

ORIGINAL ARTICLE

Citywide trauma experience in Kampala, Uganda: a call for intervention

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Objectives: To describe injuries and their emergency care at five city hospitals.

Setting: Data were collected between January and December 1998 from casualty departments of the five largest hospitals of Kampala city, Uganda, with bed capacity ranging from 60 to 1200.

Methods: Registry forms were completed on trauma patients. All patients with injuries were eligible. Outcome at two weeks was determined for admitted patients.

Results: Of the 4359 injury patients, 73% were males. Their mean age was 24.2 years, range 0.1–89, and a 5–95 centile of 5–50 years. Patients with injuries were 7% of all patients seen. Traffic crashes caused 50% of injuries, and were the leading cause for patients ≥ 10 years. Fifty eight per cent of injuries occurred on the road, 29% at home, and 4% in a public building. Falls, assaults, and burns were the main causes in homes. Fourteen per cent of injuries were intentional. Injuries were severe in 24% as determined with the Kampala trauma score. One third of patients were admitted; two thirds arrived at the hospital within 30 minutes of injury, and 92% were attended within 20 minutes of arrival.

Conclusions: Injuries in Kampala are an important public health problem, predominantly in young adult males, mostly due to traffic. The majority of injuries are unintentional. Hospital response is rapid, but the majority of injuries are minor. Without pre-hospital care, it is likely that patients with serious injuries die before they access care. Preventive measures and a pre-hospital emergency service are urgently needed.

Injury is a significant cause of morbidity and mortality in developing countries.^{1–5} The most common causes of mortality among children less than 5 years in developing countries are communicable diseases. In the older age groups, however, non-communicable diseases are increasing, with injury accounting for 13% of mortality in Africa.³ In a South African study, injury was the commonest cause of death in those aged 5–14 years.⁶ Sources of injury data in Uganda include police, postmortem examination, and hospital discharge data; in a few hospitals the *International Classification of Diseases*, 10th edition (ICD-10) is used. Police records include mostly intentional and road traffic injuries, but miss many unintentional and domestic injuries. Community surveys give a more complete picture, but the estimates of severity are imprecise, and information on clinical care is lacking.⁷ Hospital trauma registries are a vital source of information on the pattern of injuries and quality of clinical care. However, such registries include only those who access care, and the catchment area of any single hospital is not population based.

Uganda's capital city Kampala is served by five major hospitals, several health centers, and private clinics. The five hospitals are Mulago, Nsambya, Rubaga, Mengo, and Kibuli. Mulago is a tertiary level 1200 bed teaching hospital; it has a 24 hour casualty department, and the only specialized neuro-surgical care in the city. The other hospitals are smaller mission aided hospitals with bed capacity ranging from 60 to 500 beds. They use outpatient departments for casualty services during the day, and emergencies are admitted directly to the wards at night. Each hospital has at least one full time surgeon. Uganda has no systematic pre-hospital emergency care, and patients with severe injuries are brought in by bystanders, relatives, or the police.⁸

We present results of analysis of registry data from the five hospitals, collected between 1 January and 31 December 1998. The objective was to describe the pattern of injuries seen in major hospitals in Kampala district. We also assessed the hospitals' response to traumatic emergencies.

METHODS

A one page registry form, described elsewhere,^{8,9} was completed in the casualty department for each patient by nurses, clinical officers, or doctors trained in hospital injury surveillance.^{8,9} Demographics, causes of injury, severity, and outcome were recorded. The patient status and outcome at two weeks were recorded by records clerks. At each hospital a surgeon, or senior doctor, checked the registry for accuracy and completeness.

Classifications of external causes of injuries were derived from the ICD-10, with the exception of "blunt injuries" and "cuts/stabs", which for simplicity were based on mechanism. Data from the registries were managed and quality controlled at the Injury Control Center–Uganda. Injury severity was determined using the Kampala trauma score (KTS) whose validity and reliability for use in both adults and children was described elsewhere.⁸ This scoring system, which has been shown to perform as well as the injury severity score and revised trauma score, includes all the elements of the trauma score and injury severity score (TRISS),¹⁰ but is simplified so that it can be determined in outpatient settings of hospitals with limited resources. Severe injury consisted of a KTS < 11 , moderate injury 11–13, and mild injury 14–16.

