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Describing trauma patient characteristics and care provided at a referral hospital in Mwanza, Tanzania: a prospective crosssectional study

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Abstract

Background Over 90% of trauma deaths occur in low- and middle-income countries (LMICs). The trauma burden in Tanzania is similar to the global rate of 10% and road traffic injuries result in a 40% mortality. To understand epidemiology of trauma referrals and care we aimed to describe the patients presenting to a tertiary, referral hospital in Tanzania for trauma care, their injuries and mechanism of injury, and describe the care received.

Methods A cross-sectional study was done at the emergency department of this tertiary referral hospital in the northwestern zone of Tanzania between March – August 2023. All patients presenting to the emergency for trauma were approached and those who could consent or assent were enrolled. Data was collected on the WHO Trauma form and injury severity was calculated with Kampala trauma score II. Data was entered into Redcap and analyzed using R statistical software. Descriptive statistics and frequency tables and charts were used to present data.

Results At the Emergency department, 12% of the patients were categorized as trauma. Median age was 29 years (IQR 20–41 years) with a 79% male predominance. Most patients (78%) presented with major injuries resulting from road traffic accidents. There was high acuity, with 57% had Kampala trauma score < 6. The most prevalent injuries were musculoskeletal and skin. Most patients (84%) attended one prior hospital before being referred. Mwanza region contributed the highest to the trauma referrals (53%) and the most common intervention was intravenous canulation (98%).

Conclusions Trauma-related referrals are common in the young with the majority presenting from the Mwanza region. Most patients were referred from another health facility in line the with Tanzanian referral channel. Most patients had severe injury and amongst all IV cannulation was the most prevalent lifesaving intervention at EMD.

Keywords Trauma, Emergency Medicine, Injury, Tanzania, Low-Middle Income Country, WHO trauma form

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 Table 1
 Patient demographics

Characteristic	Statistics
Age (y)	29 [0, 98]
Age	
<5	36 (5%)
5–15	88 (12%)
16–55	513 (72%)
>55	76 (11%)
Missing	
Gender	
Male	576 (79%)
Female	143 (20%)
Missing	7 (1%)
Education	
Complete primary	235 (32%)
Complete secondary	186 (26%)
Incomplete secondary	111 (15%)
Incomplete primary	84 (12%)
None	53 (7%)
University	36 (5%)
Unknown	12 (2%)
Missing	9 (1%)
Occupation	
Peasant	194 (27%)
Student/Child	108 (15%)
Motorcyclist	77 (11%)
Business	57 (8%)
Day worker	45 (6%)
Professional	34 (5%)
Unemployed	24 (3%)
Government service	13 (2%)
Driver	7 (1%)
Missing	167 (23%)
History obtained from	
Patient	348 (48%)
Parent or Spouse	279 (38%)
Other Relative	75 (10%)
Other non-relative	10 (1%)
Missing	14 (2%)

Background

Over five million people die annually every year due to injuries, and over 90% of these deaths occur in lowand middle-income countries (LMICs) with almost 1/3 more deaths from trauma than from HIV/AIDS and malaria combined [1, 2]. Additionally, LMICs carry an excess burden of trauma occurrence due to road traffic accidents despite only having 1% of the worlds motorized fleet [2]. Trauma outcomes and mortality can be improved by establishing comprehensive trauma care systems [3]. Trauma care systems have been established in most high-income countries and they are growing in LMICs. Within these systems trauma care involves care across the injury spectrum: injury prevention, pre-hospital care, emergency department and inpatient care as well as any necessary rehabilitation services [1, 4]. The trauma burden is estimated to make up approximately 10% of patients seeking acute care [3] with 25% occurring in pediatric patients [5]. Trauma, and road traffic injuries pose a significant public health problem in the country. Fatality from road traffic injuries is three times higher in Africa as compared to Europe [6]. In Tanzania, road traffic accidents contribute to almost half of injuries and account for 60% of injury fatality [7] and case fatality rates of 10–17% [8, 9]. Despite his high trauma burden in Tanzania, the healthcare system is ill-equipped to handle trauma cases, and this increases the risk of death and disability [10]. Most district and regional hospitals can handle minor to moderate trauma with equipment and human resource present at that level.

