

Head trauma: A significant public health concern among young men in Botswana. Etiology referral patterns and opportunities for interventions

Megan Cox,¹ Timothy Becker,² Mpapho Motsumi³

¹Department of Emergency Medicine, Faculty of Medicine, University of Botswana, Gaborone, Botswana;

²Perelman School of Medicine, University of Pennsylvania, USA;

³Department of Surgery, Faculty of Medicine, University of Botswana, Gaborone, Botswana

Abstract

This study aims to present and discuss acute Head Injury (HI) presentations including etiology, referral patterns and disposition in patients presenting to a major referral hospital in Gaborone, Botswana. Cross-sectional, retrospective data collection from July 2015 through September 2015 extracted descriptions of patient demographics, mechanism of injury, comorbidities, diagnosis and disposition from Emergency Centre (EC) records. 360 HI patients presented in three months, averaging four per day and increasing on weekends and end of the month. HI disproportionately impacted young adult males, with motor vehicle accidents accounting for 38%, violence implicated in 39% and 80% recorded as blunt trauma. HIV status was unknown for 84% of patients at the time of presentation and 10% of patients were recorded as HIV positive. Patients referred from external hospitals had a higher admission rate. HI in young males is a significant trauma burden in this hospital, similar to the known regional trauma patterns. More studies regarding trauma, alcohol, and violence related to paydays should be considered to investigate and reduce the burden of HI in Botswana.

Introduction

Trauma has emerged as one of the greatest public health challenges of the early 21st century. An estimated 5.8 million people die annually from injuries, more than from malaria, tuberculosis, and HIV/AIDS combined.^{1,2} Traumatic Brain Injury (TBI) is the most common cause of death and disability in trauma, especially in young adults. The incidence of TBI in Sub-

Saharan Africa is 150-170 per 100,000 compared to the global average of 106 per 100,000.³

Trauma victims in low- and middle-income countries (LMIC) suffer greater morbidity and mortality than their counterparts in high-income countries, thus highlighting trauma surveillance and care improvement as a potentially powerful means to reduce global health disparities.^{4,5} Although the impact of trauma has been widely acknowledged, few studies have described the prevalence and etiology of trauma in developing regions.^{4,6} Since causes and outcomes of trauma vary considerably among countries, local data is critical to developing effective treatment and prevention strategies. Increased urbanization and motor vehicle use partly underlie the rise of traumatic burden in the developing world. The burden of motor vehicle accidents (MVAs) tends to increase with development in LMICs, uniquely placing countries with recognized rapid development, such as Botswana, at greater risk.⁷ Little research exists regarding the trauma burden in Botswana, an upper middle income country in Southern Africa.

Princess Marina Hospital (PMH), located in Gaborone, the capital and largest city in Botswana, with a population greater than 230,000 serves as the main teaching and referral hospital for the country and is the primary and district referral hospital for local residents.⁸ A study of presentations to the PMH EC in 2011 found that trauma accounted for 22.3 percent of all patient encounters, trailing only infections (25.6%), and vastly surpassing obstetric and gynecologic conditions (12.9%), non-communicable diseases (12.6%), and GI disorders (8.4%).⁹ However this 2011 study did not assess etiologies of trauma presentations, and there is no current trauma registry at PMH. HI is a known significant worldwide trauma burden so it was chosen to be studied to better characterize and describe demographics, referral patterns, aetiologies, diagnosis, co-morbidities and disposition of trauma patients presenting to PMH.

Study Site

Data was collected retrospectively on all patients with HI who presented to the PMH EC from July 1, 2015 through September 30, 2015. PMH is a 567-bed facility with a 24-hour EC and all medical, paediatric, obstetric, and surgical specialties including a mixed (adult and children) 8-bed ICU. PMH is one of only two public facilities in the country to offer CT scanning services, so trauma patients from much of the country are referred to PMH for further evaluation.

Correspondence: Megan Cox, Emergency Department, Faculty of Medicine, Private bag 00713, University of Botswana, Gaborone, Botswana.
Tel.: +26776574766.
E-mail: Mcox2050@gmail.com

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Materials and Methods

A database (Microsoft Access 2010) was setup on a computer in the EC at the beginning of July 2015 and was used to extract relevant information from EC patient records. Data was entered into the database by a research assistant, a limited number of doctors working in the EC, and an Emergency Medicine (EM) specialist. Several training meetings were held for all study members involved with data entry.

Information was collected directly from the PMH triage sheet and PMH EC records describing patient demographics (*e.g.*, age, sex, geographical location), presentation (*e.g.*, method of presentation to EC, time of injury), mechanism of injury, referring institution, disposition and co-morbidities. Physician descriptions of the nature of specific injuries written on EC records were coded according to WHO International Classification of External Causes of Injury (ICECI) categories on four axes, intent, mechanism, object producing injury, and alcohol use, at time of data entry.¹⁰ Co-morbidities (hypertension, diabetes, pregnancy, psychiatric conditions, and HIV status) and the EC diagnosis relevant to HI were noted from the EC record, along with the patient's

destination and discharge disposition from EC. Diagnosis was based only on the treating doctors' notes written in the EC record.

