



Intentional injury against children in Sub-Saharan Africa: A tertiary trauma centre experience



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ABSTRACT

Background: Intentional injuries are the result of violence. This is an important public health issue, particularly in children, and is an unaddressed problem in sub-Saharan Africa. This study sought to describe the characteristics of intentional injury, particularly physical abuse, in children presenting to our tertiary trauma centre in Lilongwe, Malawi and how they compare to children with unintentional injuries.

Methods: A retrospective analysis of children (<18 years old) with traumatic injuries presenting to Kamuzu Central Hospital (KCH) in Lilongwe, Malawi from 2009 to 2013 was performed. Children with intentional and unintentional injuries were compared with bivariate analysis and multivariate logistic regression modelling.

Results: 67,672 patients with traumatic injuries presented to KCH of which 24,365 were children. 1976 (8.1%) patients presented with intentional injury. Intentional injury patients had a higher mean age (11.1 ± 5.0 vs. 7.1 ± 4.6 , $p < 0.001$), a greater male preponderance (72.5 vs. 63.6%, $p < 0.001$), were more often injured at night (38.3 vs. 20.7%, $p < 0.001$), and alcohol was more often involved (7.8 vs. 1.0%, $p < 0.001$). Multivariate logistic regression modelling showed that increasing age, male gender, and nighttime or urban setting for injury were associated with increased odds of intentional injury. Soft tissue injuries were more common in intentional injury patients (80.5 vs. 45.4%, $p < 0.001$) and fist punches were the most common weapon (25.6%). Most patients were discharged in both groups (89.2 vs. 80.9%, $p < 0.001$) and overall mortality was lower for intentional injury patients (0.9 vs. 1.2%, $p = 0.001$). Head injury was the most common cause of death (43.8 vs. 32.2%, $p < 0.001$) in both groups.

Conclusions: Sub-Saharan African tertiary hospitals are uniquely positioned to play a pivotal role in the identification, clinical management, and alleviation of intentional injuries to children by facilitating access to social services and through prevention efforts.

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Introduction

The global burden of paediatric injury is well described, but under-reported as a public health crisis in sub-Saharan Africa [1–8]. Unfortunately, because communicable disease and nutritional problems still account for significantly higher causes of childhood mortality and morbidity in most of the developing

world, the relative importance of childhood injuries has historically been diminished. Injury mortality exceeds that of HIV, tuberculosis, and malaria combined in children five years of age and older [9] and this burden is disproportionately experienced in low- and middle-income countries (LMICs) where 95% of paediatric deaths due to injury occur [10].

Intentional injury is the result of violence, which the World Health Organisation defines as, “the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation” [11]. As much as 7–10% of childhood injuries are intentional [1,2,12], and some studies

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suggest that the incidence is even higher in low and middle-income countries [13,14]. This is important because intentional injuries are associated with many different health, family, and social consequences. For example, children in Malawi who undergo violence are more likely to experience mental distress, indulge in smoking or drug use, suffer sexually transmitted infection (STI), or engage in other self-harming behaviours [15]. Intentional injuries also resulted in the deaths of approximately 311,000 people in Africa in the year 2000, which is a rate of 60.9 deaths per 100,000 people. This figure far exceeds the intentional injury mortality rate in high-income countries of 14.4 deaths per 100,000 people and the unintentional injury mortality rates of both the WHO European and American regions at rates of 32.0 per 100,000 people [12]. Unfortunately, there is a dearth of data as to the true magnitude of childhood intentional injuries in sub-Saharan Africa.

Children in developing countries are one of the most vulnerable populations worldwide and healthcare providers have an obligation to advocate for their safety and health. Malawi, like many of the other countries in sub-Saharan Africa, is a poor country with approximately 45% of the population under the age of 14 years [16]. Given the size of this population and available data that demonstrates that violence against children is a significant issue, ascertaining the characteristics and associated epidemiology and outcomes of children utilizing available trauma services is imperative. Indeed, Malawi's Violence Against Children Survey suggests there is an under-utilisation of available services, with less than 10% of children suffering physical violence ever receiving any professional services [15]. These data will help inform policy decisions on improving trauma care and developing the associated social support services required. Therefore, we sought to describe the characteristics of paediatric intentional injury, how these injuries compare to unintentional injury, and the proportion of new trauma cases that were intentionally inflicted presenting to our tertiary trauma centre in Lilongwe, Malawi.

Methods

This study is a retrospective analysis of secondary data from the Kamuzu Central Hospital (KCH) Trauma Registry. KCH is a public 600-bed tertiary care hospital in the capital city of Lilongwe, which serves as a referral centre for approximately 5 million people in the central region of Malawi. KCH is equipped with four intensive care unit beds and four ventilators, a surgical step-down unit, and a paediatric ward. Trauma and orthopaedic surgical services are available seven days a week. Surgical consultants and Malawian general surgery registrars staff the trauma service.