Most trauma data from Tanzania originates from the Dar-Es-salaam and Moshi regions. Patterns and causes of injuries vary, but road traffic injuries are the most common cause of injuries among adult trauma patients (40-60%), with median ages ranging between 20 and 30 years [1, 11, 12]. The most frequent reasons for admission of all trauma patients were fractures requiring orthopedic intervention or head injuries requiring neurosurgical interventions [13]. The "golden hour" is a common concept in trauma literature known to many regarding the importance of care within one hour of trauma. Healthcare providers have the best opportunity to try and reverse the detrimental effects of trauma in the first sixty minutes after the patient has sustained injury and before receiving definitive care. This framework may not be implementable in some LMICs, Tanzania included, due to inadequate road infrastructure, significant distances between injury sites and hospitals, lack of pre-hospital emergency medical services (EMS) and trauma care specialists primarily posted to the secondary and tertiary referral centers and not those who see the trauma in its initial phases [14]. Furthermore, Tanzania's health care system follows a referral system necessitating a patient to go through a series of healthcare facilities which keeps on referring the patient to higher centers if they are unable the treat the injury [15]. This system works as a double edge in the sense that lower facilities could act as site for stabilizing a severely injured patient prior to referral or prevent them reaching to a tertiary hospital expeditiously. The practice of emergency care in Tanzania has evolved over the last decade [10, 16]. This has led to significant improvements in-hospital mortality with the evolution of emergency departments [17]. The expected process of trauma care in an EMD in this setting should generally follow World Health Organization (WHO) and Advanced Trauma Life Support (ATLS) guidelines with appropriate triage

category assignments, completion of primary and secondary patient evaluation surveys, and documentation of interventions and dispositions.

The development and enhancement of trauma care as well as the prevention of traumatic injuries depends highly on trauma data. In many countries, trauma data registries are an essential component of the trauma care infrastructure by providing standard methods of documenting and collecting trauma information and using this data to target interventions to observed patterns. Many LMIC do not have trauma registries and for those that have such registries, many have been short term or project-limited, and few link to multiple institutions [18]. Most EDs in Tanzania have limited capacity to provide emergency care and therefore without understanding the demographics or trauma patients of care received, it can be challenging to know what to target to improve capacity [19].

Bugando Medical Centre (BMC) is a zonal and tertiary referral hospital in the Mwanza region of Tanzania. In the pyramid of referral, it is designated as a Zonal referral hospital, serving the northern and western zone of the country with a catchment population of 20 million people which is a third of the country's population. The Emergency Department (ED) at BMC serves about 36,000 patients annually and as the ED capacity continues to improve, it is imperative to understand the profile of trauma patients seeking care at the hospital. At this time, Bugando Medical Centre does not have a standard process for evaluation and documentation of trauma patients. Patient information is recorded in a general electronic medical record (EMR) without any internal feedback on care or trends. There are also no prompts in the EMR for trauma evaluation.

The World Health Organization (WHO) trauma form is used in many countries as a standardized form for patient care and data collection. A pilot trauma registry was implemented in 5 Tanzanian regions by the different stages of ED development in that region. The trauma registry served as both a patient chart as well as a data collection tool. Data capture was seen to be significantly improved with the introduction of the standardized trauma form [20].

This study goal is to utilize the standardized WHO trauma form on all patients presenting to the ED for trauma care, to better understand the patient population and current care at a tertiary level hospital with the ultimate goal of identifying areas of focus for future efforts.

Study aims

The primary aims of this study were to:

- Describe the characteristics of trauma patients presenting to the emergency medicine department (EMD)at Bugando Medical Center in Mwanza, Tanzania and the location and types of injuries occurring over a 6-month period.
- 2. To describe the basic components of trauma care in this referral hospital in Tanzania; how trauma patients present to the EMD, initial trauma survey findings, the diagnostic and therapeutic interventions received, and dispositions recorded to identify key areas for future training and intervention.