Participants

Triage forms for all patients who presented to the EC during the study period were reviewed. Patients presenting with any injury to the head were included. Patients who were *brought in dead* were excluded. Ethics committees at the University of Botswana, University of Pennsylvania, Princess Marina Hospital, and Botswana Ministry of Health approved study procedures.

Results

Demographics

During the study period, 360 patients were identified as presenting with HI. HI patients included 247 (68.6%) males and 113 (31.3%) females. Patients had a mean age of 29.4 (SD=16.1, range 1 to 90) and median age of 29.5. In our setting, patients over the age of 13 years are admitted to adult wards, therefore 299 (83.1%) were listed as adults, 57 (15.8%) were paediatric patients, and 4 patients had missing age data. Eighty percent (80%) of patients presenting with HI were younger than 40 years.

Etiology

The majority of HI was documented as unintentional or accidental in origin (59%), but HI attributable to assault constituted 39% of the total presentations. Table 1 displays the classification of injury causes.

MVAs accounted for 136 (65%) of unintentional HI, followed by falling, jumping, or being pushed 52 (24.8%), and other blunt forces 20 (9.5%). Blunt force, including rods, bottles, and stones, was the primary mechanism of head trauma due to assault 85 (59.9%), followed by other penetrating forces 21 (14.8%), and cuts and stabblings 10 (7.0%). Males outnumbered females in all causes of injury. Figure 1 shows the injury intent stratified by age.

Comorbidities

The EC record indicated the HIV status as unknown (or undocumented) in 84% of the HI presentations; 10% of patients were HIV positive and 6% were believed to be negative. Alcohol involvement in HI patients was poorly documented with 278 patients (77.2%) having no information about alcohol recorded in their EC record and only 37 patient records (10.3%) implicated alcohol in the event. 16 EC presentations specifically recorded no suspicion of alcohol use. EC records were noted to have

poor documentation concerning other comorbidities.

Referral patterns

Patients presented to PMH EC from throughout Botswana for management of HI (Figure 2), with origin recorded for 318 of 360 (88.3%) of patients. Of those with

known geographical origin, 69.5% presented to PMH EC from within 40km of Gaborone. The farthest patient origin was from a health facility (Gumare) over 1000km from PMH. Patients were referred from various other care settings, most commonly transfers from other public (district

Table 1. Mechanisms of head injuries.

	Unintentional	Assault	Unknown	Total	Percentage of total
MVA overall	137	1		138	38.3%
<i>MVA stratification:</i>					
<i>occupant</i>	55			55	15.3%
<i>pedestrian</i>	40	1		41	11.4%
<i>unspecified</i>	42			42	11.7%
Other transportation	1			1	0.3%
Falling, jumping, or pushed	52	2		54	15.0%
Other specified or unspecified blunt	20	85	2	107	29.7%
Shot by firearm	0	0	1	1	0.3%
Cut or stabbed	0	10		10	2.8%
Other penetrating force	0	21		21	5.8%
Other	0	2		2	0.6%
Unspecified	0	21	5	26	7.2%
	210	142	8	360	

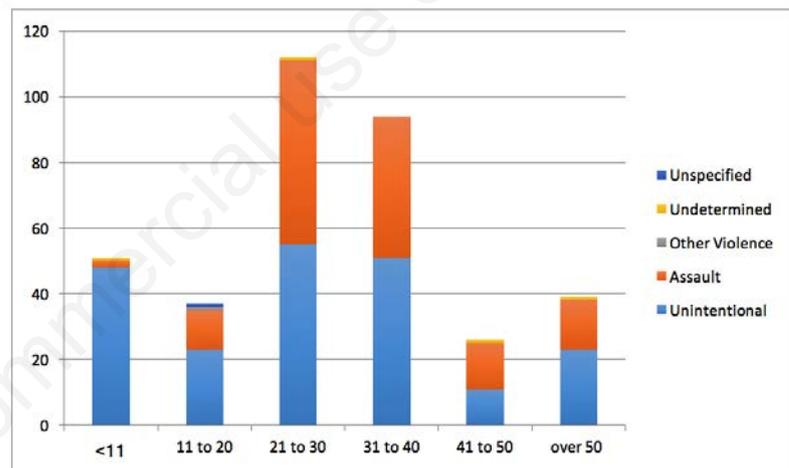


Figure 1. HI intent of injury by age.