RESULTS

A total of 4515 patients were registered between January and December 1998; 156 were excluded from analysis because of incomplete data on the injury or outcome. Results are based on the remaining 4359 patients. The distribution of injury patients by hospital was Mulago, 75%, Nsambya, 12%, Mengo, 5%, Rubaga, 4%, and Kibuli 3%. Overall, the 4359 injury

Abbreviations: ICD-10, *International Classification of Diseases*, 10th edition; KTS, Kampala trauma score

Table 1 Top four causes of injury in each age group

Age (years)	No (% total sample)	No (%) top four causes	
≤10	711 (16)	Falls	210 (30)
		Traffic	204 (29)
		Burns	111 (16)
		Cuts/stabs	87 (12)
11–20	1020 (23)	Traffic	494 (48)
		Cut/stabs	178 (18)
		Falls	145 (14)
		Blunt injuries	73 (7)
21–30	1577 (36)	Traffic	904 (57)
		Cuts/stabs	276 (18)
		Blunt injuries	121 (8)
		Falls	100 (6)
31–40	661 (15)	Traffic	384 (58)
		Cuts/stabs	93 (14)
		Falls	55 (8)
		Blunt injuries	45 (7)
41–50	217 (5)	Traffic	119 (55)
		Cuts/stabs	24 (11)
		Falls	29 (13)
		Blunt injuries	14 (7)
>50	173 (4)	Traffic	89 (51)
		Falls	33 (19)
		Cuts/stabs	20 (12)
		Blunt injuries	11 (6)
Total	4359 (100)	Traffic	2194 (50)
		Cuts/stabs	678 (16)
		Falls	572 (13)
		Blunt injuries	298 (7)
Mean=24.2			
Range=0.1–89			

patients were 7% of all the patients seen in these hospitals. Of the 4359 patients, 2836 (65%) were treated and sent home, 1448 (33%) were admitted, 28 (0.6%) died within two weeks.

Patient characteristics

Males comprised 73% of injury patients. The age distribution is described in table 1. Twenty per cent of injury patients were not Kampala residents, while 21% were injured outside the district. The demographics of the patients were not different between hospitals.

Cause of injury

Road traffic was the most important cause, causing 50% of all injuries, followed by cuts/stabs (16%), and falls (13%). The causes for the various age groups are in table 1. Pedestrians comprised 38% of traffic injuries, drivers 5%, other motor vehicle occupants 35%, and cyclists 22%.

Intent

The majority (86%) of the injuries were unintentional, 13% were intentional, and 1% undetermined. Most gunshot wounds (89%) were intentional. Many blunt injuries (43%) and cuts/stabs (32%) were intentional. The proportion of intentional injury among other causes was minimal. Of the 567 intentional injuries, 314 (55%) occurred at home. Females were more likely to have sustained an intentional injury at home (62%), than males (39%), $p < 0.001$. However, the causes of domestic intentional injuries were similar in females and males.

Occupation

Students and pupils accounted for the biggest proportion (29%) followed by civil servants (16%), casual laborers (13%), and small business owners (11%). In all occupations, traffic

Table 2 Mean (%) time between arrival to hospital and receiving attention

Hospital	Time (min)		
	0–10	11–20	>20
Mulago	506 (88)	36 (6)	32 (6)
Nsambya	412 (84)	36 (7)	45 (9)
Rubaga	139 (81)	14 (8)	18 (11)
Mengo	193 (86)	12 (5)	20 (9)
Kibuli	108 (74)	18 (12)	20 (14)
Total	1358 (84)	116 (7)	135 (8)

Table 3 Injury severity as measured by the Kampala trauma score, by hospital; results are number (%)

Hospital	Severity of injury		
	Severe	Moderate	Mild
Mulago (n=2531)	29 (1)	44 (2)	2458 (97)
Nsambya (n=537)	4 (1)	13 (2)	520 (97)
Rubaga (n=175)	0	0	175 (100)
Mengo (n=221)	0	8 (4)	213 (96)
Kibuli (n=132)	7 (5)	15 (11)	110 (83)
Total (n=3596)	40 (1)	80 (2)	3476 (97)

was the commonest cause: students/pupils, 42% of the injuries, civil servants 58%, and casual laborers, 48%; followed by falls (23%), and cuts/stabs (15%).

Place of injury

The majority of injuries happened on roads/streets (58%), and homes (29%). Other places were public buildings (4%) and factories (3%). More women were injured at home (41%) compared to males (25%), $p < 0.001$.