Methods

Study details

The study setting was at the Emergency Medicine Department (EMD at Bugando Medical Center in Mwanza, Tanzania. In 2017, under the EM trained leadership of the department, a major rehabilitation and equipping process was undertaken in the EMD as a priority endeavor by hospital administration. The basic capacities include bedside diagnostics – such as rapid malaria tests, urine tests, blood gas analysis, point of care ultrasound (POCUS) and ECG; patient monitoring facilities with basic patient monitors and ventilatory capacity with 2 ventilators in the department.

The study design was a cross-sectional study carried out for a 6-month period between March and August 2023. We enrolled all patients designated as trauma patients in the EMD, with exclusion criteria of those with injuries>5 days old (to ensure capturing the initial injury and not delayed injury complications), inability to consent, failure of nearest relative or next of kin to provide consent or failure to assent for children.

Two research assistants (RAs) were recruited from the EMD and were responsible for recruiting patients and collecting the required data. We trained the RAs on the WHO Trauma Form [21] as well as the process of filling it and the transfer of data into RedCap using tablets. Additionally, Kampala trauma score II was calculated and used to grade the severity trauma amongst the patients presenting to EMD. Data was first collected on coded paper forms and then entered into RedCap. The RAs approached each patient designated by providers as trauma and obtained consent from the patient, parent, or nearest relative. If a patient arrived outside of the time the RAs were present in the EMD, identification of such patient was done from the EMD patient register and then they were approached to participate in the study during their hospitalization and their data was extracted from the electronic medical record.

 Table 2
 Prehospital information

Characteristic	Statistics
Region	
Mwanza	388 (53%)
Mara	76 (10%)
Geita	61 (8%)
Simiyu	55 (8%)
Shinyanga	43 (6%)
Kagera	30 (4%)
Tabora	28 (4%)
Kigoma	17 (2%)
Katavi	13 (2%)
Dar-es-Salaam	6 (1%)
Njombe	1 (0%)
Ruvuma	1 (0%)
Singida	1 (0%)
Missing	6 (1%)
District in Mwanza (N=388)	
Nyamagana	145 (37%)
llemela	120 (31%)
Kwimba	35 (9%)
Magu	31 (8%)
Misungwi	22 (6%)
Sengerema	19 (5%)
Ukerewe	8 (2%)
Buchosa	6 (2%)
Missing	2 (1%)
Place of Injury	
Road Traffic Accidents	385 (53%)
Home	124 (17%)
Work	43 (6%)
Farm	11 (2%)
School	2 (0%)
Other	71 (10%)
Mechanism of Injury	
RTA	383 (53%)
Fall	89 (12%)
Assault	67 (9%)
Blunt force trauma	44 (6%)
Other	34 (5%)
Penetrating trauma	28 (4%)
Burn	11 (2%)
Number of Prior facilities	
0	107 (15%)
1	608 (84%)
2	2 (0%)
Missing	9 (1%)
Arrival mode	
Ambulance	607 (84%)
Car/truck	101 (14%)
Motorized 2/3 wheeler	5 (1%)
Public transport	5 (1%)
Other .	1 (0%)
Missing	7 (1%)
Prehospital care	

The data variables collected on the WHO form include some free text descriptions and some checklist variables predetermined in the WHO form. To understand body systems involved and interventions done, checkboxes were present to describe normal versus abnormal and a list of common predetermined facets of history and common trauma interventions and assessments. Prior to utilizing this data collection tool at BMC, all trauma patient data was collected via free text format without clear delineations for the standard expected trauma evaluation of primary and secondary surveys as well as ensuring that deficits in these surveys result in expected interventions.

Data collection and transcription was with an intermittent review of RedCap by study leadership and RAs reviewed medical records as needed. For the free text variables, descriptive categorical variables were developed from free text.