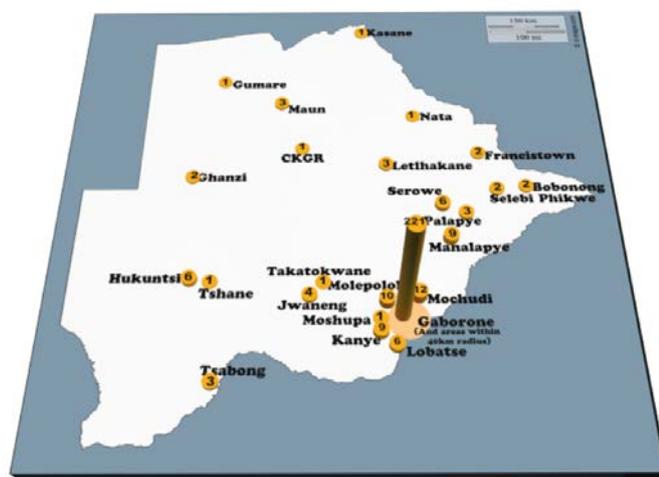


Figure 2. Geographic representation of counts of patients from different regions of the country.

or primary) hospital facilities (36.1%), followed by referrals from local Gaborone clinics (33.1%), EMS from site of injury (14.4%), and patient self-referrals (12.5%).

HI presented to the EC more frequently on the weekend days (Figure 3).

Wages are paid once a month in Botswana and usually at the end of the month. This period after pay day referred to as *month end*, anecdotally is known in the EC for increased presentations of trauma. Looking at the data, this period was defined by the authors as the last 6 days of one month and the first day of the next month. At this month end period there was an average of 4.75 injuries per day, whereas at other times it was 3.3 injuries per day; but these figures were not statistically significant.

Disposition

Overall 197 (55%) of the 360 HI patients were discharged from the EC and 96 (27%) were admitted to an inpatient ward, 33 (9%) transferred to external hospitals, 11 (3%) sent to PMH operation theatre, and 10 (3%) admitted to PMH ICU. Table 2 shows the disposition of patients stratified by sex.

Of the 197 discharged patients, 168 (85%) were referred to PMH EC from within a 100km radius. The disposition of the patient varied depending on the patient's referral pattern with 85% of self-referred patients and 74% referrals from local Gaborone clinics discharged directly home from the EC. Patients transported by the EMS were discharged home 70% of the time however patients transferred from other hospitals were most likely to be admitted. Only 30 of these 102 transferred patients (29.4%) were discharged, while the remaining 72 were admitted to medical or surgical ward (60, 58.8%), ICU (6, 5.9%) or operating theater (5, 4.9%)

Discussion

Assessment of results and Implications

This is the first study from Botswana reporting etiology, referral patterns and disposition of acute head injuries. The findings are similar to the worldwide and SSA burden of HI with head trauma disproportionately affecting young adult males. The majority of head trauma was unintentional, with MVAs the most common cause but assaults, most frequently by blunt force was the most common single cause. Men were more likely to be admitted and undergo surgical interventions than women, suggesting more severe injuries.

Local acute trauma data to compare with is scarce; but a recent study of spinal injuries in Botswana reported the most common spinal injury aetiology was MVA; especially in the 31-45 years age group and assault was the second.¹¹ A recent study from Botswana also showed that the country's significant positive economic growth was associated with an increased number of

vehicles per 1000 population and increased MVA fatalities.⁷

Alcohol was only implicated in this study as contributing to 10% of HI, but was not widely documented in the PMH EC record. Alcohol is a known risk factor for MVAs and violence, and thus TBI, especially in LMICs.¹² Trauma surveillance data from a major trauma hospital in neighboring South Africa recently reported over 80% of emergency patients with intentional injuries were under the influence of alcohol or other intoxicating substances.¹³ Significant reductions in traffic accidents were seen after an increased alcohol levy in Botswana,¹⁴ but there is currently no mandatory alcohol testing of traffic related presentations to health centres in Botswana.

The primary mechanism of HI was assault at 60%, in young males, with injury presentations increasing in the week around payday. Despite this result not being statistically significant in this small study, this effect has been noted in other LMICs. A recent study in Guatemala found a cyclic time trend in violence related deaths and

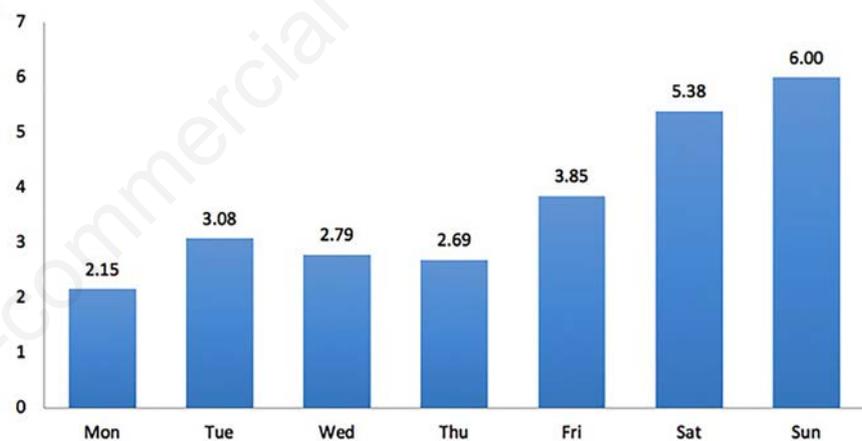


Figure 3. Average frequency of head injuries by day of the week.