Care and outcome

The majority of patients arrived in hospital within an hour (66%). There was no significant difference in arrival time between hospitals. Neither was there a difference in the median arrival time in patients who died (45 minutes), and patients with other outcomes (60 minutes), $p = 0.462$. Of the 114 patients who arrived after 24 hours, 8% had been injured in Kampala. The median hospital response time was five minutes at all the five hospitals. The majority of patients (84%) were attended to within 10 minutes (see table 2). The response time for patients who died was 10 minutes, compared with five minutes in all other categories ($p = 0.306$).

At two weeks, 943 (65%) of the 1448 admissions had been discharged, 81 (6%) had died, 107 (8%) were still in hospital, and 317 (22%) left hospital “against medical advice”.

Severity and outcome

The majority of the patients (97%) had minor injuries, 2% had moderate injuries, and only 1% had severe injuries (see table 3). There were no significant differences in the distribution of severity of injuries between the hospitals. However, Kibuli registered a relatively higher proportion of moderately and severely injured patients, 11% and 5% respectively, compared with the other four hospitals. The head, neck, and/or face were the most commonly injured parts of the body, 44%, followed by the bony pelvis and/or extremities (39%) (see table 4). In 8% of the patients, a head, neck, or face injury was associated with another injury. The highest number of deaths occurred with KTS <14. These deaths were mainly from traffic (54%), falls (11%), stabs and cuts (11%), and burns (8%). Mulago had

Table 4 Body area injured (admitted patients) by hospital; results are number (%)

Body area injured	Hospital					Total (n=1405)
	Mulago (n=1001)	Nsambya (n=153)	Mengo (n=123)	Rubaga (n=58)	Kibuli (n=70)	
Head/neck/face	445 (44)	62 (41)	58 (47)	30 (52)	30 (43)	625 (44)
Chest	64 (6)	24 (16)	14 (11)	9 (16)	4 (6)	115 (8)
Spinal cord	40 (4)	7 (5)	6 (5)	4 (7)	8 (11)	65 (5)
Abdomen	71 (7)	13 (8)	13 (11)	5 (9)	7 (10)	109 (8)
Bony pelvis and extremities	423 (42)	49 (32)	44 (36)	12 (21)	24 (34)	552 (39)
Head/neck/face + any other body part	69 (7)	16 (10)	17 (14)	8 (14)	4 (6)	114 (8)

a statistically higher death rate (7.2%) than Nsambya ($p=0.002$) with 0.7% deaths, and Mengo ($p=0.046$) with 2.4% deaths.

Of the patients with severe injuries, 64% arrived within one hour. No severely injured patients arrived after 12 hours. For moderate injuries, 34% arrived within one hour, 83% by four hours, but none after 24 hours. Of the patients with minor injuries, 22% of patients arrived within one hour, 88.7% within four hours, and 0.7% after 24 hours.

DISCUSSION

Large financial commitments are made to the five Kampala hospitals. It is therefore appropriate to evaluate the pattern of injury seen at these institutions in terms of etiology, care, and outcome. The findings describe the situation in Kampala but reflect the problems faced by other large African cities, and perhaps cities of low income countries elsewhere. Similar to other studies in Africa and elsewhere,¹¹⁻¹⁵ young men were the largest consumers of the hospital emergency trauma services in Kampala. The largest occupational category of the injured were students which may reflect the youthfulness of the population, but still emphasizes that the journey to and from school presents a high risk for traffic injury. This is different from South Africa where the majority of injured persons were workers, with students a minority.¹³ Schools clearly present an entry point for injury prevention programs in Kampala. The high risk for pedestrians in Uganda is dissimilar to Tanzania where vehicle occupants predominate in traffic injury.¹¹

The hospital admission rate of 33% in Kampala is comparable to injury studies in Ghana.¹⁶ In Kampala females predominated in only one injury category which was intentional domestic injury. None of the hospitals has domestic violence counseling, or a referral service, so such injuries are offered care only for their physical trauma. Such services should be added to give more holistic care.

One in three patients arrived more than one hour after injury and the average time for arrival of those who died was 45 minutes. This delay has serious implications for the survival of severely injured patients. There is no pre-hospital emergency care system in Kampala and many patients may be dying before they receive care. Surprisingly, this study did not show a difference in survival associated with delay in arrival. One explanation for this could be that in the case of severe injuries we are seeing a population dominated by survivors. Many trauma victims with severe injuries may be dying before they access care.

The predominance of head and neck injuries in this study indicates a need for coordinated services for neurotrauma. Mulago hospital has the only neurotrauma service but does not receive proportionately more patients with head and neck injury than the non-specialized hospitals. In the case of domestic violence, a referral service for counseling is necessary if care is to be comprehensive, while in the case of neurotrauma the specialized service could be better utilized with the introduction of an appropriate referral system.