Data cleaning was performed by project leadership. We calculated descriptive statistics for study variables using the open-source R software environment (R Core Team. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/).

Results

During the study period, there were a total of 6423 patients seen in the EMD, not including those patients seen in the non-acute area. There were 760 patients seen in the resuscitation area and classified as trauma patients. Data from 726 patients was eligible for analysis.

The median age of patients was 29 (IQR = [20, 41]) with 79% male patients and approximately a quarter (27%) of patients had the employment description of 'peasant.' Approximately half (48%) of patients provided their own history, with the remainder mostly coming from relatives. Most were not on medications or reported any past medical history. (Table 1) Trauma patients were predominantly referrals, with 84% of patients coming from at least 1 prior facility. The most common mode of arrival was via ambulance (Table 2). Patients mostly arrived in the later portions of the day and overnight, between 2:00pm and 12:00am, though they were mostly steady throughout the day (Fig. 1).

Most injuries occurred on the roads (53%), with the second most common injury location as home (17%). Over half of the injuries were due to road traffic accidents (53%), followed by falls 1(12%), assault (9%), then other blunt force trauma (6%) and penetrating trauma (4%) (Table 2).

The WHO trauma form categories injury based on the body system involved. The most common body system involved was musculoskeletal (54%), followed by skin (46%), head, eyes, ears nose, throat (42%), and then neuro (20%). Most patients had one reported serious injury (78%) and 21% of patients were determined to have 2 or more serious injuries and the calculated (Table 3). Kampala Trauma Score tended to be high, i.e. milder injury (Fig. 2).

A minority (27%) of patients were treated with intravenous fluids and 46% received non-opioid analgesia, 39% received antibiotics, and only 3% received blood products. Over half (66%) of patients had a hemoglobin checked and 93% had a glucose checked. Many patients had imaging done, with a FAST ultrasound exam as the most common (61%), then X-ray (60%), and CT (38%). Procedures were not well documented in this form or not performed with 98% reported having IV access, but </2% with other procedures such as chest tubes, intubation, laceration repair or other (Table 4). Most patients (98%) were admitted to the wards for continued care and only 1 patient in this cohort died.

Discussion

This patient population was primarily male, young, presented after road traffic accidents and they were most likely to present with a one or two serious injuries which was expected. Interestingly, less than half of patients were reportedly fully exposed during their EMD evaluation – which is standard care for trauma

Table 2 (continued)

Characteristic	Statistics
Professional	524 (72%)
Layperson	72 (10%)
None	38 (5%)
Not documented	126 (17%)
Triage Category	
Red	415 (57%)
Yellow	302 (42%)
Green	2 (0%)
Black (dead on arrival)	1 (0%)
Missing	6 (1%)





Arrival Time Distribution By Triage Category

Fig. 1 Distribution of ages and arrivals

evaluations, less than half received intravenous fluids, and few procedures were documented. Further exploration will be required to better understand if these findings represent gaps in care versus gaps in documentation. Additionally, based on the KTS, it would suggest that these patients represent a more critically ill population, – suggesting a skewed or pre-selected population and as opposed to what is most known about trauma mortality in LMICs, this population, at a referral center had almost no mortality – though this dataset does not include any inpatient statistics. Most patients had been to at least one prior facility and came by ambulance, which was also an unusual finding. We hypothesize that the low mortality and unexpectedly low frequency of EMD procedures or treatments may reflect this selected referral population who may have

had prior stabilization interventions and further study is necessary to understand trauma care received at prior institutions. Patients were likely to receive medical imaging of various modalities, and specifically the

Missing

use of the FAST exam may represent prior trainings done on this in the EMD.