The KCH Trauma Registry was established to collect patient demographic information, clinical characteristics, and outcome data of all patients presenting to the emergency department with traumatic injuries of any severity [17]. Specifically, data points utilised in this study for comparison include age, sex, date of injury, setting of injury, mechanism of injury, type and location of injury, the amount of time to presentation to the hospital, date of admission, clinical scoring systems such as the AVPU Scale, date and type of operative procedures, length of hospital stay, and outcome (discharge, abscond, or death). The AVPU scale records a patient's level of consciousness as either alert, responding to verbal stimuli, responding to pain stimuli, or unresponsive. It correlates with GCS and the United States ATLS protocol used in the primary survey [18,19].

All paediatric patients who presented to the emergency department with traumatic physical injuries over five years between January 2009 and December 2013 were included in this study. Patients 18 years old or older or patients missing a recorded age or birthdate were excluded from analysis. Intentional

paediatric injury was classified as patients suffering a traumatic injury of any severity, including superficial injuries, with a mechanism coded as "assault" or with another mechanism but coded as "intentional." Nighttime was defined as the hours between 18:00 and 06:00. Overall crude mortality was calculated using any deaths declared in casualty or in the hospital against all paediatric patients recorded in the trauma registry. In-hospital mortality used the same methodology for recording deaths but excluded any patients discharged home from casualty.

We performed bivariate analysis using Chi² tests, two-sample Student's *t*-tests, and one-way analysis of variance tests to compare variables between intentional and unintentional paediatric trauma patients. When comparing categorical variables with more than two categories, the aggregate of the remaining categories was used as the referent for comparison. The three most common mechanisms of assault were compared by median age using the Kruskal–Wallis test because age was not normally distributed. Bivariate analysis was performed to compare injury associations with mortality. Additionally, multivariate logistic regression modelling was used to examine the association between having an intentional injury and patient demographic factors and the characteristics of the injury setting. Tested variables were included based on clinical significance.

All statistical analysis was performed using Stata/SE 13.1 (Stata-Corp LP, College Station, TX). The University of North Carolina Institutional Review Board and the Malawi National Health Services Review Committee approved this study.

Results

67,672 patients with traumatic injuries presented to KCH during the study period that included 24,365 children (age < 18 years). 760 patients (1.1%) were missing a recorded age and were not included in the analysis. Mean age was 7.4 (SD ± 4.8) years with a male preponderance of 64.4%. 1976 (8.1%) paediatric patients suffered intentional injury in our study cohort.

There were significant differences in demographic and clinical characteristics between children with and without intentional injury. Children with intentional injury were more likely to be male, (72.5 vs. 63.6%, $p < 0.001$) and were significantly older (11.1 SD ± 5.0 vs. 7.1 SD ± 4.6, $p < 0.001$). Analysis of injury location comparing intentional to unintentional injuries revealed that though there are fewer intentional injuries occurring at home compared to unintentional injuries, approximately 60% of all intentional injuries occurred within the home (59.8 vs. 71.0%, $p < 0.001$). Furthermore, there was an increased preponderance of intentional injury occurring on the street (16.9 vs. 14.2%, $p = 0.001$), in public spaces (7.4 vs. 1.2%, $p < 0.001$), or at school (7.0 vs. 5.8%, $p = 0.022$). Similarly, intentional injuries occurred more often at night (38.3 vs. 20.7%, $p < 0.001$) and alcohol was more often involved (7.8 vs. 1.0%, $p < 0.001$). Intentional injuries were also more likely to occur in an urban setting (44.4 vs. 40.6%, $p = 0.001$). The most common mode of transportation to the hospital was minibus for both groups (44.8 vs. 53.3%, $p < 0.001$) but police transport was more common for intentional injury (4.2 vs. 0.7%, $p < 0.001$) (Table 1).

There were no statistically significant differences in the initial presenting AVPU scores in the emergency department between the two trauma cohorts with over 95% scoring "responds to voice" or "alert" ($p = 0.443$). The admission rate to the hospital was much lower for intentional injury victims being admitted at almost half the rate (10.0 vs. 18.0%, $p < 0.001$) but the overwhelming majority in both groups were treated and discharged from the emergency department (89.2 vs. 80.9%, $p < 0.001$) (Table 1). Overall mortality for the victims of intentional and unintentional injuries was 0.9% (18/1976) and 1.2% (263/22,389), respectively ($p = 0.001$). However, there were no statistically significant differences in-hospital

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