In quality control assessments, we have demonstrated that the trauma registry captures an average of 60% of injured patients who come to hospital, and that there is no difference between patients included or missed by the trauma registry.¹⁷ We therefore do not believe that incomplete registry catchment is a source of bias. Inclusion of all the major hospitals in Kampala reduces selection bias due to the lack of definition of catchments associated with single hospital registries. The lack of statistical difference on demographics, outcome severity, and etiology strengthen the assertion that the data collected are representative of trauma victims who receive hospital care in Kampala.

One of the limitations of this hospital based study is that we do not know about patients who were injured and did not reach hospital. Our concern that many are dying without care is based on our 1997 community based study in Kampala which indicated an injury mortality of 2.2/1000 per year.⁷ With a population of more than one million people and the high prevalence of injury mortality noted in the community studies it is clear many patients, even those with severe injuries, are not accessing formal care. Mock *et al* found that in Ghana, 30% of patients with a severe injury both in and out of the city did not access formal care, but 60% of those with non-fatal severe injuries in the city received hospital care.¹⁶

Results show that minor injuries are crowding secondary and tertiary care services, with no triage to match injury severity to level of care. At least one severe injury must be present for patient admission. However some hospitals modify admission criteria for social or logistic reasons so in some cases overstate severity to facilitate admission.^{8 14 15} The provision of centers for minor injuries should be a priority for the city. It is unfortunate that the curative services at Kampala hospitals represent nearly all of the investment for injury control yet these resources are directed at minor and moderate injuries.

There is no pre-hospital emergency care system and discussion of these results is within that context. It is of concern that of the severely injured, 36% arrived more than one hour after injury. Most of these patients were from within the city, yet had no pre-hospital care; this has implications for patient outcome.

A pre-hospital emergency service would help improve the transit to hospital. This may result in increased hospital injury mortality initially, as more severe injuries would make it to hospital.

These results confirm that injury is an important problem to the clinical service, but we believe is a gross underestimate of the magnitude of the problem. Our findings are very similar to those from urban trauma centers in Iran, where it was concluded that trauma surgery training and direct transportation to trauma centers could improve outcome.¹⁴

IMPLICATIONS FOR PREVENTION

Preventive measures, especially for traffic injuries, are urgently needed and should have resources that reflect the magnitude

Key points

- Preventive measures, especially for traffic injuries, are urgently needed.
- Coordination of emergency trauma services among key service providers in Kampala could improve patient outcomes.

of the problem. A pre-hospital emergency service should be implemented, as this study suggests that salvageable patients are dying before reaching hospital. Injury management requires coordination, so that the large volume of minor injuries receive care without impeding the care of the seriously injured, who should be rapidly triaged to tertiary centers. This is particularly crucial for head injuries.

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LACUNAE

South Australian attempt to protect “Good Samaritans”

In an increasing litigious society and to encourage people to give assistance where it is needed the South Australian Minister for Volunteers introduced a Bill into parliament in late 2001 to limit the liability of people for injury arising out of genuine attempts to help victims in emergency situations. Called the “Good Samaritans (Limitation of Liability)”, it defined a “Good Samaritan” as a person, acting without any expectation of payment or consideration who comes to the aid of a victim in an emergency or who gives advice about the treatment of a someone apparently in need of emergency treatment. Under the Bill the Good Samaritan is not liable for personal injury to the victim arising out of a genuine attempt to help the victim unless gross negligence is established. Media reports indicate that there have not been any cases of an injured person suing their rescuer and regard the Bill as publicising the lack of risk to potential helpers rather than preventing litigation. While there is no similar legislation in other states, NSW has legal protection for medical professionals who attend an emergency and render assistance on a voluntary basis (there are limitations to this exemption in fairly extreme circumstances).

Label instructions on consumer products . . .

- On a Sear’s hairdryer: do not use while sleeping.
 - On packaging for a Rowenta iron: do not iron clothes on body.
 - On Boot’s children’s cough medicine: do not drive a car or operate machinery after taking this medication.
 - On most brands of Christmas lights: for indoor or outdoor use only.
 - On a Japanese food processor: not to be used for the other use.
 - On Sainsbury’s peanuts: Warning: contains nuts.
 - On a child’s superman costume: wearing of this garment does not enable you to fly.
 - On a Swedish chainsaw: do not attempt to stop chain with your hands or genitals.
- (Contributed by Barry Pless, who cannot confirm the veracity of these instructions!)