11 (2%)

We also hypothesize that this population may represent one that has been referred for specialty care, but did not collect information on specialty consultations

Characteristics	Statistic
Number of serious injuries	
0	5 (1%)
1	560 (78%)
2	153 (21%)
Missing	8 (1%)
Airway abnormality	18 (2%)
Missing	9 (1%)
Cervical spine stabilization	
Done	12 (2%)
Not needed	575 (79%)
Not documented	139 (19%)
Circulation	
Normal	565 (78%)
Abnormal	159 (22%)
Not documented	2 (0%)
Bleeding Present	75 (10%)
Missing	11 (2%)
Disability Level	
Responsive - A	478 (66%)
Responsive - V	12 (2%)
Responsive - P	70 (10%)
Responsive - U	23 (3%)
GCS	15 [3, 15]
Missing	13 (2%)
Patient Exposed Completely	290 (40%)
Missing	18 (2%)
Body System Involvement in Injury	
Neuro/Psych Abnormality Present	143 (20%)
Missing	15 (2%)
HEENT Abnormality Present	302 (42%)
Missing	15 (2%)
Neck Abnormality Present	28 (4%)
Missing	8 (1%)
Respiratory Abnormality Present	50 (7%)
Missing	7 (1%)
Cardiac Abnormality Present	5 (1%)
Missing	10 (1%)
Abdominal Abnormality Present	17 (2%)
Missing	8 (1%)
Pelvis Abnormality Present	51 (7%)
Missing	8 (1%)
GU/Rectal Abnormality Present	8 (1%)
Missing	8 (1%)
Musculoskeletal Abnormality Present	395 (54%)
Missing	13 (2%)
Skin Abnormality Present	336 (46%)

 Table 3
 Clinical information





Fig. 2 Kampala trauma scores

or inpatient procedures and surgeries – so future studies must better characterize this. Additionally, as only patients able to consent, assent, or have a nearest relative consent were included in this study, any patients too ill or unable to consent were necessarily excluded from this study, missing a small but potentially important subset of trauma patients.

The findings in this study are highly relevant to the international context as they describe the patient and injury types as well as care provided at a regional referral hospital in western Tanzania which adds to the continued understanding of trauma care in Tanzania. By understanding the patients seen and care received at this institution, this information can be used to ensure those caring for patients are familiar with types of injuries most frequently seen.

Conclusions

Trauma accounts for a significant burden of disease for patients seen in LMICs and globally and it is important to build the body of literature describing current practices and to ultimately link trauma data across regions and nations. Understanding current trends in trauma presentation, care, and disposition at a hospital level is key to implementing any quality improvement efforts. Many hospitals in Tanzania and similar settings have trauma registries to start these efforts, although these are often from differently resourced settings such as national referral hospitals. This study provides a unique example of findings from a regional referral institution which is a lower level of care than a national hospital.

Based on the information collected, there are several areas that may warrant further exploration. For example, the EMD can scale up staff at its busiest times (1400p - 1200a), emphasize provider training on musculoskeletal, skin, neuro, and HEENT injuries, which were most commonly seen, as well as ensuring full exposure in assessment of all trauma patients which was not documented in these patients; and because most patients initially received care elsewhere any future interventions must include training for referral centers. As a zonal teaching and referral hospital, BMC must closely interact with all referral health centers who are involved with the initial phases of trauma care. While the EMD-recorded outcomes for this particular patient cohort (low mortality), and this ED is staffed by EM-trained clinicians - if we wish to target overall morbidity and mortality for trauma in Tanzania, we must be engaged with all of the referring institutions to improve overall trauma care in the region. This study is limited by the data collected in the WHO Trauma Form and data was not collected on surgical interventions or outcomes following admission. It may be prudent going forward to incentivize institutions to collect standard trauma data through a policy or institutional intervention, rather than voluntarily at this time.

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Table 4 Care provided at the hospital

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Author contributions

SS, VK and CF prepared the primary manuscript as well as provided edits, commentary, and data collection oversight, CU and RY did the data collection, and DL performed the primary data analysis.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee at the National Institute for Medical Research in Tanzania, the Catholic University of Health and Allied Sciences CUHAS/BMC Research Ethics and Review Committee (CREC), and the Northwestern University Institutional Review Board in Chicago, IL, USA. The authors certify that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Written informed consent was obtained from all participants and/or from a parent/guardian.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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