account for some of these limitations by comparing patients with similar risk factors for mortality among those who had access to our burn center. We have also demonstrated a potentially critical association with delays to definitive care. More data is needed to adequately describe how traditional healers are being used in communities to treat burns and how their therapies can negatively affect patients. A deeper understanding of these approaches is necessary to explore strategies for integrating cultural practices with the improvement of allopathic burn care in rural communities in countries like Malawi.

5. Conclusion

The use of a traditional health practitioner prior to presentation at a tertiary burn center is associated with an increased odds of mortality after pediatric burn injury. These effects may be independent of the potential harms associated with a delay in definitive care. Further work is needed to delineate strategies for integrating with local customs and building improved networks for burn care, especially in rural areas.

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Conflict of interest

The authors have no conflict of interest to disclose. The authors have no financial relationships to disclose.

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Study data were collected and managed using REDCap electronic data capture tools hosted at UNC. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads to common statistical packages; and (4) procedures for importing data from external sources.

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