Table 2. Disposition by sex.

	Men		Women		Total	
	Frequency	% of men	Frequency	% of women	Frequency	% of total
Admit to ICU	9	3.70	1	0.85	10	2.8
Admit to Ward	76	31.28	20	17.09	96	26.7
Admit to Operating Theater	9	3.70	2	1.71	11	3.1
Discharge home	120	49.38	77	65.81	197	54.7
Died in EC	1	0.41	0	0.0	1	0.3
Left without being seen	1	0.41	0	0.0	1	0.3
Self-discharge AMA	4	1.65	0	0.0	4	1.1
Transfer to external hospital	21	8.64	12	10.26	33	9.2
Unknown	2	0.82	5	4.27	7	1.9
	243		117		360	

paydays coinciding with public holidays.¹⁵ In Reunion Island a similar trend was found for alcohol related violence.¹⁶

Over two thirds of HI patients were referred to PMH EC from local clinics or other hospitals, and almost two thirds of these external hospital referrals required admission. Local HI referrals, especially if self-referred or sent from clinics were discharged home over 70% of the time. In a vast, sparsely populated country such as Botswana, referral and transport of patients presents an ongoing health systems challenge. PMH referral patterns are complex as it currently serves as a primary, district hospital for Gaborone and major referral hospital for Botswana. These findings however, indicate that a high percentage of patients referred to PMH from an external hospital with a HI were correctly referred. The data also indicates that local clinics and EMS may benefit from more education on the management and referral needs of HI patients. National referral guidelines for HI are required to aim for a consistent standard of clinical care regardless of where the injury occurs; a National trauma registry is currently being proposed which would lead to further opportunities for referral studies.

Limitations

Our HI statistics only utilize hospital data, so often assault-related minor injuries are not referred or do not present to hospitals and so the number of HI from assaults can be underreported. Additionally the aetiology and demographic statistics in our study may be impacted by not including patients “brought in dead” or regional forensic data. This was a retrospective study of acute HI presentations and so further studies are required to follow patients longitudinally through hospital course and confirm discharge diagnosis, complications, and long-term morbidity.

Future research

Botswana, a landlocked upper middle-income country in Sub-Saharan Africa, provides an example of a middle-income country with tremendous opportunities to improve trauma care. Botswana has not yet developed centralized trauma services and has little epidemiological trauma data. Studies from South Africa, Botswana's largest neighbor, have documented a high incidence of assault related violence.^{3,17} This study shows an almost equal proportion of HI from MVAs and assaults so further epidemiologic studies on HI and all trauma aetiology in Botswana would be beneficial to assist public health education, policy and resources.

Alcohol use is known to be the highest

among young men worldwide, and this study highlights they are the main demographic impacted by injury here. More research on alcohol use in trauma and other risk factor profiles are required to better understand the impact of these issues on injury presentations in Botswana. Further studies regarding this and any link with pay day could also inform public health prevention campaigns, policy and appropriate hospital staffing patterns.

Young males continue to be overrepresented in this growing public health burden of HI trauma with long term financial and health implications. There is growing evidence about the long-term impact and significance of even minor head injuries. Individual responses to TBI, including minor TBI, vary considerably and some patients continue to experience neuropsychological sequelae for months or years following injury. In the immediate post-injury period, *post concussive syndrome* symptoms, including headaches, fatigue, dizziness, irritability, depressed mood, aggression, insomnia and cognitive processing speed reduction, can impair occupational functioning and strain interpersonal relationships. In the long-term, head trauma has been implicated in initiating or accelerating neurodegenerative processes, leading to motor and neuropsychological deterioration.^{18,19} Given the demographic findings, that head trauma predominantly affects young adult men, in their most productive working years, prevention of head injuries could have a significant economic and social impact.

Conclusions

This first study of acute HI in a major hospital in Botswana supports continued and expanded trauma surveillance to improve trauma knowledge, management and public health related initiatives for Head Injuries and subsequently all trauma related presentations in Botswana.

It is hoped that will assist in improving trauma surveillance, diagnostic and management strategies as well as inform public health specialists in preventative strategies and policies in trauma for Botswana and other LMICs.

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